МІНІСТЕРСТВО ОСВІТИ І НАУКИ, МОЛОДІ ТА СПОРТУ УКРАЇНИ

НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ
«ХАРКІВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»

TECHNOLOGY FOCUS. ENGLISH READER

Перспективи технології

Навчальний посібник з англійської мови для студентів та магістрів всіх спеціальностей

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Наведено оригінальні англійські тексти для читання, обговорення та детального аналізу. Тематика текстів охоплює різні сфери сучасної науки та техніки. Кожен текст споряджений низкою вправ на розвиток всіх аспектів мовленнєвої діяльності. Окремі розділи присвячені науковим конференціям та рекомендаціям щодо складання комп'ютерної презентації. В додатках надано тести для повторення граматичних аспектів англійської мови.

Призначений для студентів та магістрів усіх спеціальностей, а також для всіх, хто бажає вдосконалити свою англійську.

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ВСТУП

Для кого цей посібник?

Навчальний посібник «Technology Focus. English Reader» призначений для широкого кола студентів технічних спеціальностей, що вивчають англійську мову. Зміст та запропонована методика опрацювання матеріалу передбачають певні базові знання англійської мови та володіння фаховою та загальнонауковою термінологією.

Що містить посібник?

За змістом текстові матеріали охоплюють широкий спектр проблем науки і техніки сьогодення: від електричних автомобілів і надшвидкісних потягів до синтезованих ДНК, нанотехнологій та робототехніки. За стилем тексти є науково-популярними. Перевагами такого стилю для тих, хто вивчає англійську мову за фаховим спрямуванням, є поєднання доступності матеріалу для розуміння, легкої, майже розмовної, форми викладення – з одного боку, і насиченості фаховою термінологією – з іншого. Крім того, тексти запозичені з англомовних інформаційних джерел, що дає змогу студентам опановувати сучасну «живу» мову.

Як працювати з посібником?

Посібник складається з 4 основних частин:

- короткі есе про нові дослідження у різних галузях науки і технології (25 текстів);
- науково-популярні тексти для читання (8 текстів);
- тексти з машинобудування (12 текстів);
- тексти з хімії (17 текстів).

Кожен текст основних розділів споряджений численними лексико-граматичними вправами на розвиток різних аспектів мовленнєвої діяльності. Перед кожним текстом студенти знайдуть короткий словничок, в якому надається контекстний переклад слів і словосполучень. Для розвитку розмовних навичок пропонується декілька лексичних моделей з даного тексту (Speech Patterns), за якими студенти мають скласти свої приклади. Виконання низки наступних лексичних вправ дозволить студентам розширити свій словниковий запас та правильно використовувати тематичну лексику в мові. Повторення граматичних особливостей англійської мови (Grammar Practice) відбувається на прикладах їх реалізації у «живих» професійно-орієнтованих текстах.

У додатках пропонуються приклади оформлення матеріалів конференцій; рекомендації з підготовки комп'ютерної презентації; тести для повторення всіх аспектів граматики; таблиця неправильних дієслів.

Бажаємо успіху!

I. TEXTS FOR THOROUGH READING AND ANALYSING

1. NEW EXPERIMENT COULD REVEAL MAKE-UP OF THE UNIVERSE

to reveal	виявляти	treatment	лікування
to make up	складати	PET (Positron emission tomography) scan	ПЕТ (Позитронно-емісійна томографія) сканування
the universe	Всесвіт	rare	рідкісний
fingerprints	відбитки пальців	to occur	відбуватися
an array	матриця, решітка	an accelerator	прискорювач
tracking	стеження	a ratio	співвідношення
currently	в даний час	unstable	нестійкий
interaction	взаємодія	a shape	форма

Scientists at the University of Liverpool are constructing highly sensitive detectors as part of an international project to understand the elements that make up the universe. The detectors will become part of the Advanced Gamma Tracking Array (AGATA) experiment, currently based in Italy, which aims to create a "fingerprint" of the inside of the atomic nucleus to understand the structure of all matter in the Universe, including human beings and the stars. The experiment will help scientists analyse particle interactions that produce gamma rays, which are also commonly used for their penetrating properties in medical diagnostics and treatments such as PET scans and radiation therapy. Scientists will use these interactions – and the energy required to make them – to detect rare "exotic" nuclei. These are formed by nuclear reactions, which occur in the heart of stars as well as the large accelerator facilities used to study them on earth. **Exotic nuclei are difficult to detect** and consist of extreme proton and neutron ratios, making them highly unstable. The new experiment will help scientists understand why some nuclei are more stable than others and why they have a wide variety of different shapes.

Speech patterns

He	is difficult	to understand.	Його важко зрозуміти.
	is easy		Його легко зрозуміти.
	is impossible		Його неможливо зрозуміти.

1. Say whether these statements are TRUE or FALSE.

1. The Liverpool scientists are designing a new telescope.
2. The experiment will help scientists analyse particle interactions.
3. Scientists will use these interactions to detect “exotic” flowers.

2. Give English equivalents of the following word combinations:

надзвичайно чутливий індикатор, міжнародний проект, відбитки пальців, атомне ядро, структура матерії, взаємодія частинок, медична діагностика, ядерні реакції, нестійкі екзотичні ядра, різноманітні форми.

3. Match the definitions and the following terms:

a) the positively charged atomic particle presented in all atomic nuclei	1) radiation
b) a nuclear particle (a proton or neutron)	2) a nucleon
c) an uncharged atomic particle that is nearly equal in mass to the proton	3) a particle accel-erator
d) a device that accelerate charged particles by magnetic or electric fields	4) a nucleus
e) the converting of nuclear mass to energy	5) a nuclear reaction
f) the central part of an atom that comprises nearly all of the atomic mass	6) a proton
g) the emission or transfer of radiant energy such as particles, electromagnetic waves, sound etc	7) a neutron

4. Give synonyms to the following words:

sensitive, a project, a universe, an experiment, matter, to help, commonly, to detect, rare, different.

Grammar Practice

1. Give other examples of words with the same plural forms.

nucleus – nuclei	
criterion - criteria	
alga – algae	
index – indices	
datum – data	
crisis - crises	

2. Change the following sentences using passive construction.

1. Scientists at the University of Liverpool are constructing highly sensitive detectors. 2. Italian researchers carry out the experiment which aims to create a "fingerprint" of the inside of the atomic nucleus. 3. Scientists analyse particle interactions that produce gamma rays. 4. Diagnosticians commonly use them in radiation therapy. 5. Scientists will use these interactions to detect unstable exotic nuclei.

3. Put 5 special questions to the text.

2. SOUND WAVES SAVE ROADS

to repair	ремонтувати	enhancement	збільшення
to the tune of	в розмірі	to uncover	розкривати
to be underway	проводитись	to prevent	запобігати
quality	якість	educated	обгрунтований
robustly	міцно	a guess	припущення
to reveal	виявляти	to respond	відповідати
underneath	під	to suppose	припускати
to entail	викликати	previous	попередній

Every year European roads are built and repaired to the tune of several billion Euros. Intensive efforts are underway all over the world to get "more roads for your money" by developing better methods for **both** design **and** quality control of materials. One problem is that today there are no good methods for checking how robustly and safely the roads were built. There-

fore they often don't last as long as they were supposed to and more money has to go to road construction. But now a young scientist has developed a method where sound waves can reveal what a road looks like underneath and thereby show whether it is being properly built. According to the Swedish Road Administration, the method, which is expected to become the new standard, may entail major quality enhancements and cost savings. Damage to bridges, tunnels, dams, and nuclear power plants can be uncovered using this technology and dangerous accidents can thereby be prevented. Today most prognoses are based on educated guesses from previous experience, which often **prove to be wrong**. Since a road consists of many different materials – gravel, bitumen, air, water – it's difficult to predict how it will respond to future traffic and environmental loads. Because roads, unlike buildings, for instance, are "built into" the ground, it's hard to inspect them visually.

Speech patterns

both ... and	**як ..., так і ...**
I like both mathematics and physics.	Мені подобається і математика, і фізика.

He	**proves** / **appears** / **turns**	**to be**	a good sportsman.	Виявляється, що він хороший спортсмен.

1. Say whether these statements are TRUE or FALSE.

1. There are lots of methods to check how roads are built.
2. The method for checking the road condition was developed by a group of experienced scientists.
3. It's difficult to predict the future state of a road because it is made of many different materials.

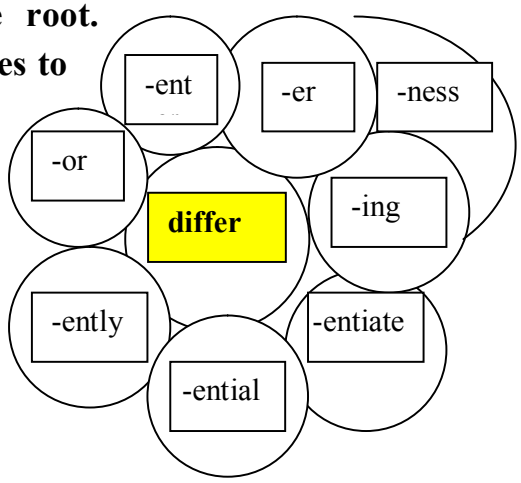
2. Give synonyms to the following words from the text:

to build, several, a method, good, to expect, prognosis, to respond, to inspect.

3. Match the English word combinations and their Ukrainian equivalents:

a) dangerous accident	1) попередній досвід
b) previous experience	2) обгрунтовані припущення
c) educated guesses	3) перевантаження довкілля
d) intensive efforts	4) жахливі нещасні випадки
e) quality enhancement	5) атомна електростанція
f) nuclear power plant	6) ретельні зусилля
g) environmental loads	7) зростання якості

4. Translate the words of the same root. Construct a "word-flower" using suffixes to form derivatives of the word "*to differ*". Cross out the unnecessary "petals".



1) qualitative, quality;
3) safely, safeness, safety, safe;
4) robust, robustness, robustly;
5) properly, proper, property;
6) inspect, inspector, inspection.

Grammar Practice

1. Make the plural forms for the following words:

prognosis, analysis, basis, crisis, appendix, alumnus, alga, criterion, datum, index, medium, nucleus, phenomenon, radius, spectrum, vita.

2. Find all the occurrences of the Passive Voice in the text and define the tense of the verb forms.

3. Use the required form of the verbs in brackets.

Several billion Euros (to spend) every year on the building and repairing of European roads. Intensive efforts (to make) to improve the methods for quality control of materials. A new method of using sound waves already (to develop) by a young scientist. The introduction of this technology (to prevent) horrible accidents.

4. Find all the occurrences of the verb "*to be*" in the text and explain their functions.

3. WHAT IS THE VOLUME & CHEMICAL COMPOSITION OF BLOOD?

approximately	приблизно	adipose	тваринний жир
to suspend	зависати	tissue	*біол*. тканина
suspension	суспензія, завись	cellular	клітинний
a platelet	тромбоцит	remainder	залишок, решта
bottom	нижній	to dissolve	розчиняти(ся)
abundant	*хім*. поширений	a coat	*мед*. оболонка
straw-colored	блідо-жовтий	buffy	жовтий

Blood is slightly more dense and approximately 3-4 times more viscous than water. Blood consists of cells which are suspended in a liquid. **As with other** suspensions, the components of blood can be separated by filtration, however, the most common method of separating blood is to centrifuge (spin) it. Three layers are visible in centrifuged blood. The straw-colored liquid portion, called plasma, forms at the top (~55%). A thin cream-colored layer, called the buffy coat, forms below the plasma. The buffy coat consists of white blood cells and platelets. The red blood cells form the heavy bottom portion of the separated mixture (~45%).

Blood volume is variable, but **tends to be** about 8% of body weight. Factors such as body size, amount of adipose tissue, and electrolyte concentrations all affect volume. The average adult has about 5 liters of blood.

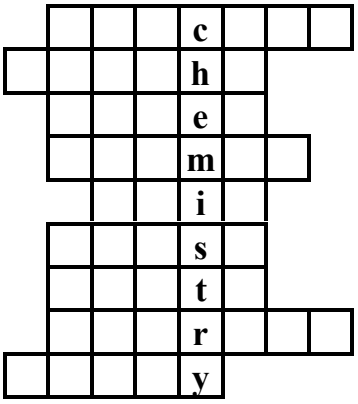
Blood consists of cellular material (99% red blood cells, with white blood cells and platelets making up the remainder), water, amino acids, proteins, carbohydrates, lipids, hormones, vitamins, electrolytes, dissolved gases, and cellular wastes. Each red blood cell is about 1/3 hemoglobin, by volume. Plasma is about 92% water, with plasma proteins as the most abundant solutes. The main plasma protein groups are albumins, globulins, and fibrinogens. The primary blood gases are oxygen, carbon dioxide, and nitrogen.

Speech patterns

tend to be	як правило
It **tends to be** cold at night.	**Як правило**, у ночі прохолодно.

as with other	як і інші
As with other suspensions, the components of blood can be separated by filtration.	**Як і інші** суспензії, компоненти крові можуть бути розділені за допомогою фільтрації

1. Write English equivalents of the following word combinations:
найбільш поширена розчинна речовина, основні групи плазми білка, хімічний склад крові, найбільш поширений метод поділу крові, рідина блідо-жовтого кольору, кремовий тонкий шар, оболонка жовтого кольору, розчинені гази, білі та червоні клітини крові, жирова тканина, важка нижня частина, розділена суміш.



2. Find synonyms and antonyms for the following words. Complete the puzzle inserting the words into the rows.
Dense, white, viscous, common, layer, average, heavy, main, weight.

3. Complete the following sentences to write a summary of the text.
1. The text is devoted to …
2. The aim is to convince a reader …
3. The major attention is paid to ...
4. The main conclusion is …

Grammar Practice
1. Find all occurrences of the verb "*to be*" in the text and explain their functions.

2. Find Adjectives with different suffixes in the text and put them into several lists according to the suffix. Translate them.

3. Find Adjectives in different degrees of comparison in the text and give two other forms.

4. COMPUTERIZED SCHEDULING FOR AIRPORTS

an approach	підхід	decision	рішення
a delay	затримка	observation	спостереження
handling	обробка	experience	досвід
to aim	мати намір	furthermore	більш того
scheduling	календарне планування	search engine	пошукова машина
assignment	призначення	to enhance	збільшувати
to affect	впливати	crucially	значно; критично
capable	здатний	vital	життєво важливий
manually	вручну	given	за умови, з урахуванням
staff	робітники; штат	to predict	прогнозувати

A new computerised approach to airport operations is being developed that will reduce delays, speed up baggage handling and decrease pollution. The research work aims to computerise and co-ordinate four key areas of airport operations: scheduling of airplanes taking-off and landing, gate assignment and baggage handling. The end result will be a prototype search engine capable of analysing the many billions of possible scheduling combinations so as to provide the best advice to the controllers, who decide where in the airport to send planes. Currently these four aspects of airport operations are, in most cases, organised manually by highly skilled staff **making decisions** based on observations, reports and their experience. Furthermore, each activity is run in isolation from the others, which allows the potential for any difficulties in operations in one area to affect another. This can lead to delays snowballing. As well as enhancing the experience for passengers, crucially, the improvements in scheduling will reduce pollution by minimising the time planes are on the ground with engines running. This could

save thousands of litres of aviation fuel every year, a vital improvement **given** the growth in air travel predicted in the coming years.

Speech patterns

Make* vs. *Do

to make	a decision	приймати рішення
	a mistake	робити помилки
	a bed	застилати постіль
	a nest	вити гніздечко
	notes	занотовувати
	a film	знімати фільм
	money	заробляти гроші
	a plan	складати план
	friends	потоваришувати
	a date	призначати побачення

to do	right (wrong)	вчиняти добре (погано)
	work (duty, task)	виконувати роботу (обов'язки, завдання)
	miracles	робити дива
	a favour	зробити послугу
	good (harm)	приносити користь (шкоду)
	credit	робити честь
	lecturing	читати лекції
	a sum (a problem)	вирішувати задачі
	the room	прибирати кімнату
	one's hair	робити зачіску
	sightseeing	оглядати визначні місця

1. Say whether the following statements are TRUE or FALSE.

1. The aim of the research work is computerising passengers' check-in.
2. The main operations in the airport are made unattended.
3. The changes in the airport control may increase the time planes are on the ground.

2. Give synonyms to the following words:

to reduce, to speed up, handling, research, area, prototype, to provide, currently, skilled, observation, activity, to allow, to enhance, vital.

3. Choose one of the options to fill in the gaps.

1. You can have this job only if you have enough ____.

a) experiment b) experience c) examination

2. He always follows his parents' ___.

a) decrease b) device c) advice

3. Most cars use an internal combustion ___.

a) engineer b) engine c) engineering

4. Nobody can ___ his fate.

a) predict b) prepay c) prepare

5. Water ___ has caused the death of fish and other aquatic organisms.

a) scheduling b) improvement c) pollution

4. Find the words in the text that correspond to the following definitions:

1) a heavier-than-air powered flying vehicle with fixed wings; 2) an account prepared for the benefit of others, e.g. one that provides information obtained through investigation; 3) systematic investigation to establish facts or principles or to collect information on a subject; 4) suitcases, bags, etc., packed for a journey; 5) to act upon or influence; 6) to intensify or increase in quality, value or power.

Grammar practice

1. Find all the occurrences of Passive Voice in the text and define the tense of the predicate.

2. Find all the occurrences of the verb "*to be*" in the text. Define their functions.

3. Find all the words ending in *-s* in the text. Put them into two lists: 1) Plural of the Noun; 2) Present Indefinite form of the Verb (3rd person).

5. RED WINE BY-PRODUCTS TURN INTO YOGHURT, CHOCOLATES, CREAMS AND MORE

a conversation	розмова	powder	порошок
a benefit	перевага	to preserve	зберігати
by-product	побічний продукт	a property	властивість
to discard	викидати	to prevent	запобігати
to reason	міркувати	inflammation	запалення
a goodness	поживні якості	to develop	розробляти
to consume	споживати	a wrinkle	зморшка

Two years ago, a group of friends were enjoying a glass of wine in the Mosel region in south-west Germany when their conversation turned to the health benefits of the drink. During the fermentation process of making wine, by-products are often discarded as waste and the friends reasoned that since these by-products contain the goodness of wine in an even more concentrated form, and without the alcohol, shouldn't it be more often used and consumed by humans? One of the friends was Bernd Diehl, the 48-year-old co-owner of a German chemical analysis company called Spectral Service. He proposed a method of turning the by-products into a powder preserving as many of the natural, healthy properties of wine as possible – the proteins, B vitamins, minerals and polyphenols, which **are thought to prevent** heart or circulation diseases, inflammation and thrombosis. As well as developing wine powder, the company also wants to test their powders in different kinds of products – in both food and drink, as well as in make-up. Skin creams using the powder are rather effective and some wine properties can be good for the skin, including having anti-wrinkle effects.

Speech patterns

Cell phones	are thought	to be harmful to our health.	Вважають, що стільникові телефони шкідливі для нашого здоров'я.
	are considered		
	are believed		

1. Say whether the following statements are TRUE or FALSE.

1. When wine is made, its by-products are usually used again.

2. Bernd Diehl is a co-owner of a garage.
3. The chemical company is planning to use the wine-powder in cosmetics.

2. Give synonyms to the following words from the text:
a region, a conversation, to discard, a company, to propose, to preserve, a property, to test.

3. Give your own definitions to the following words:
wine, by-product, powder, vitamin, food, skin, disease.

4. Put the sentences into correct order.
1. The company Spectral Service developed a technology of producing healthy additives to many kinds of food and drink products.
2. One of the friends proposed a method of turning by-products of wine into powder.
3. Some people met to have a glass of wine.
4. The company tried to use the wine-powder in cosmetic products.
5. The friends noted that by-products of wine are discarded in vain.

5. Choose one of the options to fill in the gaps.
1. We ___ our staying in this hotel very much.
a) endured b) enjoyed c) enclosed
2. Babies cannot take pills. You should grind the pill into ___ and mix it with liquid to give it to a child.
a) power b) pour c) powder
3. This heater ___ much electricity.
a) consumes b) costumes c) constitutes
4. Special clothing ___ Polar researchers from overcooling.
a) prescribes b) prevents c) predicts

Grammar Practice
1. Try to explain the use of all the articles in the text. Note that some nouns are used without articles. Why?

2. Find combinations Preposition+Noun in the text. Put them into two lists: a) combinations where the preposition is translated as a corresponding preposition; b) combinations where the preposition is rendered in a different way.

3. Find all *-ed* verb forms in the text. Define their functions.

6. WHY DO CUT APPLES, PEARS, BANANAS AND POTATOES TURN BROWN?

to bruise	пом'яти, побити	oxidation	окислення
rust	іржа	cutlery	ножові вироби
preservative	захисний	corrosion	іржа
sulfur dioxide	сірчаний ангідрид	oxides	оксиди
tyrosine	тирозин	rate	швидкість

Apples and other products (e.g., pears, bananas, peaches, potatoes) contain an enzyme (called polyphenol oxidase or tyrosinase) that reacts with oxygen and iron-containing phenols that are also found in the apple. The oxidation reaction basically forms a sort of rust on the surface of the fruit. You see the browning when the fruit is cut or bruised because these actions damage the cells in the fruit, allowing oxygen in the air to react with the enzyme and other chemicals.

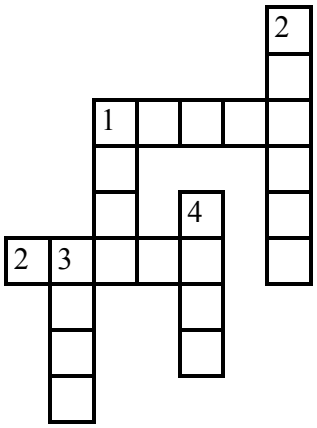
The reaction **can be slowed or prevented by inactivating** the enzyme with heat (cooking), reducing the pH on the surface of the fruit (by adding lemon juice or another acid), reducing the amount of available oxygen (by putting cut fruit under water or vacuum packing it), or by adding certain preservative chemicals (like sulfur dioxide). On the other hand, using cutlery that has some corrosion (as is seen with lower quality steel knives) can increase the rate and amount of the browning by making more iron salts available for the reaction.

Speech patterns

to prevent by + Gerund	**запобігти шляхом чогось**
The reaction can be slowed or	Цю реакцію можна уповільнити чи

prevented by inactivating the enzyme with heat.	запобігти їй шляхом деактивації ензимів теплом.
to prevent from + Gerund	**зашкодити чомусь**
Nothing can **prevent him from** achieving his goal.	Ніщо не може зашкодити йому досягти своєї мети.

1. Complete the crossword using the words from the text:



Horizontally:

1) any of various alloys based on iron containing carbon; 2) a clear colourless tasteless odourless liquid that is a neutral substance, an effective solvent for many compounds, and is used as a standard for many physical properties.

Vertically:

1) a white powder or colourless crystalline solid, consisting mainly of sodium chloride; 2) a common light yellow chemical substance that burns with a very strong unpleasant smell, and is used in drugs, explosives, and industry; 3) any substance that dissociates in water to yield a sour corrosive solution containing hydrogen ions, having a pH of less than 7, and turning litmus red; 4) a malleable ductile silvery-white ferromagnetic metallic element widely used for structural and engineering purposes.

2. Answer the questions.

1. What fruits and vegetables contain the enzyme called polyphenol oxidase? 2. What happens (chemically) when we cut a fruit? 3. What colour is rust? 4. Does rusty cutlery affect the rate of the oxidation? 5. How can the process of fruit oxidation be prevented?

3. Find the definitions of each of the following words:

1) rust	a) the reaction of a substance with oxygen or another oxidizing agent;
2) sulfur dioxide	b) to combine with oxygen (iron rust because it is oxidized by exposure to the air;

3) to preserve	c) a colorless odorless gaseous chemical element that is found in the air;
4) oxidation	d) a reddish brown color;
5) to oxidize	e) a heavy pungent toxic gas that is used esp. in bleaching, as a preservative, and as a refrigerant, and is a major air pollution;
6) oxygen	f) to keep from decaying, e.g. to process food to prevent spoilage.

4. Fill in the gaps with the words from the text using the appropriate form: *to prevent, amount, available, surface, to contain, to reduce, to increase*.

1. This medicine is ___ only on doctor's prescription.
2. Lately, the number of telephone calls has ___ dramatically.
3. A stumble may ___ a fall.
4. Serious efforts should be made to ___ unemployment.
5. His essay ___ many faults in grammar.
6. This company doubles the ___ of gas deliveries each year.
7. Many animal and plant species have vanished from the ___ of the globe for ever.

Grammar Practice

1. Change the prepositionless terminological complexes into the prepositional ones. Translate them into Ukrainian.

Carbon monoxide, hydrogen chloride, nitrogen oxide, zinc chloride, sulfur dioxide, manganese dioxide.

2. Find all the occurrences of the Passive Voice in the text and define the tense of the predicate.

3. Find all the words ending in *-s* in the text. Put them into two lists: 1) Plural of the Noun; 2) Present Indefinite form of the Verb (3rd person).

7. IS THERE REALLY A CHEMISTRY OF LOVE?

love potion	любовний напій	pounding heart	сильне серцебиття
attraction	привабливість	infatuation	палка закоханість
raw	істинний	meanwhile	тим часом
lust	пристрасть	benefit	перевага
sweaty palms	пітні долоні	infidelity	невіра, недовір'я
to blame	звинувачувати	suppression	стримування
to abandon	відмовитися від	to seek	шукати

I don't think there are any magic love potions that you can use to make someone fall in love, but chemistry does play an important role in how a relationship progresses. First, there's attraction. Nonverbal communication plays a big part in initial attraction and some of this communication may involve pheromones, a form of chemical communication. Did you know that raw lust is characterized by high levels of testosterone? The sweaty palms and pounding heart of infatuation are caused by higher than normal levels of norepinepherine. Meanwhile, the "high" of being in love is due to a rush of phenylethylamine and dopamine. All is not lost once the honeymoon is over. Lasting love confers chemical benefits in the form of stabilized production of serotonin and oxytocin. Can infidelity be blamed on chemistry? Perhaps, **in part**. Researchers have found that suppression of vasopressin can cause males (voles, anyway) to abandon their love nest and seek new mates. Hey, **you gotta have** chemistry!

Speech patterns

In part (partially, partly)	**частково**
This alloy is made in part (partly) of base metals.	Цей сплав частково складається з неблагородних металів.
You gotta have (you got to have)	**Ви повинні мати …**
You gotta have chemistry!	Ви обов'язково повинні мати хімію!

1. Do you agree that there really exists a chemistry of love? Give your arguments.

2. Make dialogues of two friends based on the text.

3. Find in the text and give the definitions of the following words:
attraction, relationship, infatuation, a honeymoon, lust.

Grammar Practice

1. Change the following sentences from active to passive voice making disjunctive or general questions.

1. You can't use magic love potions to make someone fall in love.
2. Chemistry can play an important role in the relationship.
3. Some of nonverbal communication may involve pheromones.
4. High levels of testosterone characterize raw lust.
5. High levels of norepinepherine can cause the sweaty palms and pounding heart.

2. Find all the introductory words in the text. What other words with the same function do you know?

3. Find all the occurrences of the verb "*to do*" in the text. Define their functions.

8. NEW MODEL MAY HELP SCIENTISTS PREDICT AND PREVENT INFLUENZA OUTBREAKS

influenza	грип	to substitute	заміщати
an outbreak	раптовий початок	to evade	уникати (*чогось*)
to affect	впливати на	defense	захист
strain	*біол.* штам	to spread	розповсюджувати
to combat	боротися	likelihood	імовірність
immunization	імунізація	to remain	залишатися
to assess	оцінювати	rate	інтенсивність
to evolve	розвиватися	findings	одержані дані

Each year, the influenza virus evolves. And each year, public health officials try to predict what the new strain will be and how it will affect the

population **in order to** combat it. The paper, published in the journal Science, shows the relationship between the evolution of the virus and immunization rates needed to prevent an outbreak in the population. These findings can help to prevent future outbreaks. Public health officials will be able to assess the usefulness of a vaccine based upon its relationship to the current influenza strain and the population's immunity level. Through previous vaccinations or infections with earlier strains of the influenza virus, many individuals already have some level of immunity. The influenza virus is continually evolving, however. By substituting different amino acids at key molecular points, the virus increases its chances of evading the immune system's defenses, allowing it to reproduce and spread. As the number of amino acid differences between a new strain and the strain an individual was vaccinated against increases, the likelihood of becoming infected increases, **as does the likelihood** of becoming infectious and the length of time the individual will remain infectious. These factors combine to increase the chance of an outbreak in the population.

Speech patterns

in order to do smth.	**щоб щось зробити**
In order to confirm his hypothesis, the scientist made hundreds of experiments.	**Щоб** підтвердити свою гіпотезу, вчений провів сотні експериментів.

The likelihood of becoming infected increases, **as does the likelihood** of becoming infectious.	Зростає вірогідність бути зараженим, як і вірогідність стати носієм інфекції.

1. Say whether these statements are TRUE or FALSE.

1. The article discusses the virus of AIDS.
2. The research shows the dependence of immunization rates and the evolution of the virus.
3. The virus is not evolving any more.

2. Give English equivalents for the following word combinations:
захист імунної системи; попередня вакцинація; сучасний штам грипу; темп імунізації; амінокислоти; рівень імунітету населення; вірус грипу; державні санітарні службовці; ймовірність зростання зараження.

3. Give antonyms to the following words:
different, individual, to spread, to increase, to allow, to combine, previous, useful, to remain.

4. Write a list of keywords of the text.

Grammar Practice

1. Give as many derivatives as possible of the following words and translate them into Ukrainian:
continually, public, official, different, length, infection, combine, health.

2. Change the following sentences into negative.
1. The influenza virus evolves.
2. These findings can help to prevent future outbreaks.
3. Public health officials will be able to assess the usefulness of a vaccine.
4. The paper was published in the scientific journal.

3. Find all the occurrences of the words ending *-s* in the text and explain their functions.

9. FIRST DNA MOLECULE MADE ALMOST ENTIRELY OF ARTIFICIAL PARTS

entirely	цілком	variety	різноманітність
artificial	штучний	a cell	клітина
an improvement	вдосконалення	to craft	виготовляти
a gene	ген	equipment	устаткування
to extend	розширити	a framework	каркас; рама
capability	здатність	a strand	смуга

a blueprint	копія	to resemble	нагадувати
a set	набір; множина	triple-stranded	три-спіральний

Chemists in Japan report development of the world's first DNA molecule made almost entirely of artificial parts. The finding could lead to improvements in gene therapy, futuristic nano-sized computers, and other high-tech advances, they say. Scientists have tried for years to develop artificial versions of DNA in order to extend its amazing information storage capabilities. As the genetic blueprint of all life forms, DNA uses the same set of four basic building blocks, known as bases, to code for a variety of proteins used in cell functioning and development. Until now, scientists have only been able to craft DNA molecules with one or a few artificial parts, including certain bases. The researchers from Japan used high-tech DNA synthesis equipment to connect together four entirely new, artificial bases inside the sugar-based framework of a DNA molecule. This **resulted in** unusually stable, double-stranded structures resembling natural DNA. Like natural DNA, the new structures were right-handed and some easily formed triple-stranded structures. The unique chemistry of these structures and their high stability offer unprecedented possibilities for developing new biotech materials and applications.

Speech patterns

result in	**призводити до; викликати**
Heavy rains resulted in floods.	Сильні дощі викликали повені.
result from	**бути наслідком чогось**
The road accident resulted from the thick fog.	Дорожня аварія виникла через густий туман.

1. Say whether the following statements are TRUE or FALSE.

1. Chemists from Japan have developed a molecule of water.
2. Scientists have never been able to create DNA with any artificial part.
3. The new structures are rather unstable.

2. Give synonyms to the following words:
entirely, artificial, to extend, capability, basic, to craft, certain, to use, to connect, to resemble, to offer.

3. Answer the questions.
1. What was the purpose of creating an absolutely artificial DNA? 2. How many building blocks does DNA use to code genetics of all life forms? 3. Was the artificial DNA absolutely similar to a natural one? 4. What properties make the artificial DNA so attractive?

4. Fill in the gaps with the words from the text.
1. A ___ of water consists of two atoms of hydrogen and one atom of oxygen.
2. The Internet is a global system of interconnected ___ networks.
3. The ___ is the basic structural and functional unit of all known living organisms.
4. Modern aircrafts are fitted with sensitive electronic ___ which can be affected by mobile phones and other electronic appliances carried by passengers.
5. Computer data ___ is often referred to as computer memory.

Grammar practice
1. Find predicates in all the sentences of the text and define their tenses. Try to explain their use.

2. Find all *-ed* verb forms in the text and explain their functions.

3. Write down from the text all the Adjectives with different suffixes. Translate them into your native language.

10. IMPROVED REDOX FLOW BATTERIES FOR ELECTRIC CARS

redox (reduction-oxidation)	окислювально-відновний	a storage	сховище; акумулювання

increasingly	все більше	to recharge	перезаряджати
to envisage	передбачати	a gas station	бензозаправка
to overcome	подолати	to pump out	викачувати
a hurdle	перепона	a solar plant	сонячна батарея

A new type of redox flow battery presents a huge advantage for electric cars. Electric mobility is becoming increasingly important. The German government's ambitious plan envisages one million electric cars being sold in Germany by the year 2020. Until then, however, researchers still have to overcome some hurdles, such as the question of energy storage. Lithium-ion batteries offer a possible solution, but **it takes** hours to charge them – time that an automobile driver doesn't have when on the road. Researchers from the Fraunhofer Institute for Chemical Technology in Pfinztal near Karlsruhe see an alternative in redox flow batteries. These batteries are based on fluid electrolytes. They can therefore be recharged at the gas station in a few minutes – the discharged electrolyte is simply pumped out and replaced with recharged fluid. The pumped-off electrolyte can be recharged at the gas station, e.g. using a wind turbine or solar plant.

Speech patterns

It takes	Займає; потрібно
It takes me an hour and a half to get to the University.	Дорога до університету займає у мене півтори години.
How much wool does it take to make a sweater?	Скільки потрібно вовни, щоб зробити светра?

1. Say whether these statements are TRUE or FALSE.

1. The German government predicts that one thousand electric cars will be sold in Germany in the year 2020.
2. Lithium-ion batteries can be recharged very quickly.
3. Redox flow batteries will be charged at the gas station in a few minutes.

2. Answer the questions.

1. What type of batteries are they going to use in electric cars in Germany? 2. What is the main problem of using electric cars now? 3. What batteries are used for electric cars now? Is there any problem of using them? 4. What forms the basis for flow batteries? 5. What is done with the contents of these batteries at a gas station? 6. What kinds of "green" energy sources are used to recharge the electrolyte from the batteries?

3. Find the words in the text that correspond to the following descriptions:

1) extremely large in size, amount, or scope; 2) an obstacle to be overcome; 3) to substitute a person or thing which has ceased to fulfill its function for another one; 4) a possibility of choice, especially between two things; 5) the executive policy-making body of a political unit or a state; 6) having a strong desire for success or achievement; 7) a specific answer to or a way of answering a problem.

4. Give synonyms to the following words from the text:

a type, important, to envisage, a researcher, a hurdle, energy, fluid, for example.

5. Render the meaning of the text in two or three sentences using the words: to envisage, storage, a hurdle, to recharge, to replace, a gas station.

Grammar Practice

1. Put all possible questions to the following sentences.

1. Flow batteries can be recharged at the gas station in a few minutes.
2. The German government predicts that in the year 2020 a million electric cars will be sold in Germany.

2. Find all the occurrences of Modal Verbs in the text. Explain their functions.

3. Find all Prepositions in the text. Compose a sentence of your own using each preposition with the same meaning.

11. WHY ARE BABIES BORN WITH BLUE EYES?

to inherit	успадкувати	a blood vessel	кровоносна судина
to deposit	давати осад	stable	стабільний, стійкий
an iris	радужна оболонка ока	to experience	зазнавати
exposure	піддавання	to affect	впливати
albinism	альбінізм, відсутність пігменту в шкірі	cut-and-dried	щось встановлене раз і назавжди, догма

You inherit your eye color from your parents, but no matter what the color is now, it may have been blue when you were born. Why? Melanin, the brown pigment molecule that colors your skin, hair, and eyes, hadn't been fully deposited in the irises of your eyes or darkened by exposure to ultraviolet light. The iris is the colored part of the eye that controls the amount of light that is allowed to enter. Some other animals are born with blue eyes, too, such as kittens.

Melanin is a protein. Like other proteins, the amount and type you get is coded in your genes. Irises containing a large amount of melanin appear black or brown. Less melanin produces green, gray, or light brown eyes. **If your eyes contain** very small amounts of melanin, **they will appear** blue or light gray. People with albinism have no melanin in their irises and their eyes may appear pink because the blood vessels in the back of their eyes reflect light.

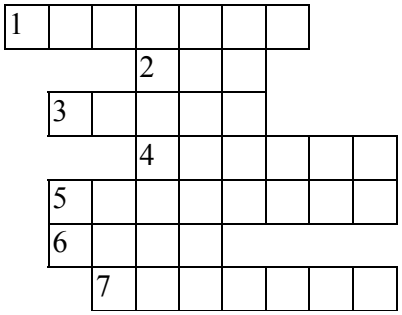
Melanin production generally increases during the first year of a baby's life, leading to a deepening of eye color. The color is often stable by about 6 months of age. However, several factors can affect eye color, including use of certain medications and environmental factors. Some people experience changes in eye color over the course of their lives. People can have eyes of two colors. Even the genetics of eye color inheritance isn't as cut-and-dried as was once thought, as blue-eyed parents have been known (rarely) to have a brown-eyed child!

Speech patterns

***If* + Present ... , ... *will* + V …**	
If your eyes contain very small amounts of melanin, **they will appear** blue or light gray.	Якщо у ваших очах **буде міститися** дуже мала кількість меланіну, вони **виявляться** блакитними чи світло-сірими.

1. Say whether these statements are TRUE or FALSE.

1. The eye color is inherited from the parents, but it may change during the first year of a baby's life.
2. The iris is the colored part of the eye that doesn't control the amount of light that is allowed to enter.
3. The larger the amount of melanin, the lighter the color of eyes.
4. People with albinism have no melanin in their irises.
5. People cannot have eyes of two colors.



2. Guess the terms from the text corresponding to the following definitions to complete the rows of the puzzle. In one of the columns read a key word:

1) coloring matter; 2) the organ of sight of animals, containing light-sensitive cells; 3) an attribute of things that results from the light they reflect, transmit, or emit; 4) a person or nonhuman mammal lacking coloring matter in the skin, hair, and eyes; 5) a branch of biology dealing with heredity and variation; 6) the colored part around the pupil of an eye; 7) to receive something from one's ancestors.

Grammar Practice

1. Find the modal verbs and their equivalents in the text and define their meaning:

a) ability, b) possibility, c) permission or d) hypothetical possibility.

2. Write down special questions to the sentences from the text with the Modal Verbs using their equivalents.

3. Find all *-ed* verb forms in the text. Define their functions.

12. WHAT ELEMENTS AND CHEMICAL COMPOUNDS ARE THE MOST POISONOUS?

nutritional	харчовий	within	у межах
truly	насправді	susceptibility	сприйнятливість
exposure	піддавання	yet	проте, однак
to excrete	виділяти	otherwise	в іншому випадку
toxicity	отруйність	man-made	штучний
deadly	смертельно небезпечний	to encounter	зустрітися, стикатися

Have you ever wondered which elements are toxic? Everything is toxic if the dose is high enough. This is a short list of elements that have no nutritional value, even in trace amounts. Some of these elements accumulate in the body, so there is no truly safe exposure limit for those elements (e.g., lead, mercury). Barium and aluminum are examples of elements which can be excreted, at least **to a certain extent**. Most of these elements are metals. The man-made elements are radioactive and toxic whether they are metals or not: Aluminum, Antimony, Arsenic (metalloid), Barium, Beryllium, Cadmium, Lead, Mercury, Osmium and others. Radioactive metals: Polonium (metalloid), Thorium, Radium, Uranium, Transuranium elements (e.g., polonium, americium), Radioactive isotopes of metals that might not otherwise be highly toxic (e.g., cobalt – 60, strontium – 90).

When you get right down to what the most poisonous chemical compound is, we may say that everything is poisonous. Water will kill you if you drink too much of it. Oxygen is a deadly poison, yet we need it to live. However, there are some chemicals that we are better off not encountering. Here's a list of the most poisonous chemicals known. **Keep in mind**, toxicity varies from one species to another (i.e., what may be poisonous for a mouse may be more / less poisonous to a human) and within a species (i.e.,

age, sex, genetics all affect susceptibility to a toxin). Here are some names of the toxins, their source, approximate average lethal dose per kilogram of body weight (LD50), and the species: tetanus – 1 nanogram/kg – mouse, human; botulinal neurotoxin (bacteria) – 1 nanogram/kg – mouse, human; shigella (bacteria) – 1 nanogram/kg – monkey, human; palytoxin (coral) – 60 nanogram/kg – dog and others.

Speech patterns

to a certain extent	**до певної міри**
Barium and aluminum are examples of elements which can be excreted, at least **to a certain extent**.	Барій і алюміній є прикладами елементів, які можливо виділити, принаймні **в певній мірі**.

to bear (to keep) in mind	**пам'ятати, мати на увазі**
Bear (keep) that in mind!	Запам'ятайте! Майте це на увазі!

1. Match the definitions and the corresponding terms:

a) the property that some elements or isotopes have of spontaneously emitting energetic particles by the disintegration of their atomic nuclei	1) a toxin
b) the processes by which an individual takes in and utilizes food material	2) nutrition
c) a group of objects or individuals, all sharing at least one common attribute, that forms a subdivision of a genus	3) man-made
d) made by humans rather than nature	4) a species
e) a poisonous substance produced by metabolic activities of a living organism that is usually unstable, very toxic when introduced into the tissues, and usually capable of inducing antibodies	5) radioactivity

2. What major problem is discussed in the text? Express your opinion on the problem.

3. Study the uses of Common Elements.

Element	Symbol	Uses
Aluminium	Al	Outdoor furniture, building, foils
Barium	Ba	Paint, rat poison
Boron	B	Antiseptic, water softening, cleaning
Calcium	Ca	Limestone, cement, plaster
Carbon	C	Petroleum, alcohol ink, pencils
Chlorine	Cl	Swimming pools, bleach, herbicide
Chromium	Cr	Plating, tanning leather, stainless steel
Cobalt	Co	Colouring glass, high temperature alloys
Cooper	Cu	Brass, bronze, coins
Fluorine	F	Etching glass, air conditioning
Iodine	I	Table salt, antiseptic
Lead	Pb	Solder, batteries, X-ray shields
Lithium	Li	Flares, paint
Mercury	Hg	Light switches, thermometers
Nickel	Ni	Coins, safes, plating
Sulphur	S	Making paper, gunpowder, sulpha drugs
Zinc	Zn	Paints, galvanising

Continue the table indicating the uses of oxygen and nitrogen. Compose sentences describing the application of the elements using the phrases: is used for, is designed for, enters into the composition of, is a part of.

Grammar Practice

1. Put 3 types of questions (general, special and disjunctive) to each statement.

1. There are some elements that have no nutritional value.
2. The man-made elements are radioactive and toxic.
3. Some chemical compounds may be both poisonous and useful.
4. Toxicity varies from one species to another and within a species.

2. Translate the following word-building chains. Explain the way of forming these words.

Susceptibility – susceptible – susceptive; nutrition – nutritionist – nutritious – nutritive – nutritional; accumulate – accumulation – accumulative – accumulator; toxic – toxicant – toxicology – toxicosis – toxin; radioactive – radioactivity; poisonous – poison – poisoning – poisoner – poisoned; chemical – chemistry – chemist.

3. Find all the sentences with subordinate clauses in the text. Define their types.

13. NEW MATERIAL FOR COMPUTER MEMORY

dramatically	значно	a vehicle	транспортний засіб
to boost	підвищувати	to reduce	зменшувати
storage	зберігання; пам'ять	a generation	покоління
to allow	дозволяти	to withstand	витримувати
definition	чіткість	an engine	двигун
to exceed	перевищувати	to improve	покращувати
a breakthrough	прорив	a technique	метод
doping	легування	application	застосування
an impurity	домішка	harnessing	підкорення

North Carolina State University engineers have created a new material that would allow a fingernail-size computer chip to store the equivalent of 20 high-definition DVDs or 250 million pages of text, **far exceeding** the storage capacities of today's computer memory systems. The engineers made their breakthrough using the process of selective doping, in which an impurity is added to a material that changes its properties. The process also shows promise for boosting vehicles' fuel economy and reducing heat produced by semiconductors, a potentially important development for more efficient energy production. Information storage is not the only area where advances could be made. By introducing metallic properties into ceramics engineers could develop a new generation of ceramic engines able to with-

stand twice the temperatures of normal engines and achieve fuel economy of 80 miles per gallon. And since the thermal conductivity of the material would be improved, the technique could also have applications in harnessing alternative energy sources like solar energy.

Speech patterns

far exceeding	значно перевищуючий
by **far** the best	явно найкращий
far and away the most important	безсумнівно найважливіший
so **far**	досі
as **far** as I know	наскільки я знаю

1. Say whether the following statements are TRUE or FALSE.

1. North Carolina State University engineers have created a new computer.
2. The invention may decrease the fuel consumption of cars.
3. Another application of the technology is creating new generations of engines and solar cells.

2. Give synonyms to the following words:

to allow, to store, to change, to boost, to reduce, important, to withstand, technique.

3. Choose one of the options to fill in the gaps.

1. The scientist has ___ a new theory that promises to change our understanding of the universe.

a) created b) compared c) conducted

2. Even a small amount of ___ can make the water unfit for drinking.

a) properties b) semiconductors c) impurities

3. Bicycle is the most environmentally friendly ___.

a) engine b) vessel c) vehicle

4. People have used the wind as an energy ___ for a long time.

a) resource b) source c) sauce

5. The total ___ of Ukraine is 603,550 sq km.

a) areal b) square c) area

4. Give your own definitions to the following words from the text:
an engineer, a computer, memory, an impurity, a vehicle, ceramics.

5. Complete the sentences with the information from the text.
1. American engineers developed a computer memory chip able to ___.
2. Selective doping is the process where ___.
3. In vehicles, the new invention promises ___.
4. A new generation of ceramic engines can be made due to ___.
5. Thanks to better conductivity, the new material will be applied in ___.

Grammar Practice
1. Find all the nouns in Possessive case in the text. Explain their use.

2. Find all the sentences with Subordinate clauses in the text. Define their functions. Give your own examples of the same types of subordinate clauses.

3. Find all the words ending *-s* in the text. Define their functions as: 1) plural of a noun; 2) possessive case of a noun; 3) a verb in 3-rd person singular.

14. ENGINEERS DEVELOP SAFER, BLAST-RESISTANT GLASS

to protect	захищати	transparent	прозорий
to contain	містити	a fiber	волокно
blast-resistant	вибухостійкий	embedded	вбудований
vulnerable	уразливий	room	місце
an explosion	вибух	cracking	розтріскування
conventional	традиційний	to provide	забезпечувати
layer	шар	flexibility	гнучкість
a sheet	лист	quantity	кількість
to replace	замінювати		

To protect from potential terrorist attacks, federal buildings and other critical infrastructures are made with special windows that contain blast-

resistant glass. However, the glass is thick and expensive. Currently, researchers from the University of Missouri are developing and testing a new type of blast-resistant glass that will be thinner, lighter and less vulnerable to small-scale explosions. Conventional blast-resistant glass is made of laminated glass that has a plastic layer between two sheets of glass. MU researchers are now replacing the plastic layer with a transparent composite material made of glass fibers that are embedded in plastic. The glass fibers add strength because, unlike plastic, they are only about 25 microns thick, which is about **half the thickness** of a typical human hair, and leave little room for defects in the glass that could lead to cracking. The use of a transparent composite interlayer provides the flexibility to change the strength of the layer by changing the glass fiber quantity and its orientation.

Speech patterns

to be half (twice)	the thickness	of something	бути вдвоє тоншим (завтовшки), ніж ...
	the width		бути вдвоє вужчим (ширшим), ніж ...
	the size		бути вдвоє меншим (більшим) за розміром, ніж ...

1. Say whether the following statements are TRUE or FALSE.

1. The researchers from the University of Missouri are developing a new kind of glasses.
2. The conventional blast-resistant glass contained plastic.
3. The glass fibers used in the new technology are as thick as a pencil.

2. Give synonyms to the following words from the text:

to protect, expensive, currently, conventional, a fiber, a defect, quantity.

3. Use one of the options to fill in the gaps.

1. To make glass stronger, the researchers use glass ___.

a) tribes b) fibers c) strings

2. The composite layer inserted between sheets of glass is ___.

a) transparent b) laminated c) cracked

3. The new type of glass will be resistant to ___.

a) scratching b) heating c) explosions

Grammar Practice

1. Find all the noun chains in the text and give their translation. E.g. potential terrorist attacks – потенційні терористичні напади.

2. Find the sentences with predicates in Passive voice in the text. Define the tense of the predicate. E.g.: *are made* – the Present Simple Passive.

3. Find Attributive subordinate clauses in the text.

a) Try to explain the presence or absence of the comma.

b) Note that they are connected to the main clause with different conjunctions. Why?

15. WHAT ARE THE ELEMENTS IN THE HUMAN BODY?

to come in	виявлятися	buck	*амер. розм.* долар
to be worth	цінитися	one's best bet	виграшна справа
worth	вартий	to tan hide	дубити шкіру
trace amount	незначна кількість	trace elements	мікроелементи
going rate	нинішня ціна	to round up	округляти
to take a look	поглянути	to run	бути в обігу (*гроші*)

Most of the human body **is made up of** water, H_2O, with cells consisting of 65 – 90% water by weight. Therefore, it isn't surprising that most of the human body's mass is oxygen. Carbon, the basic unit for organic molecules, comes in second. 99% of the mass of the human body is made up of just six elements: oxygen, carbon, hydrogen, nitrogen, calcium, and phosphorus.

Have you ever wondered how much the elements in your body are worth? First, let's take a look at the elements from which you are made. Your body is approximately: 65% Oxygen, 18% Carbon, 10% Hydrogen, 3% Nitrogen, 1.5% Calcium, 1% Phosphorous, 0.35% Potassium, 0.25%

Sulfur, 0.15% Sodium, 0.15% Chlorine, 0.05% Magnesium, 0.0004% Iron, 0.00004% Iodine. Your body contains trace amounts of other elements, such as silicon, manganese, fluorine, copper, zinc, arsenic and aluminum. What is the going rate for a body's worth of these elements? One US dollar! Are you surprised?

Let's see if we can bump the price up a bit. If you're looking to make a buck with your body, your best bet would be to sell individual organs, but since that's illegal, an alternative might be to tan your hide for use as leather. Your skin **would be** worth about $3.50 if it **were sold** at the price of a cowhide, which runs around $0.25 per square foot. So, if you take a dollar's worth of elements plus the value of your skin, you might be able to get $4.50, which we'll round up to $5, so you'll feel better about your chemical value.

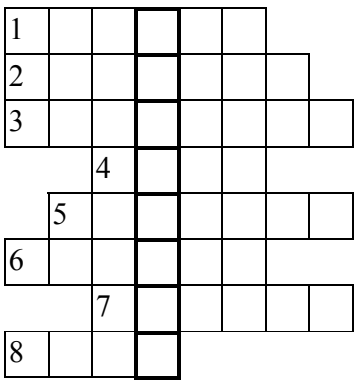
Speech patterns

***Would* + Indefinite Infinitive … *if* + Past Indefinite**	
He **would pass** his exam **if** he **worked** harder.	Він **здав би** екзамен, якби він **працював** наполегливіше.

to be made up of = to consist of	**складатися (з чогось)**
Water **is made up of** (**consists of**) hydrogen and oxygen.	Вода **складається з** кисню і водню.

1. Discuss this text by putting general questions and aswering them.

2. Divide the text into logical parts and entitle each of them.



3. Put down the names of some chemical elements mentioned in the text into the rows of the puzzle and in the selected column read the name of an outstanding chemist, one of Mendeleyev's disciples, who worked at Kharkov technological institute:

1) a colourless odourless highly reactive gaseous element; the most abundant element in the earth's crust; 2) a toxic metalloid element, existing in several allotropic forms; 3) a light malleable ductile silvery-white metallic element that resists corrosion; it is used, esp. in the form of its alloys, in aircraft parts, kitchen utensils, etc.; 4) a brittle bluish-white metallic element that becomes coated with a corrosion-resistant layer in moist air; it is a constituent of several alloys, esp. brass and nickel-silver, and is used in die-casting, galvanizing metals, and in battery electrodes; 5) a brittle metalloid element that exists in two allotropic forms; occurs principally in sand, quartz, granite, and clay. It is used in transistors, rectifiers, solar cells, and alloys. Its compounds are widely used in glass manufacture and building industry; 6) a very reactive soft silvery-white element of the alkali metal group occurring principally in common salt; 7) a nonmetallic element existing in the three crystalline forms: graphite, diamond, and buckminsterfullerene; 8) a malleable ductile silvery-white ferromagnetic metallic element. It is widely used for structural and engineering purposes.

4. Change direct questions given below into indirect ones. Use the following expressions to begin your indirect questions with: "*I wonder*" or "*It's interesting*".

1. What element constitutes the most part of the human body's mass?
2. Who can answer what is the basic unit for organic molecules?
3. How many elements is the human body made up of?
4. What trace elements does a human body contain?
5. How much money might you have for your skin?

Grammar Practice

1. Find all the occurrences of the pronoun "*it*" in the text. Note that they have different functions. Compose the sentences of your own using the same meanings of "*it*".

2. Find all the Irregular Verbs in the text and write their three forms. Then check your accomplishment using the list of irregular verbs.

3. Explain the use of the verb forms in the conditional sentences referring to the future and translate them into Ukrainian.

16. FINDING WATER ON THE MOON

significant	важливий	propellant	паливо
implication	наслідки	fairly	досить
exploration	дослідження	accurately	точно
finding	знахідка	to launch	запускати
to hit the headline	стати сенсацією	a mission	космічний польот
a headline	заголовок	whatever	будь-які
reportedly	як повідомляється	to transform into	перетворювати
data	дані	completely	повністю

The discovery of large quantities of water on the moon will have very significant implications for human space exploration, according to Kingston University space expert Dr Chris Welch. The findings by NASA, which have been hitting the headlines today, were reportedly made after researchers examined data from three separate missions to the moon. Dr Welch, astronautics and space systems expert at Kingston University London's Faculty of Engineering, said the findings could transform work for astronauts. "Scientists thought they knew fairly accurately what the surface of the moon was like and these results show that they didn't – or **at least** not completely," Dr Welch said. "Finding so **much more** water could make living on the moon **much easier** in the future. Water is very heavy and to launch it into space would be difficult and expensive. If there is water on the moon – in whatever form – then we have a potential reservoir that could be used for drinking or to transform it into hydrogen and oxygen which could be used as rocket propellant. Also, of course, we could use the oxygen to breathe."

Speech patterns

much + Comparative	**значно + прикметник (порівн.)**
The distance from the Sun to the	Відстань від Сонця до Землі **знач-**

Earth is **much longer** than that from the Moon.	**но більша**, ніж відстань від Луни.

at least	**принаймні**
You might **at least** say you are sorry.	Ви могли б, **принаймні**, вибачитися.

1. Say whether these statements are TRUE or FALSE.

1. Scientists have discovered gold on the Moon.
2. It is very easy to bring much water onto the Moon.
3. Water on the Moon can be used for producing rocket fuel.

2. Match the terms and their definitions:

a) to explore	1) to set (a missile, spacecraft, etc.) into motion
b) to discover	2) something that provides or causes propulsion, such as the explosive charge in a gun or the fuel in a rocket
c) space	3) factual information (as measurements or statistics) used as a basis for reasoning, discussion or calculation
d) to launch	4) to examine or investigate, esp systematically
e) propellant	5) a traveler in a spacecraft
f) an astronaut	6) to obtain sight or knowledge for the first time
g) data	7) the earth's natural satellite
h) a moon	8) the region beyond the earth's atmosphere

3. Use special questions to write a plan of the text.

4. What major problem is discussed in the text? Express your opinion.

Grammar Practice

1. Define the meaning of the modal verb *could* in the text as:

a) ability, b) possibility, c) permission or d) hypothetical possibility.

2. Change the Conditional I into Conditionals II and III using the appropriate phrases.

If there is water on the moon, we will have a potential reservoir for drinking.

3. Define the functions of the verb *"to have"* in the text. Translate the corresponding sentences.

17. BONES GET MENDED WITH HIGH TECH GLASS-OF-MILK

a bone	кістка	recently	нещодавно
to mend	полагодити	to order	призначати
to fix	виправити	to form	формувати
broken	поламаний	to work out	розробляти
to rush	ринути	NMR (Nuclear Magnetic Resonance)	ЯМР (Ядерний Магнітний Резонанс)
bioglass	біоскло	to simulate	імітувати
to amaze	дивувати		

Scientists at the new Nuclear-Magnetic Resonance unit at the University of Warwick have discovered how a high-tech glass of milk is helping bones mend. Low temperature Bioglass is used to help fix broken bones, but until now no one has been able to understand the process. Using a strong magnetic field to "see" into the bones researchers saw calcium rush into the bioglass in the first hour of implantation. Physicist Professor Mark Smith explains: "Bioglass is used to help mend broken bones. Recently researchers working at Imperial College discovered a new kind of bioglass which **seemed** to work better, but they could not work out all the details why. We looked at it through our NMR machine and were amazed by what we saw. Fluid simulating patient's bodies rushed calcium out of the bioglass and then into the new bones. **It seems** perhaps a glass-of-milk-a-day really is what the doctor ordered." The new Bioglass uses chemicals **rather than** heat to form the replacement bones.

Speech patterns

rather	**швидше, досить, до деякої міри**
rather … than	**скоріше … ніж**

Chemical formulas can be used **rather than** drawings of the atoms and molecules.	Хімічні формули, можливо, використовують **більше, ніж** креслення атомів та молекул.

It **seemed to** me she was far too romantic.	Мені з**далося**, що вона надто романтична.
He **seems** to be a teacher.	**Здається**, він вчитель.

1. Say whether these statements are TRUE or FALSE.

1. To fix broken bones special bioglass is used.
2. Bones are cured thanks to calcium which is taken from the bioglass.
3. Scientists examined the process with X-ray machine.

2. Match the following words from the text with their antonyms:

a) to discover	1) nonexistent
b) to mend	2) to have no idea of
c) low	3) to break
d) to understand	4) to complicate
e) strong	5) to conceal
f) to explain	6) high
g) real	7) weak

3. Guess what words from the text correspond to the following definitions:

1) an institution of higher education having authority to award bachelors' and higher degrees, usually having research facilities; 2) to repair (something broken or unserviceable); 3) a substance obtained by a chemical process or used for producing a chemical effect; 4) technology involving the use of advanced devices; 5) hard largely calcareous tissue forming most of the skeleton of a vertebrate animal; 6) one under medical care.

4. Answer the following questions.

1. What discovery has been made by the scientists of Warwick University? 2. What kind of glass is used to help fix broken bones? 3. What did scientists see through the Nuclear-Magnetic Resonance machine?

Grammar Practice

1. Write down two lists of the Infinitives from the text: a) the Infinitives with "*to*" and b) the Infinitives without "*to*". Try to explain why they are used so.

2. Make up sentences using the following words.

1. Bones / glass / a / high-tech / mend / helping / milk / of / is.
2. Strong / researchers / a / field / into / magnetic / the / bones / to "see" / patient's / use.
3. Fluid / rushed / of / is / calcium / out / by / bioglass / the.

3. Write a personal review table of the following tenses for Passive voice. Example verb "*to break*".

Active	Verb	Present Indefinite	Present Continuous	Present Perfect
	to break	*break, breaks*	*am / is / are breaking*	*have / has broken*
Passive	Verb	Present Indefinite	Present Continuous	Present Perfect
	to break			

4. Make adjectives from the following words:

science, to help, to understand, a magnet, to explain, to amaze, to use.

18. URBAN GROWTH VERSUS GLOBAL WARMING

versus	проти	vulnerability	уразливість
a stilt	опора	emissions	викиди
to recycle	утилізувати	to focus	зосереджувати
to outline	описувати в загальних рисах	particular challenges	особливі проблеми

to lead	вести	to emphasize	підкреслювати
dishwater	помиї	to cut	скорочувати
to respond	відповідати	the extremes	крайнощі
to reduce	зменшити	drought	посуха
a threat	загроза	flooding	повінь

Houses on stilts, small scale energy generation and recycling our dishwater are just some of the measures that are being proposed to prepare our cities for the effects of global warming. A three-year project led by Newcastle University for the Tyndall Centre for Climate Change Research has outlined how our major cities must respond if they are to continue to grow in the face of climate change. The report "How can cities grow whilst reducing emissions and vulnerability" focuses on the particular challenges facing London but can be used as a model for other UK cities on how policy-makers, businesses and the public must work together to prepare for climate change. **As well as** protecting our homes and buildings against the increased threat of flooding from rising sea levels, the report emphasizes the need to reduce our carbon emissions, reduce our water usage and move towards cleaner, greener transport. "Most importantly, we have to cut our carbon dioxide emissions but at the same time we need to prepare for the extremes of weather – heat waves, droughts and flooding – which we are already starting to experience," say the researchers.

Speech patterns

as well as	**так само, як; а також**
Technical students study Mathematics, Physics **as well as** other natural sciences.	Студенти ВНЗ вивчають математику, фізику, **а також** інші природничі науки.

as well	**також, крім того, на додаток**
I like to play computer games **as well**.	**Крім того** мені подобається грати у комп'ютерні ігри.

1. Say whether these statements are TRUE or FALSE.

1. One of the measures to prevent global warming is to use small-scale energy generation.
2. The article discusses the research of the American scientists.
3. The project mentioned in the article lasted for 5 years.

2. Choose definitions to the following terms:

a) a flood	1) a general increase in world temperatures caused by increased amounts of carbon dioxide around the Earth
b) a desert	2) to make or become smaller in size, number, extent, degree, intensity, etc
c) global warming	3) a long spell of dry weather
d) a drought	4) dry land with few plants and little rainfall
e) to recycle	5) a great flow of water over the land
f) to protect	6) to shield from injury
g) to reduce	7) to process in order to regain materials for human use

3. Find all the terms of "Noun + Noun" type in the text and translate them into your native language.

4. Write a summary of the text, describe its subject-matter, objective and conclusions. Choose from the following lists of words and phrases.

Subject-matter description: the text is devoted to, the text describes, the text discusses, the text concerns, the subject matter of the text is.

Objective description: the aim (objective, goal) of the text is, the text is aimed at, the text is directed to.

Conclusion description: the following conclusion can be made (can be drawn) from the text, it may be concluded that, we may conclude that.

Grammar Practice

1. Underline the suffixes in the following words and state what parts of speech they form:

energy, generation, recycling, global, warming, reducing, emission, flooding, usage, importantly, researcher.

2. Write down two lists of the Infinitives from the text: a) the Infinitives with "*to*" and b) the Infinitives without "*to*". Try to define their functions in the text.

3. Find the sentences with modal verbs or their substitutes in the text and put special questions to them.

4. Choose the correct form of the verb.

The ecologists ___ (are facing / are faced) by a lot of problems in the modern world. There ___ (is / are) about 7 billion people in the world at present. The population ___ (grow / is growing) very fast and scientists believe that in a few decades it ___ (was / will be) too big for the earth to support. The Earth ___ (is being damaged / were damaged) constantly in different ways. Among the serious problems which our planet ___ (face / is facing) are: the increasing consumption of energy and water, the pollution of air by car exhausts, the rivers that ___ (will poison / are poisoned) by chemicals, the forests that ___ (are devastated / devastated) by fire and acid rains. Many steps should ___ (take / be taken) just now to make our planet a safer and better place to live in.

19. SCIENTISTS MAY NOW LOOK INSIDE PATIENT'S INDIVIDUAL CELLS

ultrasonic	надзвуковий	a transducer	датчик
to utilise	використовувати	to fit	вміщати
tiny	крихітний	width	ширина
to detect	виявляти	frequency	частота
abnormality	аномалія	GHz (gigahertz)	ГГц (гігагерц)
cancer	*мед.* рак	current	сучасний
to aim	мати ціль	to image	зображувати
miniaturised	мініатюрний	ultrasound	ультразвук

Revolutionary ultrasonic nanotechnology that could allow scientists to see inside a patient's individual cells to help diagnose serious illnesses is being developed by researchers at the University of Nottingham. The new technique would utilise ultrasound technology – more commonly used to look at whole bodies – to look inside cells. The components of the new technology would be many thousand times smaller than current systems. The technology would be tiny enough to allow scientists to see inside and image individual cells in the human body, which would further our understanding of the structure and function of cells and could help to detect abnormalities to diagnose serious illnesses **such as** some cancers. The Nottingham researchers are aiming to produce a miniaturised version of this technology, with transducers so tiny that you could fit 500 across the width of one human hair which would produce sound waves at frequencies a thousand times higher again, in the GHz range.

Speech patterns

such as	**як наприклад; такий як**
These students are taught languages coming from Latin, **such as** French, Italian, and Spanish.	Цим студентам викладають мови, які походять від латини, **такі як** французька, італійська, іспанська.

1. Say whether these statements are TRUE or FALSE.

1. New technology makes it possible to see inside human cells.
2. The new technique uses X-ray technology.
3. The technology will be used to diagnose flu.

2. Give antonyms to the following words from the text:

to allow, to help, to detect, inside, tiny, individual, to produce, common.

3. Write down definitions of the following words:

frequency, ultrasonic, nanotechnology, ultrasound technology, to diagnose, a component, the structure of cells.

4. Give English equivalents of the words in brackets. Be sure that you understand the text.

(Дослідники) of the University of Nottingham have been developing a new (надзвукову) nanotechnology. This revolutionary technique (надасть можливість) scientists (заглянути всередину) cells in the patient's body and will be able to help (виявляти аномалії) to diagnose serious illnesses. The Nottingham researches (прагнуть зробити) a miniaturized version of this technology.

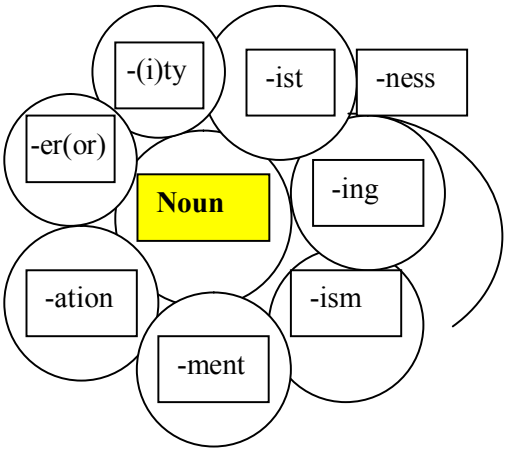
Grammar Practice

1. Write down all the infinitives with the function of purpose from the text. Compose 2 sentences with the Infinitive in this function.

2. Form nouns from the following words:

to detect, to produce, to help, to utilize, to fit, to miniature, serious, human.

Choose the necessary suffixes from the "word-flower" and add them to the words. Translate nouns into Ukrainian.



3. Match the modal verbs and their equivalents in the appropriate tense form:

a) can	1) have to
b) could	2) is able to
c) may	3) was permitted to
d) might	4) is allowed to
e) must	5) was able to

4. Find the sentences in the text where the *-ed* form of the verb is a part of the passive construction and make them interrogative.

20. STEP FORWARD FOR NANOTECHNOLOGY: CONTROLLED MOVEMENT OF MOLECULES

an advance	просування	self-healing	самозагоювання
a challenge	виклик; проблема	to repair	відновлювати
desired	бажаний	a tear	розрив
an achievement	досягнення	to deliver	доставляти
an implication	наслідок	to spare	берегти
to coax	примушувати	tissue	тканина
to treat	лікувати	to involve	включати
a disease	хвороба	partially	частково

Scientists in the United Kingdom are reporting an advance toward overcoming one of the key challenges in nanotechnology: getting molecules to move quickly in a desired direction without help from outside forces. Their achievement has broad implications, the scientists say, raising the possibility of coaxing cells to move and grow in specific directions to treat diseases. It also could speed development of some long-awaited nanotech innovations. They include self-healing structures that naturally repair tears in their surface and devices that deliver medication to diseased while sparing healthy tissue. Mark Geoghegan and colleagues note long-standing efforts to produce directed, controlled movement of individual molecules in the nano world, where objects are about 1/50,000th the width of a human hair. The main solutions so far have involved using expensive, complex machines to move the molecules and they have been only partially successful, the scientists say.

1. Say whether the following statements are TRUE or FALSE.

1. Scientists from the United Kingdom try to make molecules move in a desired direction without help of external forces.
2. One of the main fields of application of the invention is agriculture.
3. In the nano world objects are about the width of a human hair.

2. Find the words from the text that corrrespond to the definitions:
1) something that has been accomplished, especially by hard work, ability, or heroism; 2) a fellow worker or member of a staff, department, profession, etc.; 3) the smallest unit into which any substance can be divided without losing its own chemical nature, usually consisting of two or more atoms; 4) a new idea, method, or invention.

3. Give synonyms to the following words from the text:
advance, a challenge, desired, help, a possibility, a disease, to speed, to deliver, a medication.

4. Fill in the gaps with the words from the text.
1. A young ___ proposed a method of detecting unwanted impurities in water.
2. Specialists of various fields of engineering demonstrated their ___ at the annual fall exhibition.
3. A file makes the ___ of a treated material much smoother.
4. It took the mechanic the whole day to ___ our broken bicycle.
5. We cannot buy this computer, it's too ___.

Grammar Practice
1. Write down from the text all the *-ing*-forms of the verbs in two lists:
a) the Participle and b) the Gerund. Analyze the context to explain the difference in their function and translation.

2. Find all occurrences of "*to*" in the text. Analyze their functions. Give your own examples for each function.

3. Put down all plural noun forms from the text into 3 lists according to the pronunciation of *-s*: 1) [s], 2) [z], 3) [iz].

21. SELF-HEALING SURFACES

unique	унікальний	distributed	розподілений
a scratch	подряпина	to damage	пошкоджувати

a trace	слід	a pellet	кулька
a scar	шрам	to burst	вибухати
electroplated	гальванізований	to fail	зазнавати невдачі
rust	іржа	to alter	змінювати
to recover	відновлювати	a scale	масштаб
to transfer	передавати	entirely	цілком
to introduce	вводити		

Human skin has a unique property – small scratches and cuts heal quickly, leaving no trace of a scar after just a few days. It's a different matter with materials, such as metals – if the electroplated layer protecting the metals from corrosion is scratched, rust protection is lost and the layer has to be recovered. Engineers are working on transferring the self-healing effect of skin to materials. The idea behind this is to introduce evenly distributed fluid-filled capsules into the electroplated layer – rather like raisins in a cake. If the layer is damaged, the pellets at the point of damage burst, the fluid runs out and "repairs" the scratch. Until now, these plans have failed **due to** the size of the capsules – ranging from 10 to 15 micrometers they were too large for the electroplated layer, which is around 20 micrometers thick. The capsules altered the mechanical properties of the layer. Researchers from Stuttgart have developed a process for producing electroplated layers with nano-capsules. At only a few hundred nanometers in diameter, the capsules are measured on another scale entirely, compared with previous results.

Speech Patterns

We stayed at home **due to** the bad weather.	Ми залишилось вдома **через** погану погоду.
Due to your help we managed to finish the project on time.	**Завдяки** вашій допомозі нам вдалось завершити проект вчасно.

1. Say whether the following statements are TRUE or FALSE.

1. The researchers try to create the material which can "cure" itself when scratched.

2. The technology uses capsules filled with gas.
3. The technology using nano-capsules was developed in Great Britain.

2. Give synonyms to the following words from the text:
a property, quickly, a few, matter, to protect, to introduce, to damage, to burst, due to, to alter, to produce.

3. In the text, find the words that correspond to the definitions:
1) a slight injury, usually of skin; 2) a process in which a solid, especially a metal, is eaten away and changed by a chemical action, usually by oxidation; 3) a dried grape; 4) to restore (something damaged or broken) to good condition or working order; 5) a straight line connecting the centre of a geometric figure, especially a circle or sphere, with two points on the perimeter or surface; 6) any of a number of chemical elements that are often lustrous ductile solids, have basic oxides, and are good conductors of heat and electricity.

4. Fill in the gaps with the words from the text.
1. Mendeleyev classified the elements according to their chemical ___.
2. Ozone ___ protects our planet from aggressive ultraviolet radiation.
3. Electric current is ___ in amperes.
4. Any substance that flows is called a ___.
5. Translation can never be ___ with the original.

Grammar Practice
1. Find all the occurrences of the verb "*to have*" in the text. Explain their function. Give your own example for each function of the verb.

2. Find all *-ing* verb forms in the text. Explain their functions. Give your own example for each function.

3. Put down all Attributive constructions from the text into 2 lists where: 1) a noun is an attribute; 2) an adjective or a participle is an attribute.

22. HYGIENIC SURFACES, BIOCIDAL AND SELF-CLEANING COATINGS

coating	покриття	to incorporate	включати
to refer to	стосуватися	a particle	частинка
to provide	надавати	a circuit	коло; схема
to achieve	досягати	processing	обробка
treatment	обробка	to obtain	отримувати
to acquire	набувати	resin	смола
capacity	здібність; здатність	ceramic	керамічний

It is well known there is a great interest in the design and development of the so-called "hygienic surfaces", referring to surfaces that not only provide biocidal activity but also to those that **are easy to clean** and even self-cleaning. Achieving these properties on a surface is possible by means of coatings and treatments on specific surfaces, and in which nanotechnology plays a key role. Most of these coatings acquire their biocidal / self-cleaning capacity by incorporating specific nano-particles: basically silver (Ag) and titanium oxide (TiO_2). The development of these coatings is key mainly in sectors such as architecture and construction, textiles, heat exchangers, air conditioning circuits, hygiene-health (hospitals, schools) and food processing. Various methods and technologies are currently used for obtaining such biocidal effect of surfaces, **e.g.** by incorporating nanoparticles in organic resins (in ceramic matrixes).

Remember how to read some Latin abbreviations

Written form	**Pronunciation**	**Translation**
e.g.	for example	наприклад
i.e.	that is	тобто
etc.	and so on	тощо

Speech patterns

This stain	is easy	to clean without special detergents.	Цю пляму легко (складно, неможливо) віддіпрати без спеціальних миючих засобів.
	is difficult		
	is impossible		

1. Say whether the following statements are TRUE or FALSE.

1. Self-cleaning properties are achieved by means of adding soap.
2. The technology uses nano-particles of gold.
3. The technology is vital for food industry.

2. Give synonyms to the following words:

to provide, activity, by means of, treatment, to acquire, a sector, currently.

3. Fill in the gaps with the words from the text.

1. A varnish dries to a hard, glossy and transparent ___.
2. Protons, neutrons and electrons are only three of the more than 200 sub-atomic ___ that are known.
3. An electric ___ is a closed loop through which charges can continuously move.
4. He ___ success by means of hard work.
5. Nitric ___ is often referred to as Laughing Gas.

Grammar Practice

1. Give as many derivatives as possible to the following words:

activity, possible, construction.

2. Find all the sentences in the Passive Voice in the text. Explain the use of Passive in these sentences. Give your own examples of sentences with the same structure.

3. Find all *-ing* forms of verbs in the text. Define their functions as: 1) the Gerund; 2) the Participle; 3) the Verbal Noun.

23. WHY DO ONIONS MAKE YOU CRY?

vapor	випар	aside from	крім, за винятком
to release	випускати	to eat	в'їдатися (про кислоту)
sulfuric acid	сірчана кислота	volatile	летючий
an irritant	подразник	to waft	доноситися (про запах)
to smell	відчувати запах	to wipe	витирати

to remove	усунути (щось)	to reduce	зменшувати
odor (smell)	запах	to burn	обпалювати

Unless you've avoided cooking, you've probably cut up an onion and experienced the burning and tearing you get from the vapors. When you cut an onion, you break cells, releasing their contents. Amino acid sulfoxides form sulfenic acids. Enzymes that were kept separate now are free to mix with the sulfenic acids to produce propanethiol S-oxide, a volatile sulfur compound that wafts upward toward your eyes. This gas reacts with the water in your tears to form sulfuric acid. The sulfuric acid burns, stimulating your eyes to release more tears to wash the irritant away.

Cooking the onion inactivates the enzyme, so while the smell of cooked onions may be strong, it doesn't burn your eyes. Aside from wearing safety goggles or running a fan, you can keep from crying by refrigerating your onion before cutting it (which slows reactions and changes the chemistry inside the onion) or by cutting the onion under water.

The sulfur-containing compounds also leave a characteristic odor on your fingers. You may be able to remove or reduce some of the smell by wiping your fingers on a stainless steel odor eater. You just rub your fingers across the blade of a stainless steel knife to remove odors from onions, garlic, and fish.

Speech patterns

Unless	**Якщо не …**
Unless you've avoided cooking, you've probably cut up an onion.	Якщо ви не цуралися приготування їжі, ви вочевидь різали цибулю.

1. Use special questions to write a plan to the following text.

2. Translate the abstract given below.

В тексті розглядається вплив сірчаної кислоти на виникнення печії та сліз при приготуванні цибулі. Аналізуються хімічні процеси, що відбуваються під час різання цибулі. Показано, що сірчана суміш легко випаровується та взаємодіє з водою сліз людини, спричинюючи

обпалення та збільшуючи кількість сліз. Представлені методи запобігання впливу ензимів на сльозову оболонку очей та усунення запаху на пальцях.

Grammar Practice

1. Write down the names of the acids metioned in the text into several lists according to their suffixes.

2. Find all *-ing* verb forms in the text and explain their functions.

3. Find all the sentences with subordinate clauses in the text. Define their functions.

24. KEY STEP MADE TOWARDS TURNING METHANE GAS INTO LIQUID FUEL

to be valued	цінитись за шось	readily	легко, просто
a bond	з'єднання	currently	в даний час
to bind	зв'язувати	a catalyst	каталізатор
to burn	горіти, спалювати	inefficient	неефективний
to break	розривати	selectively	вибірково
carbon	вуглець	advance	досягнення
hydrogen	водень	to transform	перетворювати
to convert	перетворювати	required	необхідний

Researchers at the University of Washington and the University of North Carolina at Chapel Hill have taken an important step in converting methane gas to a liquid, potentially making it more useful as a fuel and as a source for making other chemicals. Methane is valued for its high-energy carbon-hydrogen bonds, which consist of a carbon atom bound to four hydrogen atoms. The gas does not react easily with other materials and so it is most often simply burned as fuel. Burning breaks all four hydrogen-carbon bonds and produces carbon dioxide and water. Converting methane into useful chemicals, including readily transported liquids, currently requires high temperatures and a lot of energy. Catalysts that turn methane into

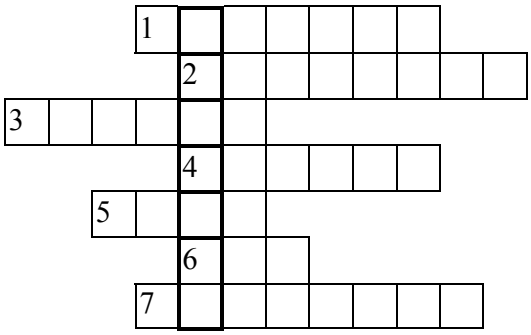
other chemicals at lower temperatures have been discovered, but they **have proven to be** too slow, too inefficient or too expensive for industrial applications. Binding methane to a metal catalyst is the first step required to selectively break just one of the carbon-hydrogen bonds in the process of converting the gas to methanol or another liquid. The work should stimulate further advances in developing catalysts to transform methane into methanol or other liquids.

Speech patterns

They	**prove** **appear** **turn**	**to be**	good specialists.	Виявляється, що вони хороші спеціалісти.

1. Say whether the following statements are TRUE or FALSE.

1. American researchers try to convert methane gas into solid.
2. When burning methane produces carbon dioxide and water.
3. Converting methane into useful chemicals needs high temperature.



2. Match the terms and their definitions. Put them into rows to read a secret word in the selected column.

a) gas	1) a colorless odorless flammable gas produced by decomposition of organic matter or from coal and used especially as a fuel;
b) liquid	2) a substance added to the chemical reaction to alter (usually to increase) the rate of reaction; it is not changed in the reaction nor does it change the nature of the products;
c) carbon	3) a nonmetallic chemical element occurring in nature especially as diamond and graphite and as a constituent of coal, petroleum, and limestone;

d) hydrogen	4) flowing freely like water, neither solid nor gaseous;
e) methane	5) the smallest particle of a chemical element that can exist alone or in combination;
f) an atom	6) a fluid that tends to expand indefinitely;
g) a catalyst	7) a gaseous colorless odorless highly flammable chemical element that is the lightest of the elements.

3. Write down 5 questions to the text.

4. Decide what info you would include in your summary of the text. Write this info in the form of topic sentences.

Grammar Practice

1. Find the sentences containing the Gerund in the text. Translate these sentences into Ukrainian and define the function of the Gerund as: a) subject, b) object, c) predicative, d) modifier, e) adverbial modifier.

2. Find synonyms and antonyms to the following words.

Word	Synonyms	Antonyms
to convert		
important		
potential		
useful		
to break		
to include		
slow		
inefficient		
to stimulate		

3. Pick out the sentences with the Perfect Tenses from the text and translate them into Ukrainian.

4. Open the brackets using the Passive voice of the verb in brackets.

1. An important step in converting methane into methanol ___ (to take) by American researchers.
2. All four hydrogen-carbon bonds ___ (to break) and carbon dioxide and water ___ (to produce) by burning the gas.
3. High temperatures and a lot of energy ___ (to require) to convert methane into useful chemicals.
4. Catalysts ___ (to discover) to turn methane into other chemicals.
5. Further advances in developing catalysts should ___ (to stimulate).

25. IF YOU'RE HAPPY, THEN WE KNOW IT: NEW RESEARCH MEASURES MOOD

mood	настрій	to investigate	досліджувати
devilish	страшенний	remote-sensing	дистанційне зондування
to irritate	дратувати	to record	записувати
to sense	відчувати	particular	зокрема
valence	валентність	exactly	саме
score	запас, рахунок	an opportunity	можливість
to measure	виміряти	to establish	встановити

In 1881, the optimistic Irish economist Francis Edgeworth imagined a strange device called a "hedonimeter" that would **be capable of** "continually registering the height of pleasure experienced by an individual", **in other words**, a happiness sensor. It was just a daydream. **In practice**, for decades, social scientists have had a devilish headache in trying to measure happiness. One of the major problems of registering the people's mood is that the individuals are often irritated learning that they are being investigated. But what if you had a remote-sensing mechanism that could record how millions of people around the world were feeling on any particular day – without their knowing? That's exactly what Peter Dodds and Chris Danforth, a mathematician and a computer scientist working in the Advanced Computing Center at the University of Vermont, have created. "The Rapid growth of personal online writing such as blogs gives us the opportunity to measure emotional levels in real time," they write in their study. "We ana-

lyze some 2.3 million blogs, looking for sentences beginning with “I feel” or “I am feeling.” Then, drawing on a standardized “psychological valence” of words established by the Affective Norms for English Words (ANEW) study; each sentence receives a happiness score.

Speech patterns

to be capable of smth	Бути здібним на щось
to be capable to doing smth	Бути здатним щось (недьре) зробити.
He is capable to doing anything.	Він на все здатний.

Introductory words

In practice	На практиці; фактично
In other words	Іншими словами
In fact	Насправді
On the one hand / On the other hand	З одного боку / З іншого боку
By the way	Доречі
For instance	Наприклад
Nevertheless	Тим не менш
Thus	Отже
Fortunately / Unfortunately	Нащастя / Нажаль
Hopefully	Будемо сподіватись, що
At any rate	У всякому випадку
Besides	Крім того

1. Write a concluding paragraph to the text. Use the following expressions: *thus, therefore, in summary, it may be concluded.*

2. Say whether the following statements are TRUE or FALSE.

1. Francis Edgeworth, who imagined a happiness sensor, was from Ireland.
2. People are always happy being investigated.
3. Scientists decided to analize the emotional level of people by using Internet.

3. Study the definitions of the following words and then compose sentences with them:

hedonism –	the doctrine that pleasure is the chief good in life; also: a way of life based on this;
happiness –	a state of well-being and contentment; also: a pleasurable satisfaction;
feeling –	expressing emotion or sensitivity;
emotion –	intense feeling (as of love, hate, or despair);
sensor –	a device that responds to a physical stimulus;
opportunity –	1) a favorable combination of circumstances, time, and place; 2) a chance for advancement.

4. Give written translation of the following expressions:

можливість реєструвати рівень емоцій; підрахунок почуття щастя; датчик рівня щастя; механізм дистанційного чуття; стандартні англійські слова; викликаючи емоції; нові дослідження з вимірювання настрою людини; психологічна валентність.

Grammar Practice

1. Choose from the text the sentences containing the Participle. Translate these sentences into Ukrainian.

2. Change direct questions into indirect ones. Use the following to begin your indirect questions: "*I wonder*" or "*I am not sure*".

1. What strange device did Francis Edgeworth imagine?
2. Was it just a daydream?
3. Are social scientists trying to measure happiness?
4. Do you want to have a remote-sensing mechanism that can record human feelings?
5. Who has created such mechanism?
6. Where do these creators work?
7. How many blogs were analyzed to receive the emotional level of people?

3. Give the nouns from which the following adjectives are derived:
optimistic, individual, computing, personal, emotional, psychological, affective.
What noun-forming suffixes do you know? Draw a pictorial "word-flower" of adjective-forming suffixes you know.

4. Find all occurrences of the words ending *-s* in the text and explain their functions.

TIME FOR FUN

- How many programmers does it take to turn in a light bulb? – None. It's a hardware problem.

- A young man hired by a supermarket reported for his first day of work. The manager greeted him with a warm handshake and a smile, gave him a broom and said, "Your first job will be to sweep out the store."
"But I'm a Harward graduate," the young man replied indignantly.
"Oh, I'm sorry. I didn't know that," said the manager. "Here, give me the broom and I'll show you how."

- Two young men who had just graduated from Harvard were all excited and talking effusively as they got into a taxi in Boston downtown. After listening to them for a couple of minutes the cab driver asked, "You men Harvard graduates?"
"Yes Sir! Class of '94!" they answered proudly.
Then the cab driver turned back to shake their hand, "Class of '58."

- Two things are infinite: the universe and human stupidity; and I'm not sure about the universe. (Albert Einstein)

II. POPULAR SCIENCE TEXTS

1. CAN TRAIN TECHNOLOGY REINVENT THE WHEEL?

a destination	призначення	a successor	спадкоємець
a pod	«капсула», стручок	a juggernaut	страшна сила
a vehicle	транспортний засіб	adoption	прийняття
conventional	традиційний	a commuter	пасажир
to rely on	залежати від	malfunction	несправність
hovercraft	апарат на повітряній подушці	reliable	надійний
a cushion	подушка	involvement	участь
a pace	швидкість	inherently	від природи

Rail transport has not fundamentally changed in the 200 years since the invention of metal rails but a new wave of transport ideas could change the way we commute forever.

A personal car that drives itself automatically to your destination may sound like science fiction but new “pods” at Heathrow Airport in London have achieved just that – taking passengers from car park to terminal quickly, easily and driven entirely autonomously.

The idea of Personal Rapid Transit, as it is called, is to make public transport more personal, allowing on-demand journeys at the push of a button, all controlled by computers and lasers rather than a human.

One blue-sky idea is the Aero-Train – a plane-like vehicle which travels at up to 350 km/h (220 mph) just 10cm above the ground. The vehicle uses a technology known as ground-effect which removes the friction that makes conventional rail transport less efficient and uses aerodynamics to reduce drag. Its speed relies on aerodynamics similar to those used in a plane or a hovercraft, using the air as a cushion **to prevent it from touching** the floor.

But there are trains in use right now that never touch the ground. The train is held from the ground by a magnetic field – the term “maglev” is short for magnetic levitation – and powered by motors that, without as much friction, allow it to go at very high speeds. Maglev trains have been

tested to run up to 581 km/h (361 mph), according to Guinness World Records, quite a pace considering there is no contact between the train and the ground.

What was once widely considered the successor to high-speed rail, maglev networks has struggled with investment in recent years, especially outside of East Asia.

So, is reinventing the wheel likely to change public transport forever?

"The steel wheel on steel rail has been in existence for nearly 200 years and it hasn't fundamentally changed in all that time," says Richard Anderson, managing director of the Railway and Transport Strategy Centre at Imperial College London. "There's a momentum in the industry that steel rail is a juggernaut that can't be stopped. It's here to stay." And that is where most governments are targeting their funding. While the future of public transport as a whole is one of much debate, high-speed rail seems to be close to widespread global adoption. Around the world more and more high-speed networks are appearing, costing billions to develop with the promise of improved infrastructure and vast economic benefits.

So what can high-speed rail offer?

Surprisingly, it seems like speed may not be the most important thing about implementing new networks at all. "**The thing** about high-speed rail **is not so much** speed as capacity," says Mr Anderson. "The best metros and trams around the world provide mass transport – they move lots of people very efficiently. The advances in technology are going to be important but, after safety, the amount of people that can travel is vital."

And safety is the one thing that causes most concern among commuters. With the general definition for High-Speed Rail being around 150 mph (240 km/h), any minor malfunction could lead to catastrophe.

But in general, driverless public transport is believed to be around 30% more reliable than if it was being driven by a human. "Most modern metros are automatic, which increases reliability," says Mr Anderson. "This is because you're cutting out a certain level of human involvement, which inherently causes problems."

Speech patterns

to prevent smb from doing smth	**завадити комусь щось робити**
The cold weather prevented us from going for long walks.	Холодна погода завадила нашим тривалим прогулянкам.

The thing	**is that …**	Справа в тому, що ...
	is not so much ...	Справа не стільки в ...

1. Say whether these statements are TRUE or FALSE.

1. Rail transport has dramatically changed in the 200 years since the invention of metal rails. 2. An Aero-Train moves ten times as fast as a usual train. 3. The term maglev is short for magnitude level. 4. Everyone knows that speed is the most important thing about implementing new networks of high-speed trains. 5. Driverless transport can be more reliable than the one driven by a human.

2. Give synonyms to the following words from the text:

a target, to control, conventional, definition, efficiently, to provide, speed, to increase, malfunction, to reduce.

2. DOES IT MEAN TIME TRAVEL POSSIBLE?

a subatomic particle	елементарна частинка	to scrutinise	ретельно перевіряти
a pillar	стовп	an inconsistency	суперечність
to tumble down	падати	consistently	послідовно
ultimate	максимальний	a bunch	пучок
relativity	відносність	to show up	виявлятися
to spot	розпізнавати	erroneous	помилковий
hopefully	можна сподіватсь	elsewhere	в іншому місці

Results that suggest subatomic particles have gone faster than the speed of light were gained at Cern, the world's largest physics lab. The team has published its work so other scientists can determine if the approach contains any mistakes. If it does not, one of the pillars of modern

science may come tumbling down. The speed of light is widely held to be the Universe's ultimate speed limit, and much of modern physics – as laid out in part by Albert Einstein in his theory of special relativity – depends on the idea that nothing can exceed it. Thousands of experiments have been undertaken to measure it ever more precisely, and no result has ever spotted a particle breaking the limit. "We tried to find all possible explanations for this," the report's author Antonio Ereditato of the Opera collaboration told BBC News. "We wanted to find a mistake – trivial mistakes, more complicated mistakes, or nasty effects – and we didn't. When you don't find anything, then you say 'well, now I'm forced to go out and ask the community to scrutinise this'." The team hopes that other scientists will find inconsistencies in the measurements and, hopefully, repeat the experiment elsewhere.

"Despite the large [statistical] significance of this measurement that you have seen and the stability of the analysis, since it has a potentially great impact on physics, this motivates the continuation of our studies in order to find still-unknown systematic effects," Dr Ereditato told. "**We look forward to** independent measurement from other experiments."

Neutrinos come in a number of types, and have recently been seen to switch spontaneously from one type to another. The Cern team prepares a beam of just one type, muon neutrinos, and sends them through the Earth to an underground laboratory at Gran Sasso in Italy to see how many show up as a different type, tau neutrinos. In the course of doing the experiments, the researchers noticed that the particles showed up 60 billionths of a second earlier than they would have done if they had travelled at the speed of light. This is a tiny fractional change – just 20 parts in a million – but one that occurs consistently. The team measured the travel times of neutrino bunches some 16,000 times, and have reached a level of statistical significance that in scientific circles would count as a formal discovery. But the group understands that what are known as "systematic errors" could easily make an erroneous result look like a breaking of the ultimate speed limit. That has motivated them to publish their measurements. Their dream would be that another, independent experiment finds the same thing. But for now

they are not claiming things, they want just to be helped by the community in understanding their crazy result – because it is really crazy.

Speech patterns

Despite smth	**Не дивлячись (незважаючи) на …**
Despite the loud music he continued to study physics.	Незважаючи на гучну музику, він продовжував вчити фізику.

We look forward to	independent measurement.	Ми **з нетерпінням чекаємо** незалежних вимірів.
We are looking forward to	hearing from you soon.	Ми з нетерпінням чекаємо від вас найскорішої відповіді.

1. Say whether these statements are TRUE or FALSE.

1. According to Albert Einstein nothing can exceed the speed of light. 2. Neutrinos have only one type and they are very stable. 3. The team of researchers sent a beam of neutrinos through the Earth from the lab in the USA to an underground laboratory in Spain. 4. In the course of the experiments, the researchers noticed that the particles moved faster than the speed of light. 5. The researchers dream that another independent experiment should prove their results.

2. Give synonyms to the following words from the text:

fast, to suggest, a mistake, to scrutinise, inconsistency, to switch, an impact, to contain, speed, to understand, tiny, to claim, crazy.

3. READY FOR THE ROBOT REVOLUTION?

a chore	хатня робота	patience	терпіння
to look after	доглядати	unconsciously	підсвідомо
a cusp	пік	to prime	попереджати
an entrepreneur	підприємець	to draft	складати план
artificial intelligence	штучний інтелект	to tell smb. from smb.	відрізняти
to vacuum	пилососити	vulnerable	уразливий

sophisticated	складний	to evoke	викликати
a point	питання, проблема	solely	виключно
frustrated	розчарований	responsible	відповідальний

From performing household chores, to entertaining and educating our children, to looking after the elderly, roboticists say we will soon be welcoming their creations into our homes and workplaces.

Researchers believe we are on the cusp of a robot revolution that will mirror the explosive growth of the computer revolution from the 1980s onwards. They are developing new laws for robot behaviour, and designing new ways for humans and robots to interact. “I think robotics technology will change who we are, just as eyeglasses and fire changed who we were before,” says Rodney Brookes, robotics entrepreneur and former director of the MIT Computer Science and Artificial Intelligence Laboratory.

Commercially available robots are already beginning to perform everyday tasks like vacuuming our floors.

The latest prototypes from Japan are able to help the elderly to get out of bed or get up after a fall. They can also remind them when to take medication, or even help wash their hair.

Current robots are not human like. For example they are things like automated beds and wheelchairs but the time is coming when robots start looking less like machines, and more like us.

Today in robotics we have machines that **are sophisticated enough to be put together** with people in a daily life setting. A major point to keep in mind is that people will need human–machine interaction in the future. The research team has found that people react well to a robot gym instructor, and seem to get less frustrated with it than with instructions given on a computer screen. The robot can act as a perfect trainer, with infinite patience.

People are going to have to like, and importantly trust robots before they welcome them into their homes, and several groups around the world are working on making it easier to communicate with them. Much of human interaction takes place unconsciously, through body language. Gestures, eye contact, and concepts of personal space are all things that robots

are being taught. In learning about how people interact with machines, researchers are also discovering new roles for robots in our lives. Robots can communicate with humans in ways that other technology cannot.

Science fiction may have primed us for the coming robot revolution, but it has also given us an idea of the types of controls we may want to consider before welcoming robots into our lives and homes.

At present, robots **are not sophisticated enough to be made to behave ethically**. The UK's Engineering and Physical Sciences Research Council, together with the Arts and Humanities Research Council, has drafted a set of ethical principles for robot design – which can be summarised as follows:

1. Robots should not be designed solely or primarily to kill or harm humans.

2. Humans, not robots, are responsible agents. Robots are tools designed to achieve human goals.

3. Robots should be designed in ways that assure their safety and security.

4. Robots are artefacts; they should not be designed to exploit vulnerable users by evoking an emotional response or dependency. It should always be possible to tell a robot from a human.

5. It should always be possible to find out who is legally responsible for a robot.

At present this code is simply a set of ideas. **It's out for debate and discussion.** However they are ideas that people should be thinking about before the coming "robot revolution".

Speech patterns

People are going to have to like	Люди обов'язково повинні полюбити
Look out! You **are going to** fall into the pit.	Обережно! Ти зараз впадеш у яму.

It's out of debate and discussion.	Це не варто обговорювати.
It's out for debate and discussion.	Це краще обговорити.

Adjective (Adverb) + *enough* + *to*-Infinitive	It is **warm enough to go** swimming. It **isn't cold enough to turn on** the heating.	Достатньо тепло, щоб іти купатись. Не достатньо холодно, щоб вмикати обігрів.
***enough* + Noun + *to*-Infinitive**	We have got **enough charcoal to have** a barbecue.	У нас достатньо вугілля, щоб зробити барбекю.

1. Say whether these statements are TRUE or FALSE.

1. Robot revolution is a course of explosive growth of the number of computers. 2. Today robots perform all routine tasks at our homes. 3. Nowadays robots look like human beings. 4. The research team has found out that people react better to a robot gym instructor than to instructions given on a computer screen. 5. Much of human interaction occurs unconsciously, through body language. 6. Robots should not be designed for killing or injuring humans.

2. Give synonyms to the following words from the text:

explosive, to develop, available, to design, everyday, to perform, sophisticated, to take place, an idea, to summarise, vulnerable, to achieve.

4. UK'S ATOMIC CLOCK IS WORLD'S MOST ACCURATE

accuracy	точність	to collate	порівнювати
to gain	відновити	a pursuit	заняття
a fountain	джерело	on a par with	нарівні з
required	необхідний	to bring about	викликати
a flip	оберт	an oven	піч
a trough	мінімум	to boost	підвищувати
a cavity	западина	to collide	стикатися
to expose	піддавати чомусь	to maintain	підтримувати
to adjust	пристосовувати	to underpin	підкріплювати
a pendulum	маятник	discrepancy	розбіжність

An atomic clock at the UK's National Physical Laboratory (NPL) has the best long-term accuracy of any in the world, research has found. Studies of the clock's performance, to be published in the journal Metrologia, show **it is nearly twice as accurate as** previously thought. The clock would lose or gain less than a second in some 138 million years. The NPL's CsF2 clock is a "caesium fountain" atomic clock, in which the "ticking" is provided by the measurement of the energy required to change a property of caesium atoms known as "spin". By international definition, **it is the electromagnetic waves** required to accomplish this "spin flip" **that are measured**; when 9,192,631,770 peaks and troughs of these waves go by, one standard second passes. Inside the clock, caesium atoms are gathered into bunches of 100 million or so, and passed through a cavity where they are exposed to these electromagnetic waves. The colour, or frequency, is adjusted until the spins are seen to flip – then the researchers know the waves are at the right frequency to define the second.

The NPL – CsF2 clock provides an "atomic pendulum" against which the UK's and the world's clocks can be compared, ensuring they are all ticking at the same time. That correction is done at the International Bureau of Weights and Measures (BIPM) in the outskirts of Paris, which collates definitions of seconds from six "primary frequency standards" – CsF2 in the UK, two in France, and one each in the US, Germany and Japan. For those six high-precision atomic pendulums, absolute accuracy is a tireless pursuit. At the last count in 2010, the UK's atomic clock was on a par with the best of them in terms of long-term accuracy: to about one part in 2,500,000,000,000,000 (twenty five hundred trillion).

But the measurements carried out at Pennsylvania State University in the US have nearly doubled the accuracy. The second's strictest definition requires that the measurements are made in conditions that were impossible actually to achieve in the laboratory.

The team's latest work addressed the errors in the measurement brought about by the "microwave cavity" that the atoms pass through (the waves used to flip spins are in the same part of the electromagnetic spectrum as the waves that flip water molecules in food, heating them in a microwave oven).

A fuller understanding of how the waves are distributed within it boosted the measurement's accuracy, as did a more detailed treatment of what happens to the measurement when the millions of caesium atoms collide.

Without touching a thing, the team boosted the known accuracy of the machine to one part in 4,300,000,000,000,000.

Nowadays definitions for electrical units are based on accurate frequency measurements, so it's vital for the UK as an economy to maintain a set of standards, a set of procedures that underpin technical development.

The fact that it's possible now to develop the most accurate standard has quite measurable economic implications.

Some Time Measurement Facts.

- The international time standard is maintained by a network of over 300 clocks worldwide.
- These are sent by satellite and averaged at BIPM, a measurement institute in France.
- But the "tick" of any one of them could drift out of accuracy, so BIPM corrects the average using six "primary frequency standards" in Europe, the US and Japan.
- Their corrected result, "International Atomic Time", is occasionally compared with the time-honoured measure of time by astronomical means: "Universal Time".
- A "leap second" is periodically added to correct any discrepancy between the two.

Speech patterns

It is the electromagnetic waves that are measured.	Замірюють саме ці електромагнітні хвилі.
It was Popov who invented the radio.	Саме Попов винайшов радіо.

It is nearly twice as accurate as previously thought.	Це майже вдвічі точніше аніж вважали до цього.

1. Say whether these statements are TRUE or FALSE.

1. The atomic clock may lose or gain about 10 seconds in some 138 million years. 2. The performance of the UK's atomic clock is based on the measurement of the energy required to change the spin of caesium atoms. 3. The work of the UK's and the world's clocks can be compared with the work of the NPL – CsF2 clock which ensures that they are all ticking at the same time. 4. There are five "primary frequency standards" in different countries. 5. The international time standard is kept by a network of over 500 clocks all over the world.

2. Give synonyms to the following words from the text:

accuracy, to require, a set of, to accomplish, correct, nearly, to gather, detailed, to collide, implication, to maintain.

5. RESEARCHERS REV UP ELECTRIC NANO-MOTORS

to rev up	прискорювати(сь)	a pivot	точка обертання
an obstacle	перешкода	capacity	здатність
a breakthrough	прорив	to figure out	зрозуміти
eventually	зрештою	to attain	досягти
a feat	подвиг	to pinpoint	точно вказати
a clump	група	fruition	реалізація

Scientists have created a molecule-sized motor that runs on electricity, as opposed to similar-sized motors running on chemicals or light. The ability to control a single-molecule motor could lead to innovations in more precise medical and engineering technology and could lead to tinier, advanced digital devices. Many obstacles stand in the way of practical applications, however.

Researchers at Tufts University announce they've created an electrical motor many thousands of times smaller than the width of a single human hair, a breakthrough they claim could eventually lead to innovations in healthcare and technology.

The microscopic motor is the size of a single molecule and is electrically charged, an innovative feat since previous single-molecule-sized motors were powered by chemicals or light.

The distinction is important. With a light or chemically charged motor, scientists struggle with precision in adding chemicals to a clump of trillions of molecules. In that scenario, the practicality of charging the motors decreases.

The Tufts research showed that electricity could be used with precision and accuracy to control a single molecule, even when additional molecules sat just a nanometer away.

An interesting thing would be to get this into opto-electronics, where you are interfacing light with electronics. With the tiny chargers on the motors, you have a tiny rotating motor and you could create something that would give off light, or a tiny microwave generator or tiny antenna.

The research, published in a recent edition of Nature Nanotechnology, was made possible thanks to huge advances in research technology such as the scanning tunneling microscope, which uses electrons instead of light.

The scientists sent an electrical current through a butyl methyl sulfide molecule using the tip of the microscope as the molecule rested on a copper surface. In that position, a single atom worked as a pivot.

From there, the scientists could measure the molecule as it spun to prove the movements were directed by the electrical charge.

While the implications could be far-reaching in the technological field chemistry experts say applications are still a long way off.

One reason for that is the extreme temperature needed to measure the molecules as they spin. Since higher temperatures increase the rate at which the motors charge, the scientists had to keep the molecules in a chilly environment.

Even at 100 Kelvin, or about negative 279 degrees Fahrenheit, the molecules spin at an astonishing million spins per second. To have the capacity to measure **what was going on**, the research team had to keep temperatures closer to 5 degrees Kelvin, or about negative 450 degrees Fahrenheit.

To apply the information found in the study to practical applications in medical or engineering fields, scientists must figure out how to operate at easier-to-attain temperatures.

If advances in technology **do come through**, the motors will be used in medical devices, perhaps to pump fluid through the pipes to better pinpoint a spot where medicine is headed or to sense the local environment for a clearer diagnosis. Those applications, though, are far from fruition.

Speech patterns

if the advances **do come through**	якщо розвиток **дійсно відбудеться**
He **does** want to repair his mistake.	Він **дійсно** хоче виправити свою помилку.

1. Say whether these statements are TRUE or FALSE.

1. Scientists have created a molecule-sized motor that runs on electricity, as opposed to similar-sized motors running on atomic energy. 2. It is easy to find practical applications of an electrically-charged motor. 3. The invented electric motor is the size of a matchbox. 4. The scanning tunneling microscope made it possible to do the research. 5. It is impossible to use a molecule-sized motor in near future because of the extreme temperature needed to measure the molecules as they spin.

2. Give synonyms to the following words from the text:

advanced, to announce, an obstacle, a breakthrough, chilly, to rotate, position, a field, to astonish, distinction, a reason, to head.

6. FINAL SHUTTLE VOYAGE CLOSES CHAPTER IN HUMAN SPACEFARING SAGA

spacefaring	космічний політ	a pinnacle	вершина, пік
milestone	віха, етап, рубіж	to eliminate	ліквідувати
to blast off	стартовати	to engage	привертати
to cap	завершувати	an impact	вплив
multipurpose	багатоцільовий	a spin-off	побічний продукт
a spare part	запасна деталь	ventricular	шлуночковий

a buff	спеціаліст	insulation	ізоляція
to mourn	сумувати	a gaping hole	прірва

The U.S. space exploration program reached another milestone: Atlantis blasted off from NASA's Kennedy Space Center on its final space shuttle mission. The flight caps 30 years of achievements including the construction of the International Space Station. Atlantis docked with the station. The crew of four astronauts – Space shuttle Commander Chris Ferguson, Pilot Doug Hurley, and Mission Specialists Sandy Magnus and Rex Walheim carried out a number of important tasks during the shuttle's 12-day mission. They delivered the Raffaello multipurpose logistics module filled with supplies and spare parts to the station. They also flew the Robotic Refueling Mission to test tools needed to robotically refuel satellites in space. In addition, the crew brought back an ammonia pump that recently had failed on the station so that engineers could improve the design for future spacecraft.

End of an Era

Despite the glow of accomplishment, scientists, space buffs and many in the business community as well are mourning the lost opportunities the program's end represents. For years NASA was the pinnacle of America's scientific efforts and achievements. And it seems that now, when the level of scientific understanding among Americans is so low, eliminating such a high-profile program is a big mistake. What the Americans need are programs that can engage people's imaginations and get kids to study science. **There's something to be said for keeping people's heads in the stars**. There is so much about the universe that humankind does not understand. The loss of the program could have an impact on advances in medical science because experiments done in space have translated to gains in medicine and scientists hope that the budget cuts to NASA will translate into boosts in the budget for healthcare.

Truly Remarkable Feat

The Space Shuttle program has brought many benefits that deeply impacted our everyday lives. Spin-offs of shuttle technologies include a miniature ventricular pump for the heart derived from the fuel pumps, and

insulation and composite materials that are used in households, cars and aircrafts. However, the science community will miss the shuttle program most of all. Without the shuttles, **neither** the Hubble Telescope **nor** the International Space Station would have been possible, but its influence **goes far beyond those historic projects**. In addition to providing a weightless environment for the scientific experiments, growth of biological organism experiments in space, and innovative material development, the shuttle program also provided a means for the young students to grow their dreams of space exploration. There were many programs that enabled students to develop a space system that can be put into orbit onboard an orbiter. You can imagine how excited the children would be to have something that they made flown in space. The retirement of the Shuttle fleet leaves a gaping hole in easy access to space for science experiments, as well as transportation of astronauts. It was a truly remarkable feat of our time.

Speech patterns

There's something to be said for keeping people's heads in the stars.	**Треба щось сказати, щоб люди продовжували дивитись на зірки.**
There is nothing to worry about.	Нема про що турбуватись.

neither ... nor	**ні ... ні**
He needs neither help nor advice.	Він не потребує ні допомоги, ні порад.

goes far beyond	**виходить далеко за межі**
Such tasks go far beyond the scope of the average schoolkid.	Такі завдання не під силу середньому школяру.

1. Say whether these statements are TRUE or FALSE.

1. Atlantis is the name of the U.S. marine exploration program. 2. The shuttle's mission lasted for a fortnight. 3. There were four astronauts on board the spacecraft. 4. The crew brought back an ammonia pump that recently had failed on the station. 5. Nowadays the level of scientific understanding

among Americans is very high. 6. The progress in medical science will slow down because of the loss of the program. 7. The Space Shuttle program has brought many problems that deeply impacted everyday lives of common Americans.

2. Give synonyms to the following words from the text:
exploration, to carry out, a shuttle, construction, spare, to eliminate, community, to include, miniature, environment, composite, to grow.

7. IBM COOKS UP SUPER-THIN GRAPHENE CHIPS

a circuit	схема	excess	надлишок
a wafer	тонка кристалічна пластина	a field-effect transistor	польовий транзистор
to grapple	боротися	complementary	додатковий
honeycomb	стільники	yield	виробіток, вихід
a flake	пластинка	elastic	гнучкий
a challenge	проблема, виклик	impermeable	непроникний
top-gate	верхній закрив	alumin(i)um	алюміній

Scientists at IBM have figured out a way to use graphene in the production of circuits. Graphene is an incredibly thin substance; in fact, it's only a single atom thick. IBM researchers have demonstrated a graphene circuit which integrates all circuit components onto a single wafer made of silicon carbide. Integrating it monolithically – meaning in one unit – with other materials is a problem researchers have been grappling with since 2004, when the material's properties were first demonstrated.

What Is Graphene?

Graphene is essentially carbon that comes in sheets one atom thick densely bonded together in a honeycomb crystal lattice. You can think of graphene as a plane of graphite – that stuff making up your pencil lead – which is one atom thick. In 2004, physicists at the University of Manchester and the Institute for Micro-electronics Technology in Chernogolovka, Russia, first isolated individual graphene flakes and measured their electronic properties.

About IBM's Announcement

The integrated graphene circuit announced by the IBM researchers operates as a broadband radio frequency mixer at frequencies up to 10 GHz. Frequency mixers are used in all communications devices – radios, TVs, cellphones and radio satellites. The circuit announced by IBM is an analog circuit. It's designed to work – meaning switch on and off – at 10 GHz, which is 10 billion times a second. IBM is working to improve on that.

Creating graphene circuits is difficult because combining graphene with other materials has slowed down the circuits. Wafer-scale fabrication of graphene has been one of the biggest challenges in realizing the promise of graphene electronics. To make the integrated graphene circuit, the IBM team first heated a silicon carbide wafer to release silicon and form a layer of graphene on its surface. The graphene film was allowed to grow to two or three layers in thickness, and then the silicon surface was heated to 1,400 degrees Celsius. Top-gated dual-fingered field-effect transistors were then integrated with aluminum inductors. Following this, the wafer was spin-coated with a thin polymer, and a layer of hydrogen silsesquioxane was applied to create active channels. The active channels were then carved by e-beam lithography, the excess graphene was removed with an oxygen plasma laser, and the circuit was cleaned with acetone. IBM's circuit measures one square millimeter.

The Future for Graphene Circuits

CMOS (complementary metal oxide semiconductor) technology, which is currently used in integrated circuits, is rapidly approaching the limits of what it can do, and graphene is one of the alternatives being eyed as a replacement. However, the technology to produce graphene circuits **is still in its infancy**, and **more work needs to be done** to iron out the wrinkles. Among other things, the device yield rate **needs to be improved**. Using graphene in electrodes is the application that's probably closest to commercialization. However, there are many other potential uses of graphene because of its uniqueness. Graphene is transparent like plastic but conducts heat and electricity better than metal, it's an elastic thin film, it's

an impermeable membrane, and it's chemically inert and stable, it will have a wonderful future.

Speech patterns

to be in smb's infancy	**бути в зачатковому стані**
The project is only in its infancy.	Проект ще тільки на початковій стадії.

More work needs to be done.	Треба зробити ще більше роботи.
The rule needs to be revised.	Це правило треба повторити.

1. Say whether these statements are TRUE or FALSE.

1. Graphene is a substance that has the thickness of only a single atom. 2. It was very easy to make a graphene circuit which integrates all circuit components onto a single wafer. 3. A frequency of 10 GHz means that the circuit switches on and off 10 billion times a second. 4. The silicon surface under the graphene film was heated to 1,400 degrees Kelvin.

2. Give synonyms to the following words from the text:

production, to demonstrate, a substance, a component, a lattice, rapidly, to integrate, property, to mix, transparent, a layer, to combine, stable, a limit.

8. POWER PLANT: ONE SMALL LEAF COULD ELECTRIFY AN ENTIRE HOME

to split	розщеплювати	fossil	викопний
fuel cell	паливний елемент	to mitigate	послабляти
renewable	відновлюваний	partial	частковий
rare	рідкісний	eventually	зрештою
conversion	перетворення	deployment	розгортання
ambient	навколишній	to face	зустрічати

A team of scientists at the Massachusetts Institute of Technology has developed what it describes as the first practical artificial leaf. The device, made from silicon, electronics and catalysts, is the same size and shape as a

playing card, but thinner. It splits water into its two components, hydrogen and oxygen. These are then stored in a fuel cell and used later to generate electricity. It's really cool stuff – they're taking a solar cell and turning it into a battery. You can think of this as the first dark solar energy because it'll give you solar energy at night in the form of light.

Placing the artificial leaf in a single gallon of water in bright sunlight could produce enough electricity to supply a house in developing countries with its daily electricity requirement.

Much research has been conducted on the concept of an artificial leaf. Technically, the first artificial leaf was developed more than 10 years ago by John Turner of the U.S. National Renewable Energy Lab in Boulder, Colo. However, Turner's device used rare, expensive materials and was highly unstable. Presented device uses inexpensive materials that are widely available. It can use water from any source and is highly stable. It was shown that a prototype of this leaf in the laboratory operated continuously for at least 45 hours without a drop in activity.

The process was based on the researchers' creation of a new catalyst consisting of cobalt, phosphates and an electrode. When placed in water and electricity from any source runs through the electrode, the catalyst produces oxygen. It is combined with another catalyst such as platinum that can produce hydrogen gas from water, to duplicate photosynthesis. The conversion of solar energy into hydrogen under ambient conditions **is considered to be** one of the greatest challenges scientists face in this 21st century. Scientists believe this process could help create cheap electricity, reduce our dependence on fossil fuels, and thus help mitigate global warming.

New catalysts self-assemble from water to form a partial cubane structure. They are self-healing, and they split PH-neutral water into hydrogen and oxygen at atmospheric pressure and room temperature. Cubane is a synthetic hydrocarbon molecule that consists of eight carbon atoms arranged at the corners of a cube with one hydrogen atom attached to each carbon atom. The catalyst operates at 100 mA per square cm at 76 percent efficiency. The efficiency of the artificial leaf is also impressive. Overall, solar panels are typically in the 10 percent efficiency range nowadays, so

they're not high-efficiency devices. If you have something that's able to absorb sunlight at anything close to 70 percent efficiency, it's practically turning sunlight into gold. The ability to split PH-neutral water has led to the discovery of an inexpensive hydrogen-producing catalyst that operates at 1,000 mA per square cm at 35 mV overpotential. **What all this means is that** it could eventually enable the large-scale deployment of solar energy by providing a mechanism for its storage as fuel.

The development of such an artificial leaf is a step in the right direction. This may lead us to larger solutions that let us use thermal, solar and hydrogen solutions all at one time, and that will be huge.

Speech patterns

He **is considered (known)**	**to be** a reliable person.	**Вважається (відомо),** що він	надійна людина.
	to sing well.		добре співає.
	to have founded this institute.		заснував цей інститут.

What all this means is that ...	**Все це означає, що**
What I want to tell you is only that I have lost my documents.	Все, що я хочу тобі сказати, це те, що я загубив свої документи.

1. Say whether these statements are TRUE or FALSE.

1. Scientists from the Massachusetts Institute of Technology have developed an artificial tree. 2. The device splits water into oxygen and hydrogen. 3. To supply a house with its daily electricity requirement one should place the device into boiling water. 4. The first device with similar properties was designed in the 19th century. 5. The new device is highly efficient compared to conventional solar panels.

2. Give synonyms to the following words from the text:

a team, a scientist, artificial, a device, a component, to store, to generate, requirement, research, expensive, to use, to operate, conversion, a challenge, to attach, typically, eventually.

III. READING IN MECHANICAL ENGINEERING

1. GRIPPER LIKE A HAND

gripper	захват; гріпер	fragile	тендітний
flexible	гнучкий	disparate	відмінний
a jaw	щелепа	isosceles triangle	рівнобедрений трикутник
to rotate	обертатись	a slat	поперечина; планка
to pick up	піднімати	to attach	приєднувати
a part	деталь	a hinge	шарнір
predefined	раніше визначений	a bearing	підшипник
to confuse	сплутати	to pivot	обертатись
to clasp	затискати	to accommodate	пристосовувати
diverse	різноманітний	reinforcement	зміцнення
despite	незважаючи на	sintering	спікання
to surround	оточувати	to fuse	плавити
a series of	ряд; набір	bellows	роздувальні міхи
a shape	форма	to print out	випускати
light bulb	лампочка	a strip	смужка; стрічка
to wrap	огортати		

“Flexible” is a word not usually associated with robotic grippers, and for good reason. Robotic grippers can open and close their jaws and rotate all they want, but most are engineered to pick up only one specific part fixtured in one predefined orientation. No one would confuse this with a truly flexible gripper – your hand, for example – that can clasp and manipulate objects as diverse as a penny, a ball, or a fork.

Festo AG’s new FinGripper shows one new approach to changing this paradigm. The company put it on display at Germany’s Hanover Fair this past April. Despite being surrounded by swimming and flying robotic penguins, the FinGripper drew a large crowd of engineers.

Based on the flexible structure of a fish's tail, Festo's FinGripper **is flexible enough** to grasp a series of differently shaped light bulbs without damaging the glass.

What they saw were the three plastic "fingers" that made up FinGripper's hand wrapping around each of three differently shaped light bulbs, and lifting and rotating them 90 degrees. The gripper had a touch so light it could manipulate the fragile bulbs without breaking any glass, and so flexible it could grasp one disparate shape after the other.

The key to FinGripper's performance is the "Fin Ray" structure of its three "fingers," which move like the flexible tail of a fish. (This is something Festo learned from studying how penguins and fish swim.)

Each FinGripper finger looks like an elongated isosceles triangle with a series of slats running between the two long sides. The slats are attached to the side with hinges, which act like bearings. When the triangular finger wraps around an object, such as a light bulb, the slats pivot to accommodate the motion while providing the reinforcement needed for a firm grip.

Festo made the grippers directly form CAD drawings using selective laser sintering, which fuses one layer of plastic at a time until the structure is complete. The company powers the three fingers with a pneumatic bellows.

"We haven't optimized the design yet," said Markus Fischer, a Festo designer who leads the company's efforts to translate biological capabilities into industrial applications. "We thought it would break after 10,000 to 100,000 cycles, but so far it has lasted 5 million cycles."

Like natural systems, Festo's FinGrippers have evolved. "The grippers either worked as a system or not at all," Fischer said. "The first ones we printed out were not so good. They needed thicker walls and bearings on the strips going across."

"Festo wants to use the technology for industrial robotics", said Fischer. Potential applications include aquaculture and agriculture, where the FinGripper could sort fragile objects like tomatoes.

Speech Patterns

He is **clever enough** not to do such a mistake.	Він достатньо розумний, щоб не робити такої помилки.
This is **too good** to be true.	Це занадто добре, щоб бути правдою.

Exercise 1. Answer the questions.

1. Where was the gripper presented first? 2. What do the fingers of the gripper resemble? 3. What material are the fingers of the gripper made of? 4. What are the fingers of the gripper powered from? 5. How long has the gripper been working? 6. Where can the gripper be applied?

Exercise 2. Give synonyms to the following words from the text:

diverse, a shape, to rotate, to damage, fragile, a series of, good, to use.

2. CONFORMAL COOLING

to slash	скорочувати	to fuse	сплавляти
a rate	норма, доля	a core	центр, ядро
a part	деталь	to eliminate	ліквідувати
to remove	видаляти	a housing	корпус
evenly	рівномірно	to be around	активно працювати
account manager	рекламний агент	durable	міцний, стійкий
molding	лиття, формовка	to withstand	витримувати
sintering	спікання	to bedevil	мучити
to account for	складати	gunk	багнюка
to warp	деформувати	a bump	вигин, гуля

A new way to make molds for injection molding promises to slash cycle times and scrap rates for complex parts. Creating conformal **rather than** straight-drilled cooling channels in molds removes heat faster and more evenly. “While performance varies with part size and complexity, some companies have reduced cycle times by 60 percent and scrap by 50 percent”, said Augustin Niavas. Niavas is a key account manager for Ger-

many's EOS GmbH Electro Optical Systems, which makes equipment that builds the molds directly from CAD files.

Injection molding is the most widely used plastics processing technology. The process melts thermoplastics and forces them into a metal mold. After the plastics cool, the mold opens to reveal the finished part. To speed cooling, molders run liquid through cooling channels they drill into the mold.

Direct metal laser sintering builds molds with integral cooling channels layer by layer. Shaping the cooling channels to the part speeds cycle times and slashes scrap.

Cooling channels work great when molding parts with regular features. Add curves and irregular geometries, and manufacturers run into problems. Straight drilled channels cannot follow the contours of the part. As a result, they remove heat unevenly, so operators must wait until the material farthest away from the cooling channel cools before they remove it from the mold. No wonder cooling time can account for up to 70 percent of each injection molding cycle. Uneven cooling can also warp parts and increase scrap rates.

This is where EOS comes in. The company's equipment produces molds from 3-D CAD data by direct metal laser-sintering, fusing metal powders into solids one layer at a time. The company's equipment has no problem creating cooling channels that curve, arch, and branch to conform to any shape, because channels are built into the mold as it is formed, not drilled afterwards.

EOS application engineer Siegfried Mayer pointed to a German service bureau, LaserBearbeitungs-Center outside Stuttgart, which was having trouble molding long, thin, cylindrical lipstick caps. It was easy to remove heat from the outside of the part with standard cooling, but it was hard to build an effective cooling channel inside the mold's core. This produced a hot spot on the cap of the tube. Using conformal cooling eliminated the hot spot and reduced cycle time by more than 60 percent.

Mayer also mentioned a filter housing that had a problem with warpage. "Its core was so thin, it was impossible to create a cooling channel," he explained. "There were different cooling gradients within the mold.

They had to keep the whole mold enclosed until the energy flowed out." Even then, the processor had to scrap 50 percent of its output. Conformal cooling not only reduced cycle times, but also slashed scrap rates to nearly zero.

While direct metal laser sintering has been around for decades, **it was not until 2007 that** EOS developed a maraging steel that it could use to make molds durable to withstand mass production.

Conformal cooling also solves a problem that bedevils drilled cooling channels, flow blockage as gunk accumulates at right-angle turns. "We don't have that problem because we have very regular paths," said Niavas. "We can also build structures like bumps into the pathway to generate turbulence to clean the channel."

Speech Patterns

rather ... than ...	скоріше ... чим; а не
It's better to repair this instrument rather than buy a new one.	Краще відремонтувати цей прилад, а не купувати новий.
He is an engineer rather than a scientist.	Він скоріш інженер, чим вчений.

It was not until ... that ...	Тільки в ...
It was not until September that we were able to start the experiment.	Тільки у вересні ми змогли почати експеримент.

Exercise 1. Say whether the statements are TRUE or FALSE using the phrases *quite right, of course, sure, certainly, definitely, it goes without saying* if the statement is TRUE and *of course not, certainly not, nothing of the kind, it is not the case* if the one is FALSE.

1. Creating conformal cooling channels in molds in some cases reduces cooling rate by 10 percent. 2. Injection molding is used while producing parts from plastics. 3. To speed cooling, manufacturers put the mold into cold water. 4. When the cooling channels are drilled straight, the part is cooled unevenly. 5. EOS company produces molds from 3-D CAD data. 6. One of the applications of the technology mentioned in the text is pro-

ducing computers. 7. In 2007 EOS developed maraging steel to produce durable molds.

Exercise 2. Give synonyms to the following words from the text:
complex, fast, to reduce, to account for, to warp, to increase, to curve, durable, to accumulate.

3. ATTRACTIVE MAGNETICS

a payload	корисне навантаження	to propel	просувати
virtually	практично	an elevator	ліфт
a puck	шайба	dropoff	падіння
conventional	традиційний	to claim	заявляти
to insert	вставляти	throughput	продуктивність
a pallet	піддон, плита	accurate	точний
a requirement	вимога	a fraction	частка
permanent	постійний	assembly	монтаж

MagneMotion Inc. of Devens, Mass., has introduced a smart, new linear synchronous motor called MagneMover Lite for moving payloads of up to 2 kilograms at speeds to 2 meters per second over virtually unlimited distances. Building on the company's QuickStick system, the new MagneMover Lite includes a built-in controller that individually identifies and routes each puck, positioning it within 0.05 millimeter at any workstation along the line.

Because it has fewer moving parts to maintain and uses electricity efficiently, MagneMover Lite has a lower cost of ownership than conventional conveyor systems, according to MagneMotion's vice president of sales and marketing, Peter Mattila.

The MagneMover controller keeps up to nine pucks in motion per meter of track. Pucks can also travel bidirectionally, so if a screw is not inserted at a workspace, the system can back up the individual pallet and repeat the operation instead of routing the pallet around the entire line a second time. Individual puck identification also supports the pharmaceutical industry's track and trace requirements.

The system is based on a permanent magnet linear synchronous motor. It puts permanent magnets on the pucks, then runs a current through stationary coils (stators) under the track to generate an electromagnetic field. This pulls or pushes against the field created by the permanent magnets (which act like rotors) on the puck, propelling it forwards or backwards. MagneMotion has used the same technology to move larger loads **as well as** elevators for several years now.

Linear synchronous motors are similar to the propulsion systems used for magnetic levitation trains. Most other industrial magnetic systems are based on linear induction motors, which mount the magnetic coils on the puck and induce magnetic fields within copper or aluminum plates on the track. The coils require lots of current to induce magnetic fields and **grow less efficient** as tracks **grow longer**.

According to MagneMotion, linear synchronous motors can run long distances without large dropoffs in efficiency. It claims small systems typically achieve 50 percent efficiencies, while larger systems reach 85 percent or more. "We can build a line 300 meters or longer, compared to about 1 meter for induction systems," Mattila said.

According to Mattila, the new MagneMover Lite is designed to compete with conventional conveyor systems on a cost-of-ownership basis. The system achieves higher speeds and throughputs, up to 2-4 meters/second compared with about 0.3 meter/second for high-speed conveyors, and **there are** no moving parts to wear out or replace. "The system is accurate to within a fraction of a millimeter without a pneumatic stop, so you can position parts for assembly without removing them from the puck," he said.

Speech Patterns

as well as	**а також; крім того**
Sport strengthens your body as well as your spirit.	Спорт укріплює й ваше тіло, й ваш дух.

grow + Adjective	**ставати; робитися**
grow longer	ставати довшим
grow old	старіти

grow angry	розсердитись
grow dark	темнішати

There are many drawings	of this woman.	**Існує** багато малюнків цієї жінки.
	on the wall.	На стіні (висить, **знаходиться**) багато малюнків.

Exercise 1. Say whether the statements are TRUE or FALSE.

1. MagneMotion Inc. is an American company. 2. It produces motors for conveyor lines. 3. MagneMover Lite is more efficient than conventional conveyor systems because it has fewer moving parts. 4. MagneMover always runs in one direction. 5. MagneMover is based on linear induction motor. 6. MagneMover uses the same principle as in magnetic levitation trains. 7. MagneMover can provide speeds of a conveyor up to 20 meters per second.

Exercise 2. Give synonyms to the following words from the text:

speed, because, to travel, entire, a requirement, permanent, to act, small, typically, conventional.

4. PULTRUSION GOES ROUND IN CIRCLES

a ladder	драбина	fatigue strength	межа втоми
a ski pole	лижна палка	fiber	волокно
decking	настил	to dip	заглиблювати
a vat	бак	to grab	хапати
resin	смола	to cure	вулканізувати
a die	штамп, прес-форма	batch production	серійне виробництво
a spring	пружина	hollow	пустий
a beam	балка	core material	стрижень
mileage	пробіг	silicone	кремній

Until now, pultrusion has been used to make straight composite profiles that go into everything from ladders and ski poles to industrial decking and military antennas. The process looks a lot like extrusion, except it

works by pulling rather than pushing. A gripper grabs the reinforcing fibers, pulls them through a vat of resin, and then through a die. The die shapes the profile while heating the resin so that it solidifies as it exits.

Pultrusion is cheap (for composites), fast, and produces a quality part – **as long as** it's straight. Now, thanks to Thomas Technik+Innovation KG of Bremervörde, Germany, pultrusion can also make curved parts of almost any radius. Potential applications include lightweight spiral springs for automobiles, circular aircraft fuselage segments, arched windows, more expressive furniture, bridge beams, pipes, and storage tanks.

Composites bring advantages to the table in many applications. Take, for example, automobile suspension springs. Composites weigh significantly less than steel, and so improve gas mileage and handling. They also demonstrate excellent fatigue strength and resist corrosion. They may even have a cost advantage in shorter production runs.

The problem with conventional molds is that by the time the fiber and resin are about two-thirds through them, the materials have become too hard to bend.

The radius pultrusion process takes a different approach. Unlike conventional pultrusion, it is not a continuous pulling process. **Nor does it pull** the profile through a mold. Instead, the curved mold moves along the curved profile.

It works like this. After pulling fibers through the curved mold, the gripper stops and the mold moves from the gripper backwards along the fibers. As it moves, it dips the fibers in resin and heats the resin-coated fibers so that they harden. When it reaches the end of the segment, the gripper moves forward, grabs the newly hardened pultrusion, and pulls it along the planned curve. The mold then moves back to the gripper and repeats the dip-and-cure step again.

Clearly, radius pultrusion is not as fast as conventional continuous pultrusion. Yet Thomas believes the process is attractive for spirals with radii greater than 30 centimeters. It may also prove an alternative to batch production of smaller curved parts, since it is often faster and can produce hollow profiles with multiple channels without using core materials or silicone tubing.

Speech Patterns

You may keep this book	**as long as** you need it.	Ви можете тримати цю книгу **скільки** вам потрібно.
You should buy this book		Ви маєте придбати цю книгу, **оскільки** вона вам потрібна.

She **doesn't want** to go for a walk. **Nor do** I.	Вона не хоче йти гуляти. **І я теж** (не хочу).
They **have left**. **Nor do** we intend to stay.	Вони поїхали. Ми **теж не** збираємось залишатись.
That's **neither** here **nor** there.	Не доречно. Ні в тин ні в ворота.

Exercise 1. Say whether the statements are TRUE or FALSE.

1. Until now, pultrusion has been used to make curved profiles. 2. Resin and dies are used in the manufacture process of the profiles. 3. The company that proposed a new radius pultrusion technology is situated in Austria. 4. Composite materials are corrosion resistant. 5. In the radius pultrusion technology molds are stationary. 6. The fibers are heated so that they melt. 7. In the technology some steps must be repeated.

Exercise 2. Give synonyms to the following words from the text:

to look like, a die, to exit, a storage, for example, to improve, to demonstrate, excellent, to resist, to stop, since.

5. DIAMOND IS A PIPE'S BEST FRIEND

lubricious	гладкий	to be exposed	піддаватись впливу
coating	покриття	high-alloy	високолегований
wear	зношування	harsh	суворий
to embrace	використовувати	a liner	обшивка
a valve	клапан	grinding	шліфування
girt	гравій	chrome plating	хромування
to entrain	захоплювати	to adhere	приклеюватись
friction	тертя	a tap	удар
fouling	забруднення	to pop off	відколотись

to retain	зберігати	graded	ступінчастий

Diamonds are not just beautiful. They rank as the hardest and most lubricious of all natural materials. Over the past 25 years, several firms have learned to apply diamond and diamond-like coatings to the exterior of wear parts. Now Sub-One Technology Inc. of Pleasanton, Calif., has developed a low-cost way to apply diamond-like and silicon carbide (another very hard ceramic) to interior surfaces as well.

Diamond-like coatings protect the interior of downhole pipes from corrosion and wear, while lowering in-pipe friction significantly.

Offshore oil and gas companies have already begun to embrace Sub-One's coatings for pipes, valves, and other downhole components. Known as InnerArmor, the coating has a hardness that stands up well to abrasive wear and erosion from the grit and sand entrained with oil and gas. The coating's coefficient of friction is so low (down to 0.01), drillers may be able to narrow downhole pipe diameter without reducing flow. **Moreover**, the coatings are chemically inert, so they resist fouling and retain their lubricity even when exposed to saltwater and sulfates in gas and oil.

This gives engineers a new option for offshore drilling. In the past, they often chose high-alloy pipes, which handled extreme conditions but were costly and required expensive machining.

Or they could treat the surfaces of lesser alloys to handle the harsh offshore environment. Compared with polymer liners, InnerArmor is harder, more durable, and far more heat-resistant. It is easier to apply to a pipe interior than thermal spray coatings, and produces smoother surfaces without grinding and polishing. It uses environmentally friendlier chemicals than chrome plating does, requires less surface preparation, and produces a harder and more wear resistant coating.

Sub-One sees other potential applications from automotive piston rings, cylinders, and diesel exhaust recirculation systems to piping for high-pressure, high-temperature geothermal power systems.

Creating a practical diamond-like carbon coating **has taken decades**. The first diamond-like carbon films tended to adhere to themselves better than to the surfaces on which they were applied. When they were applied

too thickly, a tap of a hammer would be enough to pop them off the surface. Sub-One solved the problem by creating a graded surface that gradually transitions from silicon to diamond-like coating, so there is no one transition point.

According to Dore Rosenblum, vice president of marketing for Sub-One, the company can produce coatings that range from 3 micrometers on an engine cylinder to 30 to 40 μm on the interior of a downhole pipe. The company's deposition process applies the coating at about 0.5 μm per minute.

Speech Patterns

Moreover	Крім того, більш того
Furthermore	Крім того, більш того
Therefore	Тому
Besides	Крім того, до того ж
Unfortunately	Нажаль
Hopefully	Сподіваємось, що
Thus	Таким чином
In fact	Фактично, насправді
Although (though)	Однак, хоча
On the one (other) hand	З одного (іншого) боку

He **took** his bag and left.	Він **узяв** портфель та пішов.
To get to the station, **take** bus number 5.	Щоб дістатись до станції, **сідайте** в автобус номер 5.
It **takes** me half an hour to get to the University.	В мене **займає** пів години, щоб дістатись до університету.

Exercise 1. Say whether the statements are TRUE or FALSE.

1. Diamonds are considered the softest natural materials. 2. Diamond-like coatings decrease pipe's wear resistance. 3. Diamond-coated parts are used by off-shore gas and oil companies. 4. The coefficient of friction of these coatings is very high. 5. The alternative for diamond coatings is chrome

plating. 6. The first diamond-like coatings stuck well to the underlying surfaces.

Exercise 2. Give synonyms to the following words from the text:
beautiful, a firm, a way, to begin, to retain, an option, machining, environment, to require, power, to produce.

6. SMALL LATHES

a lathe	токарний станок	a tailstock	задня бабка
a shop	цех	capacity	продуктивність
to boost	підвищувати	to flip	перекидати
at a premium	в дефіциті	available	наявний
chuck	оправка	thereby	таким чином
a tool	інструмент	unattended	без участі людини
a turret	револьверна головка	a feeder	завантажувальний механізм
turning	токарний	secondary	допоміжний

A machinery company in Oxnard, Calif., has found that smaller shops increasingly do shorter product runs that include multiple operations. It wants to help them out, so it is offering two small-footprint lathes priced at under $30,000. The company, Haas Automation Inc., says the machines can boost productivity in small and midsize shops where floor space is at a premium.

One of the models, GT-10, has a footprint of 82 × 85 inches, a maximum cutting length of 8 inches, and a maximum cutting diameter of 10 inches. The other one, GT-20, is 96 × 73 inches on the floor, with a cutting length up to 12 inches and a diameter to 11 inches. The GT-10 has a 7.5-hp motor and a price of $25,995. The GT-20 has a 20-hp motor and costs $28,995.

Haas sells the lathes without tooling. Options include a pneumatic chucking system for the GT-10 and a hydraulic chucking system for the GT-20. An optional eight-station tool turret is also available for both machines.

According to Scott Rathburn, marketing product manager at Haas Automation, the GT-10 and GT-20 are smaller, less expensive alternatives to the company's SL-10 and SL-20 turning centers for shops that don't need a tailstock or longer turning length capacity. The Haas SL-20, for example, has a maximum cutting length of 20 inches, but the machine is much larger than the GT-20, and has a base price of $54,995.

Haas suggests small lathes for secondary operations in short production runs with multiple orders. Rathburn described one possible scenario. Turned parts often require secondary operations to finish the back side of the part (the portion held in the chuck). If the work is done on a single machine, the operator must manually flip the part and then perform the secondary operation. Each piece is handled twice on the same machine.

For a reasonably small investment, a shop can have a second machine available for the finishing work. The primary turning operations, which typically are more complex and have longer cycle times, can be done on one machine, using a bar feeder and automatic parts catcher to increase throughput and run unattended. The secondary operation can then be done quickly by the same operator on a secondary lathe like the GT-20, and thereby increase productivity.

Exercise 1. Answer the questions.

1. What equipment does the company Haas Automation Inc. produce? 2. What is the power of motors in the lathes offered by the company? 3. What tooling can be supplied with the lathes? 4. What are the prices of the machine-tools? 5. What operations are done with a part if there is only one lathe? 6. In which way can productivity be raised using two machines?

Exercise 2. Form all possible derivatives from the following words:

a product, operation, short, possible, quickly.

Exercise 3. Give synonyms to the following words from the text:

to offer, small, to boost, expensive, to perform, productivity.

7. HARMONIC GOES LINEAR

a drive	привід	rotation	обертання
accuracy	точність	missing	відсутній
to cause	викликати	a pulley	шків
a screw	гвинт	to fold	згортати, складати
a gearhead	зубчастий редуктор	to wind	крутитися, обертатися
a brake	тормоз	CEO (a chief executive officer)	генеральний директор
maintenance	обслуговування	tension	напруга
lubrication	змазка	backlash	мертвий хід
to transmit	передавати	play	люфт
to fit	поміщати	stroke	хід
a spline	зубчасте колесо	a bearing	підшипник
an assembly	вузол	thrust	тяга
rigid	жорсткий	revolution	оберт
to be engaged	бути задіяним	pitch ratio	шагове відношення

A linear drive that brings the advantages of harmonic drives to linear motion can achieve high accuracy in long lengths that cause problems in screw-type drives, and it also works without gearheads or brakes, according to a manufacturer that has introduced one.

The manufacturer, Animatics Corp. of Santa Clara, Calif., says the design has fewer parts, requires less maintenance, and never needs lubrication.

To understand how it works, first consider the workings of a conventional harmonic drive. It consists of three pieces. The first is a wave generator, an elliptical steel disk that usually transmits power from a motor or servo. It fits inside a flex spline, a steel cup with gear teeth on the outside of its thin walls that deform to take on the wave generator's elliptical shape. This elliptical assembly fits inside a rigid, toothed circular spline so that 30 percent of the teeth are engaged at all times.

So far, it sounds like just another collection of gears. But the flex spline has fewer teeth than the circular spline. This means that every time the flex spline makes a full rotation forward, the circular spline moves backward by the number of gears equal to the missing teeth. So if the flex spline has 200 teeth and the circular spline 202 teeth, then it would move backward two teeth for every rotation, a 100:1 reduction ratio in only a few inches of space.

So how does this apply to linear drives? Most conventional linear drives combine a motor and gearhead with pulleys to pull a linear stage back and forth. Animatics' harmonic linear drive uses a recirculating belt that folds back upon itself as it winds over several pulleys with different diameters. The different diameters of the pulleys work like the mismatched gear teeth in a harmonic drive to force the belt to travel at different rates in different areas.

"By adding a few $5 pulleys, we've eliminated a $300 to $500 gear-head," Animatics CEO Robert Bigler said. He also noted that since the belt is always in tension, it comes to a complete stop without backlash. "Gear-heads have to have some play, because if you try to preload them, you'll have problems with the bearings," he added.

Bigler claims that the harmonic linear drive performs about as well as highly accurate but more expensive ball screw drives, especially in medium to long lengths where screws begin to vibrate.

The new drives come in standard stroke lengths of 100 to 3,200 millimeters and equivalent pitch ratios of 2.5 mm per revolution to 12.5 mm per revolution. The company's HLD60 model generates up to 450 newtons of thrust with an average moment loading of up to 150 newton-meters.

Speech patterns

so **far**	дотепер, поки що
as **far** as (I know, I understand)	наскільки (я знаю, я розумію)
as **far** back as (in the 10^{th} century)	ще в (10-му столітті)
by **far** (better, more clever)	набагато (краще, більш розумний)

Exercise 1. Answer the questions.

1. What advantages does the new design have compared to a conventional linear drive? 2. What parts does the conventional harmonic drive consist of? 3. How does a flex spline differ from a circular spline? 4. Why do they use pulleys of different diameters in the harmonic linear drive? 5. How do they save money on using additional pulleys? 6. What is the advantage of the drive's belt being always in tension?

Exercise 2. Give synonyms to the following words from the text:

advantage, accuracy, to cause, to transmit, rigid, to engage, ratio, to force, to move, to vibrate, average.

8. CHEAP CHIP CAN DRIVE

to boost	підвищувати	to run off	заміняти
a dishwasher	посудомийна машина	a shunt resistor	паралельний резистор
an appliance	прилад	interlock	блокування
high-end	сучасний, потужний	short circuit	коротке замикання
white goods	побутові прилади	consumption	споживання
average	середній	a pump	насос
a bootstrap capacitor	прискорюючий конденсатор	an evaluation board	демонстраційна плата
a circuit	схема; плата	to familiarize	знайомити

How do you boost electrical efficiency of the brushless motor in a dishwasher, refrigerator compressor, or other appliance? One way is to add a power inverter to match motor speed with load. This is **just** what appliance manufacturers have done with high-end white goods.

Now Mitsubishi Electric Europe B.V. claims it has an inverter that is economical enough for average household appliances. Mitsubishi's Semiconductor European Business Group claims its new single-chip inverter, M81500FP, is the world's smallest intelligent power module for the 90-watt range. It takes only three passive components – a ceramic bootstrap

capacitor, a shunt resistor, and a second ceramic capacitor at the voltage supply pin – to operate the inverter.

At 17.5 millimeters by 11.93 millimeters, the entire printed circuit is designed for surface mounting, a low-cost automated process that bonds chips directly onto circuit boards without additional packaging. It is then run off the appliance's microcontroller or digital signal processor.

The inverter, which is rated for 500 volts and 1 amp, not only drives the motor but protects against under-voltage, interlock, short circuit, and over-temperature. In case of short circuit, it can turn off the device within 15 microseconds.

The thinking behind all this engineering is to make an inverter inexpensive enough to use with just about any appliance.

The inverter reduces energy consumption, and enables motors and pumps to run smoother and with less noise. According to Van Trung Nguyen, general manager of Power Semiconductors Europe, the design "opens up new marketing and sales opportunities for the manufacturers."

In addition to the inverter itself, Mitsubishi is offering an evaluation board (EVBM81500FP) that contains a microcontroller so engineers can familiarize themselves with the technology.

Speech patterns

You are not **just** to him.	Ви до нього **несправедливі**.
This is **just** what you wanted.	Це **саме** те, що ви хотіли.
The train has **just** come.	Потяг **тільки-но** прийшов.
I **just** call to say ...	Я **просто** дзвоню, щоб сказати ...
just the same	**все одно**

Exercise 1. Say whether the statements are TRUE or FALSE.

1. A dishwasher, refrigerator compressor and other appliances use an internal combustion engine. 2. The company Mitsubishi Electric Europe B.V. has suggested a new processor. 3. The new device is placed on a single chip. 4. It contains five passive components. 5. The size of the entire printed circuit is a square inch. 6. The inverter protects the appliances

against short circuit. 7. It takes only 1 second to turn off the device in case of short circuit. 8. The inverter increases the noise of the appliances.

Exercise 2. Give synonyms to the following words from the text:
an appliance, goods, household, intelligent, entire, to bond, to protect, to provide, opportunity, to familiarize.

9. FOILED AGAIN

a bearing	підшипник	hypersonic	надзвуковий
foil	фольга	to absorb	поглинати
film	плівка	a shock	удар
thrust	тяга	delicate	чутливий
to exceed	перевищувати	stiffness	жорсткість
ultimate	граничний	damping	демпфування
yield strength	міцність	to toss	кидати
a shaft	вал	to match	вирівнювати
to crack	тріскатись	gradually	поступово
spring-loaded	пружинний	airborne	що перебуває у повітрі
journal lining	опорна підкладка	to prevent	запобігати
coated	покритий	to survive	витримати
lubricant	змазка	a missile	ракета
revolution	оберт	a turbocharger	турбокомпресор
to clock in	обертатись	to cut back on	скорочувати

Foil bearings are making explosive progress, according to Hooshang Heshmat, an ASME Fellow and founder of Mohawk Innovative Technology Inc. in Albany, N.Y.

Foil bearings run on a thin film of air that enables them to achieve very high rotational speeds. How high? According to Heshmat, he once ran a 50-pound-thrust turbine engine so fast that it exceeded the ultimate yield strength of the shaft, which cracked and exploded into thousands of pieces. Nor was it any ordinary shaft: It was made of 440C, a high-carbon chromium bearing steel used in the Space Shuttle's main engine.

The key to foil bearing performance lies in its foil. The shaft rests on a spring-loaded foil journal lining coated with solid lubricant. Once it starts moving, it rides on the foil until it moves fast enough to generate the air pressure needed to push the foil away. At this point, the shaft is riding on a film of air. Foil bearings use no liquid lubricants.

The technology was invented 50 years ago. In the early days, foil bearings could support maximum loads of only about 10 pounds per square inch at room temperature. Today, Mohawk has bearings that carry loads up to 100 pounds per square inch and operate at temperatures as high as 1,700°F. The smallest foil bearings are 4 mm in diameter and achieve 1 million revolutions per minute. The largest bearings are 235 mm diameter and clock in at hypersonic speeds of more than 600 meters per second.

Mohawk's latest bearings take advantage of two key innovations. The first **has to do with** the bearing's ability to absorb shocks without failing. This involves a delicate balance of stiffness and damping. Heshmat likens it to tossing a child into the air. "As the baby starts coming down, you match his speed with your hands to slow him down gradually before catching him," he explained. "We've designed the foil and springs around the shaft to achieve multilevel stiffness and damping to do just that."

Heshmat's team has also developed an innovative foil coating. It fulfills two important functions. First, it acts as a solid lubricant to smooth the startup of the bearing before it goes airborne. This prevents wear. The same coating also acts as a thermal barrier, enabling the foils to survive for tens of thousands of hours at temperatures up to 1,700°F.

The military funded much of Mohawk's research for use in missiles, rockets, and jet engines.

Lubrication-free bearings could make possible turbochargers for diesel engines. As today's diesel turbochargers age, oil leaks into the engine and comes out as particulates. Environmental regulations limit particulate emissions, such as the black soot that diesels emit as they warm up to operating temperatures. While foil bearings could double the cost of turbochargers, they would allow diesel manufacturers to cut back on the equipment now needed to capture particulate emissions.

Speech Patterns

to have something (nothing) to do with smth.	**мати (не мати) відношення до чогось**
I'm sure he has something to do with medicine.	Я певен, що він має якесь відношення до медицини.
This problem has nothing to do with us.	Ця проблема нас ніяк не стосується.

Exercise 1. Say whether the statements are TRUE or FALSE.

1. Foil bearings run on a film of oil. 2. Heshmat made an experiment with a turbine engine to check the strength of the shaft. 3. The shaft used in the experiment was made of cast iron. 4. The technology of foil bearings was invented 20 years ago. 5. The smallest foil bearings are less than 1 sentimetre in diameter. 6. Heshmat compares the operation principles of the bearings with tossing a child into the air. 7. Foil coating enables to prevent overheating. 8. The military are going to use the foil bearings in submarines.

Exercise 2. Give synonyms to the following words from the text:

progress, ultimate, ordinary, main, performance, to support, to achieve, stiffness, to toss, innovative, regulation.

10. WIGGLE ROOM

a take	точка зору, трактовка	a PCB (printed circuit board)	печатна плата
actuator	привід	benchtop	настільний
a phenomenon	явище	suburb	передмістя
a nut	гайка	simultaneously	одночасно
a screw	гвинт	a stake	пакет акцій
to come up with	знайти	a joint venture	спільне підприємство
a shift	зсув	to headquarter	розміщувати штаб
a hip	стегно	to purchase	купувати
a thread	різь, нарізка	to customize	виробляти на заказ
to squiggle	звиватись	to be rated	бути розрахованим

axial	осьовий	stock	серійний
a clearance	зазор	to replace	заміняти
to advertise	рекламувати	a stepper motor	шаговий мотор
fine	точний		

Here's a different take on the piezoelectric actuator, the device that takes advantage of the deformation of certain ceramics when an electric field is applied to them. The piezoelectric actuator changes shape and can move something.

A few years ago, David Henderson got the idea of using the shape-changing phenomenon **to cause a nut to vibrate** and drive a screw. What he came up with is a linear motor that can move about 100 times its own mass and can be manufactured in sizes down to about 1.5 centimeter thick, and perhaps even smaller.

Henderson received a patent for the idea in 2005 and has founded a company, New Scale Technologies Inc., which says it can make as many as 100,000 motors a month at its factory in Victor, N.Y. He is both co-CEO and chief technology officer. The other co-CEO, Ted Franceschi, is chief development officer.

The device consists of a screw inside a nut, with both parts made of stainless steel. The nut is encased in four piezoelectric plates. A voltage is applied to the plates at the frequency of the nut's first bending resonant frequency, Henderson said. Depending on the size of the nut, that could be anywhere from about 40 to 200 kilohertz. The plates operate in pairs, and the current is applied separately to each pair with a 90-degree phase shift.

The result is an alternating deformation of the plates that causes the nut to vibrate in a circular motion. Henderson compared the action to the movement of the hips of a person spinning a Hula Hoop. Tangential forces from the threads of the nut work on the screw, which will begin to rotate and can move a load.

The company calls it the Squiggle motor. According to Henderson, the system requires an axial load to work properly. When there is no load on the screw, it may move, or it may not, depending on thread clearance and the mass of the screw. The company makes the motors in which the nut is

as small as 1.5 × 1.5 × 6 mm. Henderson said it may be possible to manufacture them 33 percent smaller.

One of the applications for which New Scale advertises the motors is for fine control of lenses in tiny cameras, like the ones in cellular phones. New Scale recently expanded a two-year-old license with Tamron Co., a maker of optical equipment in Japan. Tamron is now licensed to make Squiggle motors for its own products at factories in Japan and elsewhere in Asia. It may also serve as a contract manufacturer for New Scale.

The company suggests a range of uses for Squiggle motors, from toys to electronic locks or microfluidic controls in drug pumps.

There are several options for the electronics needed to drive the motors, Henderson said. Among them, he said, are benchtop electronics in housings, separate PCBs using discrete electronic components that are ready for integration in a customer's product, or a motor drive circuit on a single application-specific integrated circuit.

New Scale has partnered with Austriamicrosystems AG, a manufacturer of integrated circuits in Unterpremstaetten, a suburb of Graz, Austria, to develop a chip that will be able to drive two Squiggle motor simultaneously. The collaboration will also develop a position sensor.

Austriamicrosystems earlier this year invested $6 million to buy a 25 percent stake in New Scale. Austriamicrosystems was formed in 1981 as a joint venture of American Microsystems Inc. and VOEST Alpine AG. It is headquartered in a 12th-century castle, Schloss Premstaetten, that VOEST purchased in 1981.

New Scale makes a range of Squiggle motors in standard sizes and offers to customize, as well. The smallest stock motor that New Scale makes, Model SQL-1.5-6, has a nut that is 1.5 × 1.5 × 6 mm. Its mass is 0.15 grams and it is rated to generate up to 0.2 newton, or 20 grams force. The stock model has a maximum travel of 6 mm and a travel speed of 5 mm per second. Its resolution is listed at 0.5 micrometer.

According to Henderson, a Squiggle motor is applicable "anyplace you want to replace a solenoid or stepper motor and want to go smaller." They are especially advantageous at widths, or motor diameters, under 6 mm, he said.

Speech patterns

to cause smb. (smth.) to do smth.	**примушувати когось (щось) робити щось**
The strong wind caused us to stay home.	Ми залишились вдома через сильний вітер.
to cause smth.	**викликати щось; бути причиною чогось**
The strong wind caused big damages.	Сильний вітер викликав великі пошкодження.

Exercise 1. Say whether the statements are TRUE or FALSE.

1. The piezoelectric actuator can move something due to changes in shape. 2. David Henderson suggested a big-sized linear motor that can move very big objects. 3. Henderson founded his company in 2000. 4. The company New Scale Technologies Inc. is situated in New York City. 5. The parts of the device are made of stainless steel. 6. The frequency of the voltage applied to the plates of the device ranges from 200 to 300 kilohertz. 7. Henderson compared the movement of the nut in the device with a squirrel in a cage. 8. Henderson's company cooperates with Japan and Austria.

Exercise 2. Give synonyms to the following words from the text:

a device, to change, a few, to cause, to manufacture, small, to receive, to found, to call, properly, fine, a manufacturer, simultaneously, to offer.

11. SUPER INDUCTION

plc (public limited company	відкрите акціонерне товариство	a downside	недолік
fair	ярмарок	so far	досі
brass	мідь, латунь	preliminary	попередній
to extrude	формувати видавлюванням	a trial	випробування
alternating current	перемінний струм	commissioned	введений в експлуатацію
eddy current	вихровий струм	distribution	розподіл

to resist	опиратись	alloy	сплав
a coil	котушка, виток	a billet	заготівка
homogeneous	однорідний		

British superconductor developer Zenergy Power plc and German machine manufacturer Bültmann GmbH have begun selling an industrial-scale, superconductor-based induction heater for metal processing. The technology, which they say is **twice as efficient as** conventional induction heaters, won the prestigious 100,000-euro Hermes Prize at this year's Hannover Fair in Germany.

Metal fabricators use induction heaters to soften aluminum, brass, bronze, and copper in order to shape or extrude such parts as heat exchanger tubes, pipes, window frames, computer components, and automotive profiles.

The induction heaters themselves are electromagnets driven by high-frequency alternating currents. This induces eddy currents in the workpiece. The resistance of the eddy currents to changes in direction induced by the alternating current causes the metal to heat up. Induction heaters typically have energy efficiencies of 35 to 45 percent, and can consume an astonishing 1 to 5 percent of an industrial country's total energy production, according to Zenergy.

One reason that induction heater efficiency is so low is hysteresis, the tendency of the magnetic cores to resist the rapid cycling of the magnetic fields. Superconductors provide a solution to that problem. They have zero electrical resistance, so there is no hysteresis, **no matter how fast the current alternates** to switch the polarity of the magnetic field.

This greatly reduces the amount of energy needed to power the induction coil. Superconductor induction heaters achieve efficiencies of 90 percent. The technology produces highly homogeneous and precisely controllable temperature gradients in the workpiece, with no risk of damage from local overheating. Superconducting induction heaters start up quickly. Their only real downside is expense, but Zenergy claims that companies can pay off the purchase price within five years based on energy cost savings alone.

So far, Zenergy and Bültmann have sold two commercial units. The first one, in September 2007, went to aluminum fabricator Weser Alu GmbH, which used it to replace an existing copper-based aluminum heater at its manufacturing plant in Minden, Germany. Based on preliminary trials, Weser Alu expected to decrease energy use to 160 kilowatt-hours, from 280 kilowatt-hours, while reducing heating times and improving temperature distribution.

The second unit builds on lessons learned in the first heater, the developers said. They said it has been sold to a manufacturer that makes automotive, electrical, air conditioning, and refrigeration components. The manufacturer will use the induction heater in a newly commissioned facility to extrude copper and copper alloy billets.

Speech patterns

twice as ... as	**в два рази**
This car is **twice as expensive as** mine.	Ця машина вдвоє дорожча за мою.

no matter how (where, when)	**як (де, коли) би не**
No matter how hard it is, I will do it.	Як би не було важко, я це зроблю.
Call me **no matter when** he comes.	Подзвоніть мені, коли б він не прийшов.

Exercise 1. Say whether the statements are TRUE or FALSE.

1. The induction heater made by Zenergy Power plc is used for plastics processing. 2. Conventional induction heaters are less efficient than the new superconductor-based induction heater. 3. Induction heaters are used for shaping computer components and window frames. 4. The induction heaters contain electromagnets driven by direct current. 5. Induction heaters consume much energy. 6. The main reason for low efficiency of induction heaters is eddy current. 7. There is no hysteresis when superconductors are used. 8. Superconductor induction heaters can cause local overheating of workpieces.

Exercise 2. Give synonyms to the following words from the text:
to induce, resistance, typically, astonishing, total, tendency, to provide, a problem, a downside, expense, a trial, to expect, a billet.

12. HOT BOLT POWERS SENSORS

to harvest	збирати, отримувати	an issue	проблема
dc (direct current)	постійний струм	self-sustaining	самозабезпечуваний
a trickle	струмочок	intermittent	переривчастий
a node	вузол	conditioning	регулювання
to track	відстежувати	a heat sink	тепловідвід
a survey	огляд	ambient	навколишній
deployment	введення в дію	to evaluate	оцінювати

A German company, Micropelt GmbH, has developed a prototype bolt that screws into a hot machine and harvests the waste heat as electricity. Based on thermoelectric thin films, the TE-Power-Bolt generates 0.2 to 15 milliwatts of power and uses an integrated dc-dc converter to set voltage between 1.2 and 5 volts.

So what can you do with **such a small trickle** of power? Micropelt's vice president, Burkhard Habbe, points to wireless sensor nodes. By connecting tiny autonomous sensors wirelessly, manufacturers create distributed networks to track material flow and monitor machinery. The network gives managers a precise picture of production status. A single plant could use dozens, hundreds, or even thousands of sensor nodes.

Today, batteries power those devices. Habbe points to a survey by San Diego-based market research firm ON World Inc. that sees global deployment of 128 million wireless sensor nodes within two years. The same survey found that 75 percent of industry experts named batteries as a critical issue because they require constant monitoring and replacement.

Micropelt's solution is to replace batteries with TE-Power-Bolts. The bolts are self-sustaining power supplies that never need replacement. Their low power output is ideal for sensors that take and report intermittent

measurements (as opposed to critical sensors that must operate all the time).

The sensors themselves consist of two different types of semiconductors that produce a current when there is a temperature gradient between them. The semiconductors and power conditioning devices sit on the head of an M24 steel screw.

The screw transmits heat from a hot machine or a pipe carrying fluids to the semiconductors. One of the semiconductors is connected to a 1.5-inch-diameter aluminum heat sink above the bolt head that draws away heat. As long as the hot surface is 10 to 20°C warmer than ambient temperature, the TE-Power-Bolt will generate power.

"We are supporting two basic scenarios," Habbe said. "One is an external energy supply, as represented by TE-Power-Bolt, where a short wire connects to the sensor node, which may not sit on a warm surface but has one nearby. The second is an integrated thermal energy source, functioning like a built-in battery, which would never run out. It is good for sensors sitting on warm or hot surfaces of any type."

The TE-Power-Bolt was designed to show how an energy harvester based on the company's thin film thermoelectric technology might look. Micropelt would like to license the technology, and Habbe says some companies are already evaluating the prototype.

Speech patterns

It was **such a** nice **day**.	Це був **такий** чудовий день.
The day was **so** nice.	День був **такий** чудовий.

Exercise 1. Answer the questions.

1. What is the function of a hot bolt developed by the German company Micropelt GmbH? 2. What power generates TE-Power-Bolt? 3. What are sensor nodes used for? 4. How often do TE-Power-Bolts need replacement? 5. When do sensor's semiconductors produce current? 6. Where are the semiconductors placed? 7. Under what conditions does TE-Power-Bolt generate power?

Exercise 2. Give synonyms to the following words from the text:
a prototype, to generate, integrated, to point, to connect, to create, to monitor, precise, research, an expert, constant, output, to transmit, to evaluate.

TIME FOR FUN

- What's the difference between mechanical engineers and civil engineers? – Mechanical engineers build weapons. Civil engineers build targets.

- An engineer, a physicist, and a computer scientist were discussing what was the oldest profession.
The engineer claimed priority. "Look at all that matter engineered into amazing constructs like galaxies, stars, and planets".
The physicist disagreed. "Before there were planets, the matter had to be made from chaos. Physics **is responsible for** all the quarks, gluons, photons, and electrons".
The computer scientist coughed modestly. "Ah, but where do you think the chaos **came from**?"

- A vibration is a motion that cannot **make up its mind** which way it wants to go.

- A man is talking to God:
  The man: God, how long **is** a million years?
  God: To me, it'**s** about a minute.
  The man: God, how much **is** a million dollars?
  God: To me it'**s** a penny.
  The man: God, may I have a penny?
  God: Wait a minute.

- The wireless telegraph is not difficult to understand. The ordinary telegraph is like a very long cat. You pull the tail in New York, and it meows in Los Angeles. The wireless is the same, only without the cat. (Albert Einstein)

IV. READING IN CHEMISTRY

1. HYDROGEN

fusion	синтез	combustion	згоряння
to exist	існувати	viable	життєздатний
to store	зберігати	a vehicle	засіб пересування
fuel	паливо	a challenge	виклик, проблема
compression	стискання, компресія	midair	повітряний
hair bleach	освітлювач для волосся	a wound	рана, ушкодження

The chemical symbol of hydrogen is H. It is an element with atomic number 1, this means that 1 proton is found in the nucleus of hydrogen. Hydrogen is the lightest, simplest and most commonly found chemical element in the Universe, making up around 75% of its elemental mass. Hydrogen is found in large amounts in giant gas planets and stars; it plays a key role in powering stars through fusion reactions. Hydrogen is one of two important elements found in water (H_2O). Each molecule of water is made up of two hydrogen atoms bonded to one oxygen atom.

In 1766, during an acid metal reaction, Henry Cavendish first formally recognized hydrogen. In 1781 he also found that hydrogen produces water when burned. While Cavendish **is** usually **given credit for** the discovery of hydrogen as an element, it had been produced by earlier scientists who were unaware of hydrogen as a unique chemical element. **It wasn't until a few years later** (1783) that hydrogen was given its name. The word *hydrogen* comes from the Greek word *hydro* (meaning water) and *genes* (meaning creator).

Hydrogen gas has the molecular formula H_2. At room temperature and under standard pressure conditions, hydrogen is a gas that is tasteless, odorless and colorless. Hydrogen can exist as a liquid under high pressure and at extremely low temperature of 20.28 Kelvin (−252.87°C, −423.17°F). Hydrogen is often stored in this way as liquid hydrogen takes up less space than hydrogen in its normal gas form. Liquid hydrogen is also used as a rocket fuel. Under extreme compression hydrogen can also make a transi-

tion to a state known as metallic hydrogen. Laboratory research into this area is ongoing as scientists continue efforts to produce metallic hydrogen at low temperature and static compression.

Hydrogen is used to power a range of new alternate fuel vehicles. The chemical energy of hydrogen is converted by a combustion method similar to current engines or in a fuel cell which produces water and electricity by reacting hydrogen with oxygen. Engineers and car manufacturers are researching the possibility of using hydrogen gas as an efficient and viable car fuel. One of the possibilities involves storing hydrogen as a solid state in car fuel tanks. While there are many challenges involved in this process it would allow for greater hydrogen storage in vehicles, allowing them to travel for longer before refueling.

Hydrogen peroxide is a chemical compound with the molecular formula H_2O_2. It is often used as a hair bleach or cleaner. At certain concentrations it can also be used to clean wounds.

Hydrogen was used for air travel from 1852 when the first hydrogen lifted airship was created by Henri Giffard. Later airships that used hydrogen were called zeppelins and while they were reliable and safe for the majority of the time their use was stopped soon after the Hindenburg disaster in 1937. The Hindenburg airship was destroyed in a midair fire over New Jersey that was both filmed and broadcast live on radio.

Hydrogen is commonly used in the petroleum and chemical industries and is also widely used for many physics and engineering applications such as welding or as a coolant.

Hydrogen can be potentially dangerous to humans due to fires that can start when it is mixed with air, our inability to breathe it in its pure oxygen free form and also in its extremely cold liquid state.

Speech patterns

to give credit for	**надати перевагу**
While Cavendish **is** usually **given credit for** the discovery of hydrogen as an element, it had been produced by earlier	Хоча Кавендішу віддають перевагу у відкритті водню як хімічного елемента, вчені отримували його і раніше, але не здогадувались

scientists who were unaware of hydrogen as a unique chemical element.	наскільки це унікальний хімічний елемент.

It wasn't until a few years later (1783) **that** hydrogen was given its name.	І **тільки через декілька років** (1783) гідрогену дали його назву.

1. Say whether these statements are TRUE or FALSE.

1. Hydrogen produces water when burned. 2. Hydrogen cannot exist as a liquid under any conditions. 3. Engineers and car manufacturers assume the possibility of using hydrogen gas as an efficient and viable car fuel. 4. Hydrogen peroxide is a chemical compound that at certain concentrations can also be used to clean wounds. 5. Zeppelins were reliable and safe. 6. The use of zeppelins was stopped soon after the Hindenburg disaster in 1931. 7. Hydrogen can be potentially dangerous to humans due to fires that can start when it is mixed with air.

2. Match the words to their synonyms:

1) amount	a) to connect
2) to make up	b) enormous
3) mass	c) conversion
4) giant	d) to ruin
5) to bond	e) a chance
6) discovery	f) weight
7) unique	g) to compose
8) transition	h) opening
9) possibility	i) quantity
10) to destroy	j) particular

2. NITROGEN

bulk	об'ємний	a bubble	бульбашка
fluid	рідина	surgery	хірургічна операція
greenhouse gas	парниковий газ	an anesthetic	обезболювальне

decompression sickness	кесонна хвороба	demolition	знищення, руйнування
scuba diving	пірнання з аквалангом	fertilizer	удобрювач, добриво

Nitrogen is a chemical element with the symbol N and atomic number of 7. Under normal conditions nitrogen is a colorless, odorless and tasteless gas. Nitrogen makes up around 78% of the air you breathe; it is present in all living things, including the human body and plants.

Nitrogen gas is used in food storage to keep packaged or bulk foods fresh. It is also used in the making of electronic parts, for industrial purposes and has many other useful applications. Nitrogen gas is often used as an alternative to carbon dioxide for storing beer in pressurized kegs. The smaller bubbles it produces are preferred for some types of beer.

Titan, the largest moon of Saturn, has an atmosphere nearly entirely made of nitrogen (over 98%). **It is the only moon in our solar system known to have** a dense atmosphere.

Nitrogen is in a liquid state when at a very low temperature. Liquid nitrogen boils at 77 Kelvin (−196°C, −321°F). It is easily transported and has many useful applications including storing items at cold temperatures, in the field of cryogenics (how materials behave at very low temperatures), as a computer coolant (a fluid used to prevent overheating), removing warts and much more.

Decompression sickness (also known as the bends) involves nitrogen bubbles forming in the bloodstream and other important areas of the body when people depressurize too quickly from scuba diving. Similar situations can occur for astronauts and those working in unpressurized aircraft.

Nitrous oxide (also known as laughing gas or by its chemical formula N_2O) is used in hospitals and dental clinics as an anesthetic (removing or reducing pain and general awareness for various surgeries). Nitrous oxide is also used in motor racing to increase the power of engine and speed of the vehicle. **When used** for this purpose, it is often referred to as nitrous or NOS (*Nitrous Oxide System)*. Nitrous oxide is a considerable greenhouse

gas and air pollutant. By weight it has nearly 300 times more impact than carbon dioxide.

Nitroglycerin is a liquid used to create explosives such as dynamite. It is often used in the demolition and construction industries as well as by the military. Nitric acid (HNO_3) is a strong acid often used in the production of fertilizers. Ammonia (NH_3) is another nitrogen compound commonly used in fertilizers.

Speech patterns

the only ... to have	**єдиний ..., що має**
It is **the only moon** in our solar system known **to have** a dense atmosphere.	Відомо, що це єдиний місяць в нашій сонячній системі, який має щільну атмосферу.

***when* + V-III**	
When used for this purpose, it is often referred to as nitrous or NOS (*Nitrous Oxide System)*.	Коли він використовується з такою метою, то називається закисом або системою закису азоту.

1. Answer the following questions.

1. What characteristics does nitrogen have under normal conditions? 2. Where is nitrogen gas used? 3. What is the only moon in our solar system known to have a dense atmosphere? 4. What is the boiling point of nitrogen? 5. What is the mechanism of decompression sickness? 6. Why is nitrous oxide used in motor racing?

2. Give synonyms to the following words from the text:

entirely, to include, speed, quickly, an engine, small, to store, a purpose, considerable, to reduce, impact, to remove, liquid, to use.

3. OXYGEN

a crust	кора	a clergyman	священик
a layer	прошарок	treatment	1) лікування; 2) обробка
a pollutant	забруднювач	a spark	іскра

Around 1% of the sun's mass is oxygen. Oxygen is an element with the chemical symbol O and atomic number 8. Oxygen is a very reactive element that easily forms compounds such as oxides. Under standard temperature and pressure conditions two oxygen atoms join to form dioxygen (O_2), a colorless, tasteless and odorless gas.

Oxygen is essential to human life, it is found in the **air we breathe** and the **water we drink** (H_20). Oxygen makes up around 21% of the air you breathe. It is also the most common element in the Earth's crust (around 47%) and the third most common element in the Universe (but far less than hydrogen and helium, the two most common).

The large amount of oxygen on Earth is supported by the oxygen cycle which involves the movement of oxygen between the air, living things and the Earth's crust. Photosynthesis (a process that converts carbon dioxide into organic compounds using sunlight) plays a major role in this cycle.

Ozone (O_3) is an allotrope (different form) of oxygen that combines three oxygen atoms together. While ground level ozone is an air pollutant, the ozone layer in the Earth's upper atmosphere provides protection from the suns harmful rays by filtering UV light.

The sun's mass is made up of around 1% oxygen.

Between 1770 and 1780, Swedish pharmacist Carl Wilhelm Scheele, British clergyman Joseph Priestley and French chemist Antoine Laurent Lavoisier researched, documented and helped discover oxygen. The name oxygen was first used by Lavoisier in 1777.

Oxygen therapy is used as a common medical treatment. **You may have seen** patients on TV or in real life using an oxygen mask or nasal cannula (a plastic tube that fits behind the ears and delivers oxygen through the nostrils).

Oxygen has a number of other practical uses such as smelting metal from ore, water treatment, as an oxidizer for rocket fuel and a number of other industrial, chemical and scientific applications.

Concentrated oxygen promotes fast combustion. While a spark or heat **is still needed to start** a fire, having concentrated oxygen near various fuels can be very dangerous.

Speech patterns

It is found in the **air we breathe** and the **water we drink**.	Він знаходиться у **повітрі, яким ми дихаємо**, та у **воді, яку ми п'ємо**.

You may have seen patients on TV or in real life using an oxygen mask.	По телевізору, або в реальному житті **ви, мабуть, бачили** пацієнтів, що користуються кисневими масками.

A spark or heat **is still needed to start** a fire.	Іскра чи жар усе ще необхідні, щоб запалити вогонь.

1. Answer the following questions.

1. What is the atomic number of oxygen? 2. How much oxygen is there in the air we breathe? 3. What does the oxygen cycle involve? 4. Photosynthesis is a process that converts carbon dioxide into organic compounds using sunlight, isn't it? 5. How many oxygen atoms does ozone combine? 6. From what countries were the scientists who researched, documented and helped discover oxygen?

2. Put down the following words into 2 lists: a) Nouns, b) Adjectives. Underline the word-forming siffixes. Add the lists with nouns and adjectives of your own with the same suffixes.

Various, oxidizer, industrial, dangerous, treatment, application, scientific, medical, plastic, patient, pharmacist, harmful, different, pollutant, movement, essential, tasteless, pressure, condition, reactive.

4. HELIUM

to float	плисти	buoyant	плавучий, здатний триматися на поверхні
noble	благородний	to leak	витікати
jointly	спільно	hoax	містифікація, трюк
to replenish	поповнювати	to inhale	вдихати
a blimp	дирижабль	to choke	задихатися, душити

Helium is lighter than the air around us so it floats, that's why it is perfect for the balloons you get at parties. Helium is a chemical element with the symbol He and atomic number 2. It is a colorless, tasteless and odorless gas. Helium is the second most common element in the Universe (after hydrogen), making up around 24% of its mass.

Helium is part of a group of chemical elements called noble gases; the other five that occur naturally are neon, argon, krypton, xenon and radon. Under normal conditions they share similar properties, including **being less likely to participate** in chemical reactions due to their outer shell of electrons being full. Helium is the second least reactive element after neon.

French and English astronomers Pierre Janssen and Norman Lockyer are jointly credited with discovering helium after spectral analysis of sunlight following a solar eclipse in 1868.

The word helium comes from the Greek word meaning sun (helios). It was named by Lockyer and English chemist Edward Frankland.

The USA is the world's largest supplier of helium, with many reserves found in large natural gas fields.

The rate at which helium is currently being used by humans is much faster than the rate at which the reserves are being replenished. New technologies for obtaining or recycling helium are one way for gas companies to help slow this problem.

Because helium is lighter than air it is commonly used to fill airships, blimps and balloons. As it doesn't burn or react with other chemicals, helium is relatively safe to use for this purpose. While hydrogen is 7% more buoyant than helium it has a much higher fire risk.

You might have noticed the helium balloon you got from the amusement park slowly falling to the ground after a few days, this happens as the helium gradually leaks from the balloon. Helium has a lifting force of around one gram per liter. A balloon that holds 10 liters of helium should therefore lift an object weighing 10 grams. Unfortunately you'll need around 5,000 of these balloons if you weigh around 50kgs and want to get off the ground.

Because helium is less dense than normal air, when inhaled from a source such as a helium balloon, it briefly changes the sound of a person's

voice, **making it sound** much higher. However, breathing in too much helium can be very dangerous, potentially choking people due to a lack of oxygen.

Helium can be in a liquid and even solid state but they can only occur at temperatures near absolute zero. Liquid helium is used to cool metals for superconductivity use. The European Organization for Nuclear Research's (CERN) Large Hadron Collider uses liquid helium to maintain an extremely low temperature.

Helium is often used in space programs, displacing fuel in storage tanks and having other rocket fuel applications.

Speech patterns

to be less likely to participate in chemical reactions	**скоріш за все, не будуть приймати участь** у хімічних реакціях

You might have noticed …	Можливо, ви помічали …

It briefly changes the sound of a person's voice, **making it sound** much higher.	Він ненадовго змінює звучання людського голосу, **змушуючи його звучати** набагато вище.

1. Say whether these statements are TRUE or FALSE.

1. Helium is heavier than the air around us. 2. Helium refers to a group of chemical elements called noble gases which under normal conditions have similar properties. 3. It was French astronomer Pierre Janssen who discovered helium after spectral analysis of sunlight in 1860. 4. The word helium comes from the Greek word meaning helicopter. 5. A lot of helium can be found in large natural gas fields of the United States of America. 6. Helium briefly changes the sound of a person's voice, making it sound much lower.

2. Find the English equivalents to the following words and word combinations in the text:

благородні гази, підйомна сила, легший за повітря, без смаку, паливний бак, біля абсолютного нуля, вдихати / видихати, складати біля 1%,

зовнішня оболонка, найбільший постачальник, підтримувати температуру, сонячне затемнення, нестача кисню, відносно безпечний.

5. WATER

tide	прилив	to burst	вибухати
to dissolve	розчиняти	plumbing	водопровід
hail	град	soil	грунт
a vent	віддушина	sewage	стічні води
a polar ice cap	полярна льодова шапка	to be involved in	бути залученим до чогось

Above 4°C, water expands when heated and contracts when cooled. But between 4°C and 0°C it does the opposite, contracting when heated and expanding when cooled. Stronger hydrogen and oxygen bonds are formed as the water crystallizes into ice. By the time it's frozen it takes up around 9% more space.

Water is made up of two elements, hydrogen and oxygen. Its chemical formula is H_2O. Each molecule of water is made up of two hydrogen atoms bonded to a single oxygen atom.

Water has three different states, liquid, solid and gas. The word *water* usually refers to water in its liquid state. The solid state of water is known as ice while the gas state of water is known as steam or water vapor.

The existence of water is essential for life on Earth. Water covers around 70% of the Earth's surface. The three largest oceans on Earth are the Pacific Ocean (largest), the Atlantic Ocean (**second largest**) and the Indian Ocean (third largest). Found in the Pacific Ocean, the Mariana Trench is the deepest known point in the world's oceans. Ocean tides are caused by the rotation of the Earth and the gravitational pull of the Moon and Sun acting on ocean water. On average, every kilogram (2.2 lb) of seawater contains around 35 grams (1.2 oz) of dissolved salt. The freezing point of water lowers as the amount of salt dissolved in it increases. With average levels of salt, seawater freezes at –2°C (28.4°F).

Water **makes a good solvent** with many sugars, salts and acids easily dissolving in it. On the other hand oils and fats don't mix well with water.

The water cycle involves water evaporating (turning into a gas), rising to the sky, cooling and condensing into tiny drops of water or ice crystals that we see as clouds, falling back to Earth as rain, snow or hail before evaporating again and continuing the cycle.

Water in the form of ice is found at the polar ice caps of the planet Mars, some scientists have also suggested the possibility of liquid water on the red planet.

Pure water has no smell and no taste; it also has a pH level around 7.

While most people know that water boils at 100°C (212°F), this is at the normal conditions of sea level. The boiling point of water actually changes relative to the barometric pressure. For example, water boils at just 68°C (154°F) on the top of Mount Everest while water deep in the ocean near geothermal vents can remain in liquid form at temperatures much higher than 100°C (212°F).

Water can move up narrow tubes against the force of gravity in what is known as capillary action. You **may check** out this capillary action **your-self**.

Most people around the world have access to clean drinking water but it is a major problem in poorer areas of the world. Water pollution and low quality water can lead to dangerous bacteria, disease and viruses such as E coli and Cryptosporidium.

Drinking water **is needed** for humans **to avoid** dehydration, the amount you need each day depends on the temperature, how much activity you are involved in and other factors. An important use for water is in agri-cultural irrigation, this is when water is artificially added to soil in order to assist the growth of crops. Water is used frequently by firefighters to extin-guish fires. Helicopters sometimes drop large amount of water on wildfires and bushfires to stop fires spreading and limit the damage they can cause. The water industry helps deliver water to homes in various cities and coun-tries around the world. This can involve services such as purification, sew-age treatment, filtering, distillation and plumbing.

Electricity can be created from hydropower, a process that uses water to drive water turbines connected to generators. There are many hydroelec-tric power stations around the world. Water also plays a role in cooking.

Steaming and boiling food are well known cooking methods. You may have noticed this last time you made pasta or noodles.

Water is also used for fun. Water sports are a very popular recreational activity and include things like swimming, surfing and waterskiing. Ice and snow is also used in ice skating, ice hockey, skiing and snowboarding.

Speech patterns

second largest	другий за величиною (розмірами)

Water **makes a good solvent** with many sugars, salts and acids easily dissolving in it.	Вода **є гарним розчинником** для багатьох сахароз, солей та кислот.

You may check out this capillary action **yourself**.	**Ти сам** можеш перевірити цю капілярну дію.
I may **check** out this capillary action **myself**.	**Я сам** …
They may **check** out this capillary action **themselves**.	**Вони самі** …

Drinking water **is needed** for humans **to avoid** dehydration.	Питна вода **необхідна** людині, **щоб запобігти** зневодненню організму.

1. Say whether these statements are TRUE or FALSE.

1. Above 4°C, water contracts when heated and expands when cooled. 2. Each molecule of water is made up of two atoms of oxygen and one atom of hydrogen. 3. The solid state of water is known as snow. 4. The freezing point of water lowers as the amount of salt dissolved in it increases. 5. The boiling point of water at the normal conditions of sea level is 100°C (212°F) and it changes relative to the barometric pressure. 6. The amount of water you need every day to avoid dehydration does not depend on different factors. 7. Agricultural irrigation is the process when water is artificially added to soil in order to assist the growth of crops.

2. Find the English equivalents of the following words and word combinations in the text:

стискатися при охолодженні, штучний, рідкий стан, сила тяжіння, міцні зв'язки, океанські приливи, поверхня Землі, атмосферний тиск, гасити полум'я, розчинятись у воді, постачати воду в домівки, катання на льоду, пожежник, випаровування, вирощувати врожаї.

6. CARBON

to bond	зв'язувати	to feature	представляти собою
transparent	прозорий	charcoal	деревне вугілля
the Earth's crust	земна кора	emission	емісія, викид
melting point	температура плавлення	fossil fuel	викопне паливо
entirely	цілком	alloy	сплав
carbon fiber	волокна вуглецю	crude oil	сира нафта

Carbon is a chemical element with the symbol C and atomic number 6. The word *carbon* **comes from** the Latin word *carbo*, meaning coal.

Carbon forms a large number of compounds, more than any other element. Because of its willingness to bond to other nonmetallic elements it **is often referred to as** the building block of life. While carbon forms many different compounds it is a relatively unreactive element.

There are several allotropes (different forms) of carbon with the three most well known being amorphous carbon (coal, soot etc), diamond and graphite. The properties of diamond and graphite are very different, with diamond being transparent and very hard, while graphite is black and soft (soft enough to write on paper). Graphite is used for its thermal insulation (lower rate of heat transfer) properties. It is also a very good conductor of electricity. The carbon atoms in graphite are bonded in flat hexagonal lattices and layered in sheets.

Carbon is the 4th most common element in the Universe (after hydrogen, helium and oxygen). It is the 15th most common element in the Earth's crust while it is the second most common element in the human

body (behind oxygen). Carbon has the highest melting point of all elements, around 3500°C (3773 K, 6332°F).

Hydrocarbons are organic compounds made entirely of molecules featuring just hydrogen and carbon. Organic chemistry involves the study of hydrocarbons. The simplest hydrocarbon compound is methane (CH_4).

Carbon was discovered by early human civilizations in the form of charcoal and soot. The term carbon footprint **refers to** the amount of greenhouse gas emissions caused by a country, organization or individual person. The carbon cycle is the process in which carbon is exchanged between all parts of Earth and its living organisms. It is of vital importance to life on Earth, allowing carbon to be continually reused and recycled.

Carbon is found in the Earth's atmosphere in the form of carbon dioxide (CO_2). Although it only makes up a small percentage of the atmosphere it plays an important role, including being used by plants during photosynthesis.

Carbon monoxide (CO) is very toxic to both humans and animals. It forms in conditions when there is not enough oxygen to form carbon dioxide (CO_2). In many countries around the world, carbon monoxide poisoning is the most common kind of fatal poisoning.

Carbon fiber is a strong material that consists of thin fibers made up largely of carbon atoms which are bonded together in microscopic crystals. It is very useful for applications needing high strength and low weight. Fossil fuels such as methane gas and crude oil (petrol) play a large role in modern economies. Plastics are made from carbon polymers. Carbon is used to form alloys with iron such as carbon steel.

Graphite and clay are combined to make the lead used in pencils.

Charcoal is commonly used for grilling food on barbeques.

Speech patterns

The term "robot"	**comes from**	the Czech word "robota".	Слово "robot" походить від чеського слова "robota".
She		Italy.	Вона родом з Італії.
Milk		cows.	Молоко дають корови.

1. Say whether these statements are TRUE or FALSE.

1. Carbon creates a lot of compounds but not more than any other element. 2. There are different forms of carbon with the two most well known. 3. Graphite is a very good conductor of electricity. 4. Carbon has the lowest melting point of all elements. 5. Organic chemistry studies organic compounds such as hydrocarbons. 6. Carbon monoxide (CO) is very poisonous for human beings and animals as well. 7. Atoms of carbon in carbon fiber are bonded together in macroscopic crystals.

2. Match the words to their opposites:

1) nonmetallic	a) unique
2) unreactive	b) late
3) transparent	c) to absorb
4) soft	d) weak
5) common	e) metallic
6) simple	f) to hide
7) early	g) opaque
8) strong	h) hard
9) to emit	i) reactive
10) to find	j) intricate

7. DIAMOND

tool	інструмент, засіб	rarity	рідкість
to occur	з'являтися, відбуватися	to scratch	шкрябати
to mine	видобувати	luster	блиск, сяйво
controversy	полеміка, суперечка	to curse	проклинати
to seek (sought)	знаходити	eruption	виверження
a grain	крупиця, зерно	flawless	бездоганний

Diamond is an allotrope (different form) of carbon. The word *diamond* comes from the Greek word meaning unbreakable. The carbon atoms in diamonds are arranged in a strong, tetrahedral structure. Diamond is the hardest natural material known and is often used for industrial cutting and polishing tools. Diamond has a hardness of 10 on Mohs scale of mineral

hardness, with 1 being the softest (talc) and 10 being the hardest. Diamond is the best known thermal conductor (heat transfer) among naturally occurring substances.

Under the normal pressures and temperatures we experience on the Earth's surface, diamonds are actually thermodynamically unstable, slowly transforming into graphite. Yes, you read that correctly, diamonds are indeed turning into graphite, but thankfully for all those diamond owners out there it's a process that is **far too slow** for humans to notice.

Most of the Earth's natural diamond deposits are found in Africa. Around 26,000 kilograms (57,000 lb) of diamonds are mined around the world every year. They are worth billions of dollars to the powerful companies that control their production. Diamonds have often been a source of conflict and controversy, the term blood diamond refers to a diamond mined in an unstable area and sold to finance war. This issue was brought to public attention in the 2006 movie named Blood Diamond (starring Leonardo Di Caprio and Jennifer Connelly).

Diamond is the world's most popular and sought after gemstone. They are frequently worn as part of jewelry such as rings and necklaces. As well as their rarity, they are also well suited to jewelry because they polish well and can only be scratched by other diamonds. Diamonds are cut with considerable precision to optimize the luster and attention gathering shine of each specific diamond. Diamonds are valued according to their cut, color, carat and clarity.

Over the years there have been many famous (and very expensive) diamonds. The following are four well known examples. The Koh-i-Noor diamond was found in India and once thought of as the largest diamond in the world. It is now part of the British Crown Jewels in the Tower of London. The 45.52 carat Hope Diamond appears blue because of boron in its crystal structure and is famous for supposedly being cursed. Discovered in the Kimberley Mine in South Africa, the Tiffany Yellow Diamond weighed an amazing 287.42 carats (57.484 g) when discovered. It was later sold to a New York jeweler named Charles Tiffany who had it cut into a cushion shape of 128.54 carats (25.708 g) with 90 facets to show off its beauty. After being originally found by a slave in an Indian mine, the now

140.64 carat (28.1 g) Regent Diamond has been through an epic history including an English sea merchant and French royalty. It is now on display at the Louvre, where it has been on display since 1887.

Naturally occurring diamonds are formed over billions of years **under intense pressure and heat**. They are often brought to the Earth's surface by deep volcanic eruptions. The technology for synthetic diamonds was researched in the 1940's and the first synthetically created diamond was produced in the 1950's. There are a number of techniques for producing synthetic diamonds, these include high-pressure high-temperature synthesis, chemical vapor deposition and detonation synthesis (literally blowing up carbon with explosives to create extremely small diamond grains). The synthesized material known as cubic zirconia is a crystalline form of zirconium dioxide (ZrO_2). It is at times in competition with diamond because as well as being hard, optically flawless and colorless, it is also durable and cheap.

Speech patterns

The process is **too slow**	**for humans**	to notice.	Цей процес **занадто повільний**, щоб люди могли його помітити.
It is important		to protect their environment.	Людям важливо захищати своє навколишнє середовище.

Under the normal pressures and temperatures we experience on the Earth's surface, diamonds are actually thermodynamically unstable.	При нормальному тиску і температурах, яких ми зазнаємо на поверхні землі, діаманти насправді термодинамічно нестабільні.
Naturally occurring diamonds are formed over billions of years **under intense pressure and heat**.	Діаманти, що зустрічаються у природі, створювалися протягом мільярдів років під впливом високого тиску і тепла.

1. Say whether these statements are TRUE or FALSE.

1. The word diamond comes from the Latin word meaning unbreakable. 2. The softest mineral on Mohs scale of mineral hardness is talc. 3. Diamond is the worst known thermal conductor among naturally occurring substances. 4. Most of the Earth's natural diamond deposits are found in Siberia. 5. Diamonds are valued according to their size. 6. The Koh-i-Noor diamond, which was found in India, now is kept in the Tower of London. 7. The synthesized material known as cubic zirconia is at times in competition with diamond because it is durable and cheap.

2. Give synonyms to the following words from the text:
unnatural, to arrange, substance, controversy, explosive, to occur, frequently, to transform, shape, to appear, durable, to create.

8. COAL

shiny	блискучий	to undergo	проходити (*напр.* лікування), підлягати
flame	полум'я	lungs	легені
a furnace	піч	cancer	*мед.* рак

Coal is made largely of carbon but also features other elements such as hydrogen, oxygen, sulfur and nitrogen.

Coal starts off as plant matter at the bottom of water. It is eventually covered and deeply buried by sediments where over time metamorphosis (a change in form) takes place. Different types of coal contain different amounts of carbon. Lignite contains only around 60 to 75%, while anthracite contains more than 92%. Anthracite is a hard, shiny, black coal that burns with a blue, smokeless flame. While most forms of coal are associated with sedimentary rock, anthracite undergoes metamorphism and is linked to metamorphic rocks.

Coal has long been burned to create electricity and heat. The use of coal is increasing every year, in 2006 the world consumed over 6,000,000,000,000 kilograms of coal! Coal is the world's largest source of energy for the production of electricity. Coal is converted to electricity by being burned in a furnace with a boiler. **The boiler water is heated until it**

becomes steam, with the steam then spinning turbines and generators to create the electricity. Nearly 70% of China's electricity comes from coal. In total, coal produces around 40% of the world's electricity.

Coal mining and the subsequent burning of coal can have many bad effects on both humans and the environment. Examples of this include waste products, acid rain, contaminated water, poisonous emissions, high levels of carbon dioxide and increased risks of lung cancer for coal plant workers.

A popular saying among many cultures is that **if** you **behave** badly during the year, Santa **will deliver** you a lump of coal for Christmas.

Speech patterns

The boiler water **is** heated **until** it **becomes** steam.	Воду в бойлері нагрівають до тих пір, поки вона не стане паром.

If water **freezes,** it **turns** into ice.	Якщо вода замерзає, вона перетворюється на лід.
If you **behave** badly during the year, Santa **will deliver** you a lump of coal for Christmas.	Якщо ви будете погано вести себе протягом року, Санта на Різдво принесе вам шматок вугілля.

1. Answer the following questions.

1. What elements is coal made of? 2. What does the word metamorphosis mean? 3. How much carbon is there in anthracite? 4. Which way is coal converted into electricity? 5. How much of world's electricity does coal produce? 6. What are bad effects of coal mining and the subsequent burning of coal?

2. Give synonyms to the following words from the text:

eventually, to feature, different, emission, shiny, to contain, total, to undergo, shape, to spin, a lump of, to contaminate.

9. SILVER

precious	дорогоцінний	to fluctuate	коливатись
utensils	посуд, приладдя	dramatically	значно

dentistry	лікування зубів	as of (*date*)	станом на (*дата*)
sterling	встановленої проби	to rhyme	римуватись
an alloy	сплав	angst	страх, тривога

Silver is a precious metal that has had a number of different uses over the years, including jewelry, coins, silverware, electronics and photography. It is a chemical element whose chemical symbol is Ag and atomic number is 47. Silver is a soft, shiny metal that is a good conductor of electricity. Fine pieces of jewelry, coins, utensils and various pieces of art are made of silver. In modern times it is also used in dentistry, electronics, photography, mirrors and in a number of industrial applications that make use of its unique properties.

You may have heard of the term sterling sliver, this is the name given to an alloy (combination of metals) that is at least 92.5% silver by weight. The other 7.5% is made up of other metals, usually copper. Silver is found naturally by itself, as an alloy with gold or in an ore (a rock containing various metals and elements). Silver is often found in copper and lead ores. The price of silver has fluctuated dramatically over the last century, climbing as demand increases but dropping when large silver deposits are found. As of November 2009, gold was valued at around 65 times the value of silver by mass.

The word silver is one of the few words in the English language that is nearly impossible to rhyme. Words such as orange, purple, breadth, wolf, depth, angst, gulf, ninth and twelfth are also difficult or impossible to rhyme. While there are some words that **do** actually **rhyme** with these examples they are usually very rare or **hardly** used in the modern English language.

Speech patterns

***may (might, must) have* + V-III**	**припущення щодо дії, що вже відбулась**
You must have heard the news.	Ви, напевно, вже чули новину.

***do* + V** (у ствердних реченнях)	**має емфатичне значення**
I **do want** to visit this beautiful	Я **дійсно** хочу відвідати це прекрасне

city.	місто.
He **does study** hard.	Він **дійсно** вчиться старанно.

This is **hardly** possible.	Це **навряд** чи можливо.
This money was earned **hardly**.	Ці гроші були зароблені **важкою** працею.

1. Say whether the statements are TRUE or FALSE.

1. Silver is used for photography. 2. Chemical number of silver is 49. 3. Silver is a good conductor of electricity. 4. Sterling silver consists of 99% of silver and 1% of other metals. 5. Silver can be found naturally as an alloy with copper. 6. Today gold is valued 50 times the value of silver. 7. The word "silver" has many rhymes in English.

2. Give synonyms to the following words from the text:

a number of, good, a property, to be made up, various, to fluctuate, dramatically, to increase, difficult.

10. GOLD

dense	щільний	to surpass	перевершувати
malleable	ковкий	a burial mask	поховальна маска
transparent	прозорий	swelling	опух
amount	кількість	a trophy	приз, нагорода
pure	чистий	recognition	визнання

Gold is a chemical element whose chemical symbol is Au and atomic number is 79. Compared to other metals, gold is less chemically reactive; it is a good conductor of electricity and heat. Gold is shiny, soft and dense. It is also malleable, which means it can easily be beaten into thin sheets or other shapes. Gold is malleable enough for just 1 gram to be hammered into a sheet 1 square meter in size. It can also be made so thin that it appears transparent.

Due to a similar appearance to gold, the mineral pyrite has the nickname "fool's gold". The amount of gold in various alloys (a combination of

gold and another metal such as silver) is measured in carats (k). Pure gold is 24k.

As of 2009, it has been estimated that humans have mined around 160,000 tonnes of gold. Over the last 100 years South Africa has been **second to none** in production of gold. In recent times however it has been surpassed by China.

As of 2009, the USA has 8,133 tonnes of gold reserves while Canada only has 3. Throughout history gold has often been seen as a symbol of wealth. It is the most popular precious metal for investments. The price of gold continually fluctuates and is often linked to major economic events. There is a monetary system called the 'gold standard' which fixes a unit of money to a certain weight of gold.

Over the years gold has been used to create expensive jewelry, coins and various forms of art such as the Egyptian pharaoh Tutankhamen's famous burial mask. In modern times it has also been used for things such as electronics and dentistry.

Injectable gold **has been proven to help** reduce pain and swelling in patients suffering from tuberculosis and rheumatoid arthritis.

Gold is a popular choice **when it comes to** rewarding achievement with medals, statues and trophies. Academy Award, Olympic and Nobel Prize winners all receive golden items in recognition of their achievements.

Speech patterns

second to none	перший; неперевершений
In intelligence he is second to none.	Він – найрозумніший.

Gold **has been proven to help** ...	**Доказано, що** золото допомагає ...
The letter **is expected to come** in two days.	**Очікується, що** лист надійде через два дні.

when it comes to	коли доходить справа; коли йдеться
When it comes to eating, he is the first.	Коли справа доходить до їжі, він – перший.

When it comes to physics, they can argue for hours.	Коли йдеться про фізику, вони можуть сперечатися годинами.

1. Say whether the statements are TRUE or FALSE.

1. The chemical symbol of gold is Gd. 2. Gold can perfectly conduct heat. 3. A metal is malleable when we can easily hammer it in thin sheets. 4. You can never see through any piece of gold. 5. "Fool's gold" is a nickname for silver. 6. People have mined about 1,000,000 tonnes of gold. 7. Today China is the leader in production of gold. 8. Some parts in electronic devices are made of gold.

2. Give synonyms to the following words from the text:

to appear, due to, to estimate, a reserve, continually, to link, to create, to reduce, to receive.

11. IRON

moisture	волога	availability	наявність
disintegration	руйнування	cast iron	чавун
to remove	видаляти	manganese	марганець
a core	ядро	a vehicle	транспортний засіб
huge	величезний	to prevent (from)	запобігати (чогось)
strength	міцність; опір	to coat	покривати
puddle iron	пудлінговане залізо	chickpea	нут, турецький горох
wrought iron	ковane залізо	iron rich food	їжа, багата залізом

Iron is a chemical element and metal. Its chemical symbol is Fe and its atomic number is 26. When iron and oxygen react in the presence of water or moisture, rust (iron oxide) is formed. You might have noticed your bike chain (or other parts) rusting from time to time (especially if you haven't been taking care of it). Another word for rusting is corrosion, which describes the disintegration of materials such as iron and steel. Because iron oxidizes so easily, it is rarely found in a pure metal form on the Earth's sur-

face. It is instead removed from ores (rocks containing important minerals and elements).

Iron is the 4th most common element in the Earth's crust, making up around 5% of the total (usually found as iron oxide in minerals like hematite). The Earth's **core is thought to be made up** of an iron and nickel alloy. Gas giant planets such as Saturn and Jupiter have cores that are rich in iron, too. Iron is the 6th most common element found in the Universe.

Steel is a well known and commonly used alloy made from iron and a small amount of carbon (or sometimes other elements). The amount of carbon is small (usually between 0.2% and 2.0%) but it makes a huge difference to the strength. Steel can be around 1000 times stronger than iron in its pure form. The Eiffel Tower in Paris, France, is made of puddle iron. Puddle iron is a form of wrought iron, an iron alloy with a very low level of carbon content. Wrought iron was used commonly throughout western history but is **no longer** produced in large amounts due to the availability of steel. The early wrought iron used in human history actually came from meteors!

Cast iron is a type of iron that contains carbon, silicon and small amount of manganese. It was used in earlier times to build structures like cast iron bridges. Like wrought iron, however, most of its uses have been replaced by steel.

The Iron Age was a prehistoric time when useful tools and weapons were first made from iron and steel. The dates this occurred in various parts of the world vary, **with historians suggesting** around 12th century BC in ancient Greece and 6th century BC in Northern Europe.

In 2006, China was the world's largest producer of iron, making up around 33% of the world's total production.

Iron is relatively cheap to produce and has a large number of different uses. Machines, vehicles and building structures are commonly built from iron (usually in the form of steel). To prevent iron and steel from rust damage, they can be painted, coated with plastic, galvanized (coated with zinc) or by other methods that keep out water and oxygen.

Iron in the human body has a number of important functions including carrying oxygen to the body in the form of hemoglobin. Iron deficiency can

be quite common (especially among women), with a number of possible symptoms including fatigue and weakness. Iron rich foods include red meat, fish, tofu, beans and chickpeas.

Speech patterns

The core	**is thought** is considered is believed	**to be made up** of ...	Вважають, що ядро складається з...

no longer	більше не; вже не
He is no longer a student.	Він вже не студент.
I can wait no longer.	Я більше не можу чекати.

..., with historians suggesting	причому історики вважають ...
There are lots of higher educational institutions in Kharkov, **with the number of students ranging** from several hundreds to dozens of thousands.	В Харкові багато вищів, **причому кількість студентів в них коливається** від декількох сотень до десятків тисяч.

1. Say whether the statements are TRUE or FALSE.

1. In the presence of water iron shines. 2. Iron can be found in its pure form everywhere on the Earth. 3. Iron constitutes 5% of the Earth's crust. 4. Saturn is also rich in iron. 5. Steel is made of iron and big amount of manganese. 6. The Eiffel Tower in Paris, France, is made of cast iron. 7. Meteors brought wrought iron to the Earth. 8. Tools and weapons were made of iron as long ago as 12th century BC. 9. Iron is very expensive in production. 10. Galvanization is a process of coating a material with plastic.

2. Give synonyms to the following words from the text:

to form, disintegration, important, common, a core, giant, small, huge, to produce, due to, actually, to contain, to occur.

12. BIOCHEMISTRY

to conglomerate	об'єднувати, групувати	whereas	в той час як
to acquire	набувати, отримувати	a duct	трубочка, канал
tissue	тканина	a target	ціль
blood stream	тік крові	to retard	затримувати
via	за допомогою	major	основний

Biochemistry deals with the study of the complex and simple chemical processes that occur inside a human body and various biochemical elements involved in these processes. Biochemistry refers to the vital chemical processes that are underlying the routine physiological activities in our day-to-day life. Biochemistry is used to study the biochemical processes in plants, animals, microorganisms as well as human beings. Here are the basic concepts in the field of biochemistry.

Earliest references to the field of biochemistry have been spotted approximately 400 years ago. Although the use of the term "biochemistry" was seen in 1882, Carl Neuberg first proposed the term "biochemistry" in 1903.

Biochemistry involves the study of some basic bio-compounds. Some of the basic bio-molecules studied in the field of biochemistry are broadly categorized as small molecules, monomers and polymers. Basically the smaller molecules can be conglomerated into monomers, which **in turn if combined** with other monomers **can form** polymers.

Some of the basic bio-molecules include lipids, phospholipids, glycolipids, sterols, vitamins, hormones and carbohydrates. Lipids are fat-soluble that are important for energy storage and are also essential as structural components of cell membranes. Lipids are divided into eight categories, which are fatty acyls, glycerolipids, sphingolipids, glycero-phospholipids, saccharolipids, polyketides, sterol lipids and prenol lipids. Vitamins are organic compounds that cannot be synthesized in adequate quantities but our organism has to acquire them from the diet. Vitamins have various biochemical functions that are of prime importance for the living organisms. Vitamins act as hormones, anti-oxidants, cell-signaling mediators as well as regulate the cell and tissue growth and differentiation.

Hormones are chemicals that are signal carriers, carrying signals from one cell to the other via the blood stream. Hormones are classified as endocrine and exocrine hormones depending on the site of their secretion. Endocrine hormones are those that are secreted directly into the bloodstream whereas the exocrine hormones are secreted into a duct, from where they are transported to the target organ. Carbohydrates are **nothing but** the basic sugars or the simple organic compounds, which are responsible for the storage and transport of energy and also act as structural components.

Enzymes are other vital bio-molecules that are nothing but proteins which act as catalysts in the various chemical reactions. Enzyme activity can be controlled by certain specific chemicals, which are categorized as enzyme activators that initiate and accelerate the enzyme activity and the enzyme inhibitors that retard the enzyme activity.

Monomers include various bio-molecules like amino acids, nucleotides, and phosphates and monosaccharides. Amino acids are **nothing but** the building blocks of proteins. Besides, twenty standard amino acids are used by cells in protein biosynthesis. The amino acids are joined by a peptide bond in formation of proteins. Nucleotides are the structural units of RNA and DNA. A nitrogenous base, a sugar and the presence of one or more phosphate groups are the basic characteristics of nucleotides. The two major groups of nitrogenous bases include purines and pyrimidines. The phosphates are **nothing but** phosphoric acid salts, which are important biomolecules. The group of monomers also includes single sugars called monosaccharides, which cannot be broken down into simple sugars and are generally colorless, crystalline and water-soluble.

Speech patterns

in turn	в свою чергу
All sentences consist of words, which **in turn** consist of letters.	Всі речення складаються зі слів, які, в свою чергу, складаються з букв.

if combined … can …	якщо скомбінувати, може…
The smaller molecules can be	Менші молекули можуть

conglomerated into monomers, which **in turn if combined** with other monomers **can form** polymers.	об'єднуватися у мономери, які, в свою чергу, якщо їх скомбінувати з іншими мономерами, можуть утворювати полімери.

nothing but	ніщо інше як (нічого окрім)
The phosphates are **nothing but** phosphoric acid salts.	Фосфорити – це ніщо інше як солі фосфорної кислоти.

1. Say whether these statements are TRUE or FALSE.

1. Biochemistry is a study of chemical processes that take place outside a human body. 2. Biochemistry as a science was founded more than 1000 years ago. 3. Carl Neuberg was the first to propose the term "biochemistry" in 1903. 4. The basic bio-compounds are small molecules, monomers and polymers. 5. Lipids are structural components of cell membranes. 6. Lipids are divided into eighteen categories. 7. Carbohydrates are responsible for the storage and transport of energy and also act as structural components. 8. The building blocks of proteins are nucleotides.

2. Give synonyms to the following words:

simple, various, vital, activity, day-to-day life, to study, basic, a concept, a field, approximately, to propose, a compound, a characteristic, to include, essential, a component, quantity, to acquire, growth, to carry, broadly.

13. LIPIDS

a compound	суміш; сполучення	a cell	клітина
soluble	розчинний	backbone	основа
to share	поділяти; мати спільно	to bond	зв'язувати
wax	віск	to be termed	називатися
essentially	суттєво	abundant	численний

Lipids are a class of naturally-occurring organic compounds that you may know by their common names: fats and oils. Here's a look at the function, structure, and physical properties of lipids.

What Is a Lipid?

A lipid is a fat-soluble molecule. **To put it another way**, lipids are insoluble in water but soluble in at least one organic solvent. The other major classes of organic compounds (nucleic acids, proteins, and carbohydrates) are much more soluble in water than in an organic solvent. Lipids do not share a common molecule structure.

Examples of Common Lipids.

There are many different types of lipids. Examples of common lipids include butter, vegetable oil, cholesterol and other steroids, waxes, phospholipids, and fat-soluble vitamins. The common characteristic of all of these compounds is that they are essentially insoluble in water yet soluble in one or more organic solvents.

What Are the Functions of Lipids?

Lipids are used by organisms for energy storage, as a signalling molecule (e.g., steroid hormones), and as a structural component of cell membranes.

Lipid Structure.

Although there is no single common structure for lipids, the most commonly occurring class of lipids are triglycerides, which are fats and oils. Triglycerides have a glycerol backbone bonded to three fatty acids. If the three fatty acids are identical then the triglyceride is termed a *simple triglyceride*. Otherwise, the triglyceride is called a *mixed triglyceride*.

The second most abundant class of lipids consists of the phospholipids, which are found in animal and plant cell membranes. Phospholipids also contain glycerol and fatty acids, plus they contain phosphoric acid and a low-molecular-weight alcohol. Common phospholipids include lecithins and cephalins.

Speech patterns

to put it	**another way (otherwise)**	інакше кажучи
	baldly (frankly, plainly)	відверто кажучи
	mildly	м'яко кажучи
	in a nutshell	коротше кажучи

1. Say whether the statements are TRUE or FALSE.

1. Fats and oils are lipids. 2. A lipid is a molecule soluble in water. 3. All lipids have the same molecule structure. 4. Butter and wax are steroids. 5. Lipids are used for energy storage. 6. Triglycerides aren't lipids. 7. There are four fatty acids in triglycerides. 8. Phosphoric acid is also a part of triglycerides.

2. Give synonyms to the following words from the text:
a property, major, different, to use, a component, to bond, identical, to be termed, to contain.

14. WHAT MAKES LEAD POISONOUS?

to be aware	знати	solder	припій
a wick	фітіль	to phase out	згортати, припиняти
poison	отрута	heme	гем (небілкова частина гемоглобіну)
a pewter dish	свинцева тарілка	to implicate	приводити до
to leech	проникати	essential	життєво важливий
exposure	дія, вплив	acceptable	допустимо

Most people are aware that lead is a poison. It's also a very useful metal. People have been using lead in their daily lives for a long time. The Romans made pewter dishes and pipes for water from lead. The effects of poisoning from lead leeching into liquids probably contributed to the fall of the Roman Empire. Lead exposure didn't end when lead-based paint and leaded gasoline were phased out. Lead is found in the insulation coating, electronics, leaded crystal, storage batteries, to coat the wicks of some candles, to stabilize certain plastics, and in solder. You **are exposed to trace amounts of** lead every day.

You know lead is toxic, but do you know what makes it poisonous? **In a nutshell**, it's toxic mainly because it preferentially replaces other metals (e.g., zinc, calcium and iron) in biochemical reactions. Lead interferes with the proteins that cause certain genes to turn on and off by displacing other metals in the molecules. This changes the shape of the protein molecule such that it can't perform its function. Research is ongoing to identify

which molecules bind with lead. Some of the proteins that are known to be affected by lead regulate blood pressure (which can cause development delays in children and high blood pressure in adults), heme production (which can lead to anemia), and sperm production (possibly implicating lead in infertility). Lead displaces calcium in the reactions that transmit electrical impulses in the brain, which is another way of saying it diminishes your ability to think or recall information, or makes you stupid.

Paracelsus' idea that **the dose makes the poison** doesn't really apply with lead. Many substances are non-toxic or even essential in trace amounts, yet poisonous in quantity. You need iron to transport oxygen in your red blood cells, yet too much iron can kill you. You breathe oxygen, yet again, too much is lethal. Lead isn't like those elements. It's simply poisonous. The main concern is lead exposure with small children, because lead can cause developmental problems, plus kids engage in activities that increase their exposure to the metal (e.g., putting things in their mouths, not washing their hands). There is no minimum safe exposure limit, in part because lead accumulates in the body. There are government regulations regarding "acceptable" limits for products and pollution, because lead is useful and necessary, but the reality is, any lead is too much lead.

Speech patterns

to be exposed to	**піддаватись впливу чогось**
You **are exposed to** trace amounts of lead every day.	Кожного дня ми отримуємо незначну кількість свинцю.
We **are exposed to** a great amount of ultraviolet radiation on sunny days in summer.	Ми піддаємось впливу значної кількості ультрафіолетового опромінення в літні сонячні дні.

The dose makes the poison.	**Наскільки речовина є отруйною, залежить від дози.**
Paracelsus' idea that **the dose makes the poison** doesn't really apply with lead.	Ідея Парацельса про те, що отруйність речовини залежить від дози, насправді не спрацьовує у випадку зі свинцем.

In a nutshell	**Коротше кажучи, коротко**
He told me about his journey in a nutshell.	Він коротко розповів мені про свою подорож.

1. Say whether these statements are TRUE or FALSE.

1. Lead exposure ends when lead-based paint and leaded gasoline are phased out. 2. Lead is toxic mainly because it preferentially replaces other metals (e.g., zinc, calcium and iron) in biochemical reactions. 3. Paracelsus' idea that the dose makes the poison fits lead very well. 4. Lead is not dangerous for small children, because it cannot cause developmental problems. 5. It is true that any lead is too much lead.

2. Match the words to their opposites:

1) useful	a) rise
2) to turn on	b) non-toxic
3) fall	c) to forget
4) high	d) to turn off
5) to diminish	e) useless
6) minimum	f) to spend
7) too much	g) low
8) toxic	h) maximum
9) to recall	i) to increase
10) to accumulate	j) too little

15. HOW DO CHEMICAL WEAPONS SMELL?

pungent	пекучий	suffocating	задушливий
blister	пухир	to rot	гнити
weapon	зброя	bleach	хлорне вапно
mustard	гірчиця	toilet bowl	унітаз
in warfare	під час бойових дій	splash hazard	ризик розбризкування
to encounter	зустрічатись	caustic	їдкий
scouring	порошок для чи-	mildew re-	знищувач плісняви

powder	щеня	mover	

You may have a mental image of a chemical agent as some greenish vapor with a pungent, unpleasant smell. Are you surprised to learn most chemical agents are colorless and odorless? Many have characteristic odors, but some actually smell nice.

Many blister agents smell a bit like plants. Other agents may have pungent odors, yet most chemical weapons **have no scent at all**. Here's a list of some chemical agents and their... bouquets.

Sulfur Mustard – includes mustard gas, usually odorless and colorless in pure form but yellowish-brown with an odor reminiscent of the mustard plant, garlic, or horseradish when used in warfare.

Chlorine Gas – pale greenish gas with a suffocating, unpleasant odor, similar to chlorine bleach.

Lewisite – WWI blister agent that smells strongly of geraniums.

Phosgene Oxime – blister agent with an irritating smell, though somewhat of mown hay or cut green corn.

Sarin – extremely toxic odorless nerve agent.

VX – probably the most toxic nerve agent, odorless.

Soman – nerve gas that smells like Vicks VapoRub or rotting fruit, depending on who you ask.

CS Gas – tear gas, odorless.

Some of the common chemicals found in your home shouldn't be mixed together. It's one thing to say "don't mix bleach with ammonia", but it's not always easy to know what products contain these two chemicals. **Here are** some products you may have around the home that shouldn't be combined and a list of dangerous household chemicals that may be helpful.

Bleach with Acid Toilet Bowl Cleaners – can result in toxic, potentially deadly fumes.

Bleach with Vinegar – as vinegar is a type of acid so toxic chlorine vapor is produced. Don't mix chlorine bleach with any acid.

Bleach with Ammonia – toxic, potentially lethal vapors are produced. The main danger comes from chloramine vapors.

Different Brands of One Type of Product – don't mix different cleaners together. They may react violently, produce toxins, or become ineffective.

Highly Alkaline Products with Highly Acidic Products – acids and bases (alkalis) can react violently, presenting a splash hazard. Acids and bases are caustic and may cause chemical burns.

Certain Disinfectants with Detergents – don't mix disinfectants with 'quaternary ammonia' listed as an ingredient with a detergent. The effectiveness of the disinfectant may be neutralized.

Chlorine bleach is sometimes called "sodium hypochlorite" or "hypochlorite". You will encounter it in chlorine bleach, automatic dishwashing detergents, chlorinated disinfectants and cleaners, chlorinated scouring powder, mildew removers, and toilet bowl cleaners. **Do not mix** products together or with ammonia or vinegar.

Speech patterns

to have no scent at all	**зовсім не мати запаху**
He has no wish to go shopping with us at all.	У нього зовсім немає бажання сходити з нами за покупками.

Here are some apples.	Ось декілька яблук.
Here is an apple.	Ось яблуко.

Do not mix these products!	Не змішуйте ці продукти!
Mix these products!	Змішайте ці продукти!
Do not drink cold water!	Не пийте холодної води!
Drink some water!	Випийте води!

1. Answer the following questions.

1. Do all chemical agents smell? 2. Does mustard gas have odor or color in pure form? 3. What color is chlorine gas? 4. What extremely toxic nerve gases do you know? 5. Can you mix together common chemicals found in your home? 6. When may the effectiveness of the disinfectant be neutralized?

2. Match the words to their synonyms:

1) odor	a) light
2) weapon	b) to consist of
3) to produce	c) smell
4) pale	d) perhaps
5) hazard	e) usual
6) probably	f) to manufacture
7) to contain	g) to introduce
8) toxic	h) armour
9) to present	i) danger
10) common	j) poisonous

16. HEALTHIER SAUSAGES

to eliminate	знищувати	canola oil	рапсова олія
substantially	по суті, значно	notable	примітний
cardiovascular	серцево-судинний	flaxseed oil	лляна олія
a frankfurter	сосиска	chewiness	жуйна властивість
to assess	оцінювати	healthfulness	цілюща властивість

Scientists in Canada have shown that sausages can be made using vegetable oil and a gelling agent instead of animal fat, **without altering** the texture. With the continual push for healthy eating and eliminating saturated fat from our diets, this novel use of an ethylcellulose organogelator (oleogel) could be applied **to substantially reduce** the amount of saturated fat in foods.

According to the World Health Organisation, cardiovascular disease is the leading cause of death worldwide and there is evidence that links the disease with high saturated fat consumption. Scientists have been investigating alternatives to hard fats (such as saturated and trans fats) to reduce the risk of cardiovascular disease. But, it is very difficult to find replacements, says lead researcher Alejandro Marangoni from the University of Guelph. “You are left with oil, which does not have any structuring ability,” he adds.

Marangoni's team made their oleogel using the gelling agent ethylcellulose, a known organogelator for vegetable oils. 'We had to heat ethylcellulose up quite a bit to go in to triglyceride oils but once that happened, upon cooling, we found that a network formed and we had something almost as hard as a rubber ball!' says Marangoni.

An oleogel (middle) was used to replace hard fat in a frankfurter. The researchers then used texture profile analysis and a mechanical method to test the gel's hardness to assess oleogels consisting of 4–10% ethylcellulose in canola, soyabean and flaxseed oils. They found that the oleogel strength increased with increasing polymer molecular weight, composition and fatty acid composition of the vegetable oil.

They also found that frankfurters cooked with the canola oil oleogel showed no notable differences in chewiness or hardness compared with conventional animal fat frankfurters. "We made some really good breakfast sausages with oleogels!" says Marangoni. "We can easily replace two-thirds of the saturated fat."

"The work shows that ethylcelluloses can be used to create the desirable textural characteristics without using saturated or trans fats," says David McClements, an expert in food science at the University of Massachusetts, US. "This may be a novel approach towards improving the healthfulness of many food products."

Marangoni's team is now creating a database of oleogel hardness for a variety of applications, which they hope will include food systems.

Speech patterns

without altering	не змінюючи, без зміни
Sausages can be made using vegetable oil and a gelling agent instead of animal fat, **without altering** the texture.	Сосиски можуть бути виготовлені з використанням рослинного масла та желатиноподібної речовини замість тваринного жиру, що не змінить їхньої текстури.

according to	згідно (повідомленням, інформації)
According to the World Health Organisation, cardiovascular disease is the leading cause of death worldwide.	Згідно інформації Всесвітньої організації охорони здоров'я, серцево-судинні захворювання – це найпоширеніша причина смертності в усьому світі.

***to* + Adverb + Verb**	
to substantially reduce	значно зменшувати

1. Answer the following questions.

1. What ingredients do Canadian scientists suggest using instead of animal fat? 2. Why is the novel use of an ethylcellulose organogelator (oleogel) so important for people's health? 3. What is the leading cause of death worldwide? 4. What kind of fats do we call hard fats? 5. What happened when Marangoni's team first heated up and then cooled ethylcellulose? 6. What methods were used to test the gel's hardness? 7. What does the work of Marangoni's team show? 8. What are researchers from Marangoni's team doing now?

2. Give synonyms to the following words:

to show, an agent, to alter, continual, to eliminate, to reduce, amount, a disease, worldwide, to link, a consumption, difficult, to investigate, ability, a composition, to increase, a method, to happen, to test, to assess, to create.

17. ARTIFICIAL ENZYME USED TO NEUTRALIZE A NATURAL PLANT POISON

to emulate	імітувати	to spur	стимулювати
tough	міцний; в'язкий	fragile	крихкий
chestnut	каштан	stripped-down	демонтований
to cause	викликати	dramatically	значно
twitching	судорога	to alter	змінювати
vomiting	блювання	counterpart	аналог

responsible	відповідальний	resistant	стійкий

For the first time, a human-designed chemical enzyme – a chemzyme – has been used to break down a toxin found inside fruits and vegetables.

Chemzymes **are designed to emulate** the body's naturally occurring enzymes, but are much simpler and tougher. A chemzyme designed by a Danish scientist successfully neutralized glycoside esculin, a toxic compound found in horse chestnuts. The toxin can cause nasty problems like muscle twitching, lack of coordination, vomiting, diarrhea, depression and paralysis.

Enzymes are made from strings of amino acids and are responsible for chemical reactions inside the body. They can quickly break down food and toxins, and can be used in other applications to spur chemical reactions. But they are very complex and fragile, and therefore hard to duplicate.

Chemzymes are stripped-down versions of natural enzymes, containing the minimum ingredients for them to work, **according to researchers** at the University of Copenhagen, where the chemzymes were developed.

Scientists have been working on synthetic enzymes for a variety of applications, including medicine and industry. But Jeannette Bjerre, who just received her Ph.D. at the University of Copenhagen, has shown for the first time that artificial enzymes can be designed to neutralize food-borne toxins.

The chemzyme's simple design might make it easier to create new chemzymes for specific tasks. Researchers have already shown that simple changes in a chemzyme's structure can dramatically alter its chemical-reaction abilities.

So far, no one has been able to make chemzymes that work as quickly as their natural counterparts. But chemzymes are more resistant to heat and chemicals, so they would be easier to produce in large quantities, which could open new doors for pharmaceutical and chemical research.

Speech patterns

to be designed **+ Infinitive**	бути призначеним, щоб
The Internet is also designed to	Інтернет також призначений, щоб

widen our access to information.	розширити нам доступ до інформації.
to be designed for	бути призначеним для
This book is specially designed for advanced English learners.	Ця книга спеціально призначена для поглибленого вивчення англійської.

according to somebody	згідно **заяви**; як повідомляють
According to Einstein, the Universe is expanding.	Згідно теорії Ейнштейна, всесвіт розширюється.
According to him you are wrong.	За його словами ви неправі.
according to something	згідно чогось
According to the law of conservation of matter, it cannot be created or destroyed in an isolated system.	Згідно закону збереження матерії, вона не може бути створена чи знищена в ізольованій системі.

so far	до сих пір, досі
so far as (as far as)	оскільки
So long!	до побачення
so-called	так званий
so-so	так собі
so much the better (worse)	тим краще (гірше)
So be it!	нехай так і буде!

1. Say whether the statements are TRUE or FALSE.

1. A chemzyme was designed to kill some bacteria. 2. Chemzymes were created by Swedish scientists. 3. The toxin found in horse chestnuts can cause suffocation. 5. Enzymes are responsible for chemical reactions inside a human body. 6. It is easy to duplicate enzymes. 7. Synthetic enzymes can find some application in medicine. 8. Synthetic enzymes are less resistant to heat than natural ones.

2. Give synonyms to the following words from the text:
to break, simple, a scientist, nasty, quickly, complex, fragile, to receive, artificial, to alter, ability, quantity, research.

TIME FOR FUN

- Two atoms are walking down the street.

Says one atom to the other, “Hey! I think I lost an electron!”
The other says, “Are you sure?”
“Yes, I’m positive!”

- What's the difference between Chemistry and cooking? In Chemistry, you should never lick the spoon.

- The optimist sees the glass half full.

The pessimist sees the glass half empty.
The chemist sees the glass completely full, half in the liquid state and half in the vapor state.

- A chemist walks into a pharmacy and asks the pharmacist, “Do you have any acetylsalicylic acid?”

“You mean aspirin?” asked the pharmacist. “That's it, I can never remember that word.”

APPENDICES

APPENDIX 1. CONFERENCE PROCEEDINGS

General information

concise	лаконічний	a workshop	семінар
a keynote speaker	провідний доповідач	single (multiple) track	одно- (багато-) секційний
to bundle	об'єднувати	an abstract	анотація
proceedings	матеріали конференції	peer review	експертна оцінка
a span	проміжок часу	referees	рецензент
to feature	включати	entertainment	розваги
a panel discussion	стендові доклади	to submit	надавати на розгляд

An academic conference or symposium is a conference for researchers to present and discuss their work. Together with academic or scientific journals, conferences provide an important channel for exchange of information between researchers.

Conferences are usually composed of various presentations. They tend to be short and concise, with a time span of about 10 to 30 minutes; presentations are usually followed by a discussion. The work may be bundled in written form as academic papers and published as the conference proceedings. Usually a conference will include keynote speakers (often, scholars of some standing, but sometimes individuals from outside academia). The keynote lecture is often longer, lasting sometimes up to an hour and a half, particularly if there are several keynote speakers on a panel.

In addition to presentations, conferences also feature panel discussions, round tables on various issues and workshops.

Prospective presenters are usually asked to submit a short abstract of their presentation, which will be reviewed before the presentation is accepted for the meeting. Some disciplines require presenters to submit a paper of about 6–15 pages, which is peer reviewed by members of the program committee or referees chosen by them.

Presenters usually base their talk around a visual presentation that displays key figures and research results.

A large meeting will usually be called a conference, while a smaller is termed a workshop. They might be single track or multiple track, where the former has only one session at a time, while a multiple track meeting has several parallel sessions with speakers in separate rooms speaking at the same time.

At some conferences, social or entertainment activities such as tours and receptions can be part of the program. Business meetings for learned societies or interest groups can also be part of the conference activities.

The meeting is announced by way of a "Call For Papers" or a "Call For Abstracts", which lists the meeting's topics and tells prospective presenters how to submit their abstracts or papers. Increasingly, submissions take place online.

Example of a conference announcement

2nd Annual International Conference on
Materials Science, Metal & Manufacturing
(http://www.m3-conference.org/)

Date: 19 - 20 November, 2012 Venue (Місце): Bali, Indonesia

CONFERENCE THEME (Тема конференції)

Materials science has been pushed to the forefront of research and development not only in universities but in industries as well. With the planet's resources being mined each day in order to supply the growing demands of industrialization, one major task of materials science is to revolutionize the manufacturing industry with the best materials for manufacture that are sustainable for the long term.

Materials science is also paving the way for new theoretical and empirical research in areas of physics, engineering and chemistry. This conference will provide the venue to discuss these recent developments.

HIGHLIGHTS (Ключові положення)

The Conference Proceedings (Print ISSN: 2251-1857, E-Periodical ISSN: 2251-1873) will be indexed by EBSCO, CrossRef, Proquest and will be submitted to Scopus, ScienceDirect and Cabell's Directory amongst others, where applicable.

Depending on their importance, originality, quality, relevance and other editorial considerations, eligible research articles will be invited for publication.

Best Paper Awards and Best Student Paper Awards will be conferred at the conference (in order to qualify for the award, the paper must be presented at the conference).

CALL FOR PAPERS (Запрошення надіслати роботи)

Topics of interest include, but are not limited to:

• Advances in Modeling, Analysis, and Simulation of Manufacturing Processes
• Advances in Nontraditional Manufacturing
• Automatic Production Line
• Case Hardening
• Casting and Solidification
• Coatings and Surface Engineering
• Composite Materials
• Crystallography
• Cutting and Grinding
• Design and Manufacturing of MEMS components
• Electrometallurgy
• Fabrication Process of Nanomaterials and Nanodevices
• High-Speed Machining
• Intelligent Maintenance Systems for Machines and Equipments
• Laser Based Manufacturing
• Materials Forming
• Metallography
• Modeling, Analysis, and Simulation of Manufacturing processes
• Nanomaterials and Nanomanufacturing
• Non-conventional Machining
• Numerical Control Technology

• Other Machining Methods
• Other Materials Processing
• Surface Treatment
• Ultra-Precision Machining
• Virtual Manufacturing and Concurrent Engineering

BEST PAPER AWARD (Нагорода за кращу роботу)

A number of best papers will be selected and given awards at the conference. These papers will also be considered for publication in GSTF and other international refereed Journals (реферовані журнали).

IMPORTANT DATES (Важливі дати)

Paper (Full Paper) Submission Deadline (остання дата прийому) 20.07.2012

Acceptance Notification (Повідомлення про надходження) 17.08.2012

Final Paper (Camera-Ready (Оригінал-макет)) Submission Deadline 31.08.2012

Early Bird Registration Deadline (остання дата «ранньої» реєстрації) 17.09.2012

Late Registration Deadline * (остання дата «пізньої» реєстрації) 19.09.2012

Conference Dates 19–20.11.2012

*Author registrations that are completed AFTER the Late Registration Deadline may not be included in the Conference Proceedings.

SUBMITTING YOUR PAPERS (Надання робіт)

Prospective authors are invited to submit original papers (not being considered for publication elsewhere) in the IEEE Computer Society standard format (double column, single-spaced, 10-pt font) describing new theoretical and/or experimental research. Submissions are recommended to have no more than 6 pages (extra pages are subject to surcharge (доплата)), including figures, tables, and references. Submissions will be judged on originality, significance, interest, clarity, relevance, correctness, and presentation.

NOTES FOR AUTHORS (Увага для авторів)

All submitted papers will be sent to reviewers for a blind review (анонімний експертний висновок). The reviewers use the following in evalu-

ating research papers: Novel Contribution; Originality in Thought; Inferences (Висновки); Key Strengths; Key Weaknesses; Areas of Improvement; Presentation/Organization of Research

SUBMIT EXTENDED ABSTRACTS (Надання розширених анотацій)

An EA is a 2-4 page research article summarizing the key ideas and key results of your work.

Submit EA alone, in which case the EA alone will be published in the conference proceedings if accepted.

REGISTRATION (Реєстрація)

For more information, please contact our Conference Secretariat at:

(secretariat@m3-conference.org)

Your registration includes:

Concurrent/Sessions of Technical Program

Conference Proceedings (for Authors only)

Welcome Breakfast, Morning and Afternoon Refreshment Breaks, and Lunch

Paper Presentation

Attendance to all sessions

Portfolio Folder

GSTF T-Shirt

Certificate of Presentation

Complimentary City Tour

VENUE & TRAVEL (Місце проведення та подорожі)

Visa:

For Visa assistance, please visit Ministry of Foreign Affairs website.

ACCOMODATION AT A HOTEL: (Розміщення у готелі)

Hotel: Bali Dynasty Resort, Bali, Indonesia

Address: Jl. Kartika, P.O. Box 2047, Tuban 80361 South Kuta, Bali-Indonesia

Bali Dynasty Resort is a premier beachside resort in South Kuta, renowned for its warm Balinese hospitality. The Resort offers six restaurants, four bars, three swimming pools, spa villa, exercise room, beach club, kids'

club, meeting facilities and complimentary Hospitality lounge for those early arrivals and late departures.

The unique layout allows for a subtle but effective division between the couples market and the family market. Couples can enjoy the famous Gracie Kelly's Irish Pub and relax at the adults-only Lazy Pool, while kids enjoy a 56-metre waterslide flowing into their own pool and complimentary entrance to the Enchanted Garden Kids' Club. A wide variety of rooms catering to the family market are available, sleeping up to five people.

The resort is located within walking distance of Kuta's nightlife, Waterbom Park and Discovery Shopping Mall.

For more information, please visit http://www.balidynasty.com/

TRAVEL:

One of the most popular tourist destinations in the world, Bali for a few years was awarded as the world's best island by The International Travel Magazine. There, however, are still many people who do not know in depth about the uniqueness of Balinese culture. Life in Bali is always related to "Tri Hita Karana" or a tripartite concept that include the spiritual relationship between human and God, and their environment.

The rapid growth of development in tourism has had a big impact and influences to Bali tradition and lifestyle. Interestingly, Balinese culture is still as what it was, growing along with the growth of globalization.

Registration Form
2nd Annual International Conference on
Materials Science, Metal & Manufacturing (M3 2012)
Date: 19-20 November 2012, Venue: Bali, Indonesia

Please fill in the form, sign by hand, and send it via one of the following:
Fax: +65 6327 0162 / E-mail: info@m3-conference.org

Title (Student/Prof/Dr): _____ First Name: _____Last Name: _____
Paper ID: ____ Paper Title: _____ (for authors only)
Institution: _____
Street Address: _____
City: _____ State: _____ Country: _____ Zip: _____
Phone: _____ Fax: _____ Email: _____
Dietary Requirements: _____ Attending conference: Yes / No

Conference Registration Fees

The full registration fee includes: Keynote & invited speakers session(s) (if any), concurrent sessions of Technical Program, Conference Proceedings, lunch, morning and afternoon refreshment breaks and GSTF Polo T Shirt.

Become a GSTF Associate Member (+ SGD 80)

Become a GSTF Student Member (+ SGD 35)

(Members will avail of the subsidized fees as indicated on the next page)

Regular Papers

Tick the category	Category	Registration Fee (SGD)
	Early-bird registration - Author (GSTF Member)	950
	Early-bird registration - Author (Student)	950
	Early-bird registration - Author (Non Member)	990
	Additional Authors	**580/pax**
	Additional Papers	**580/paper**
	Extra Pages (up to 4 extra pages)	80/page
	Late registration - Author (GSTF Member)	1200
	Late registration - Author (Student)	1200
	Late registration - Author (Non Member)	1250
	Non-Author Participant	720
	Non-Author Participant + Proceedings	820

Posters & Extended Abstracts

Tick the category	Category	Registration Fee (SGD)
	Early-bird registration - Author (GSTF Member)	700
	Early-bird registration - Author (Student)	700
	Early-bird registration - Author (Non Member)	750
	Additional Authors	**400/pax**
	Additional Posters/EAs	**400/paper**
	Late registration - Author (GSTF Member)	900
	Late registration - Author (Student)	900

	Late registration - Author (Non Member)	950
	Non-Author Participant	720
	Non-Author Participant + Proceedings	820

Note:

- In order to avail of the student rates, a formal letter from their University is required.
- If the Non-Author Participant (Non Delegate) requests for a copy of the proceeding, there will be an additional fee of $100 charge.
- If the registered participant is unable to attend, the registration may be transferred to another presenter. S/he must inform the Conference Secretariat a month before the conference. No refunds will be issued.

Payment methods When making payment, please indicate the paper ID and title in the payment slip.

1. Wire transfer (TT)	**2. Credit/Debit Cards**
Account Name: 'Global Science and Technology Forum Pte Ltd' Bank Address: UOB, Anson Road, #01-01 International Plaza, Singapore 079903 Account Number: 057-374-304-35-6 SWIFT CODE: UOVBSGSG * For wire transfer, please add **SGD 45.00** for local/overseas bank charges.	Payment can be made online via PayPal. Please follow the link provided on the conference website. Please email the Conference Secretariat your PayPal payment slip along with the registration form. *All PayPal transactions will include a 5% PayPal administrative fee.
Author's Signature and date:	

APPENDIX II. HOW TO MAKE A SCIENTIFIC PRESENTATION

Presentation is the practice of showing and explaining the content of a topic to an audience or a learner. Presentations come in nearly as many forms as there are life situations.

When looking at presentations in the broadest terms, it's more important to focus on their purpose. There are three basic purposes for giving oral presentations:

- to inform
- to persuade
- to build good will.

A study done by Wharton School of Business showed that the use of visuals reduced meeting times by 28 percent. Another study found that audiences believe presenters who use visuals are more professional and credible than presenters who merely speak. And still other research indicates that meetings and presentations reinforced with visuals help participants reach decisions and consensus in less time.

Advice on Giving a Good PowerPoint Presentation

Joseph A. Gallian
University of Minnesota Duluth

Many years ago the traditional way to give a talk at a conference or colloquium was to use a blackboard. Gradually, the blackboard was supplanted by the overhead projector. Now PowerPoint (or equivalent) presentations have become the standard. The April 1998 issue of *Math Horizons* had an article providing advice on how to give a good math talk using transparencies. In this article we update the previous one by focusing on how to give a good PowerPoint presentation. The ability to do a PowerPoint presentation well is a valuable skill that many students will find useful in connection with their academic work and employment.

Preparation

1. Determine the level of knowledge of the target audience.
2. Choose a subject that will appeal to the intended audience.

3. Don’t overestimate what the audience knows about your subject.
4. Don’t try to do too much.
5. Use simple examples and concrete special cases. A “nonexample” often helps to clarify a concept. For instance, if you use the integers modulo 7 as an example of a finite field, be sure to point out that integers modulo 6 is not a field and why.
6. Use intuitive definitions rather than technically correct ones. Avoid technical details. A “calibration” example often helps (i.e., test a new definition on familiar objects).
7. Mention applications.
8. Choose a title that is short and informative. Cute titles are usually poor titles. “On a Theorem of Erdцs” is too vague. “On Erdцs’s Prime Number Theorem” is short and informative.
9. In your abstract, indicate the level of the talk. (Examples: “This talk is intended for a general audience;” “This talk is suitable for those who have had linear algebra;” “This talk is suitable for those who have had real analysis.”)
10. Provide a context for your talk. Explain how you became interested in the subject. Mention others who have worked on the subject of your talk.
11. Prepare a crisp beginning. Perhaps start with an anecdote, a question, or an application.
12. Keep technical terms and unfamiliar symbols to a minimum. When you do use them, remind your audience of their meaning from time to time.
13. When possible, relate your topic to other fields.
14. Use a very large font (even for a talk in a small room). If you reproduce printed material, enlarge it.
15. Leave ample margins on all four sides with an extra wide margin at the bottom since many in the audience will have their line of sight to the bottom of the screen obstructed.
16. Restrict each slide to a small number of lines. People come to listen to you talk, not to read your slides.
17. Use key words and phrases on the slides instead of entire sentences. Make sure to proofread for spelling errors.
18. Avoid filling slides with equations and formulas.

19. DO NOT COMPUTE IN PUBLIC.
20. Use figures, pictures, tables, lists, models, props, and animations.
21. If you need a particular slide more than once in your talk, reproduce it at the appropriate places rather than going back to it.
22. Do not use features of PowerPoint that do not contribute significantly to the presentation. Many people find unwarranted use of special features of PowerPoint annoying.
23. Use color for emphasis but do not overdo it. Do not use photos or bright color for the background of your slides.
24. Rehearse your talk but do not memorize it.
25. Practice your talk using a projector and time your talk.
26. Divide the latter portion of your talk into modules that you can discreetly disregard if time becomes a problem. If you have to omit portions of your talk, don't tell your audience that you are doing so. (You will come across as not well prepared.)
27. Conjectures and open problems add interest.
28. Anticipate questions you may be asked and have a response to them prepared.
29. Prepare for an off-campus talk by first giving it in your department or a class.
30. Prepare transparencies as a backup.

Delivery

1. Show up early to check out the room and the equipment.
2. Erase chalkboards even if you don't plan to use them.
3. If possible, remove objects such as a podium, tables or chairs that won't be used that are between you and the audience.
4. Bring a laser pointer and use it to highlight items.
5. Bring a remote control device so that you do not have to stand by the computer.
6. If you use your own laptop, use a power cord and turn off your screensaver.
7. Keep some room lights on. The audience wants to see the speaker.
8. Begin by letting your audience know that you are happy for the opportunity to speak to them.

9. Work to convey the impression that you are enjoying talking about this subject and that you are excited to have an audience.
10. Show enthusiasm for the subject. If you don't, your audience won't be enthusiastic either. Put a lot of energy in your talk. Your energy will energize the audience. (Why do so many people enjoy rock concerts even though the music is greatly inferior to the recordings? Answer: The energy of the live performance.)
11. Generally stay off to the side but MOVE, MOVE, MOVE! Occasionally move toward the screen. Occasionally move toward the audience. Occasionally move from one side of the screen to the other. A talk seems slow moving when the speaker is stationary. Keep your body "open" to the audience.
12. Don't read your slides to the audience. A glance should be all you need to see to speak about their content. Spend most of the time looking at the audience.
13. Personalize your presentation. Sprinkle anecdotes, humor, quotes, and personal items throughout your talk. Make clear what your contributions to the subject are.
14. Don't distribute handouts at the beginning or during your talk. People will read them rather than listen to you. Mention at the outset the handouts will be available after the talk so that the listeners don't have to take notes.
15. Repeatedly remind the audience of unfamiliar definitions.
16. Go over big ideas twice. When you get to the main thesis of your talk, recapitulate the main ideas.
17. Go over big ideas twice. When you get to the main thesis of your talk, recapitulate the main ideas.
18. MAKE EYE CONTACT. Single out a particular person in the audience who appears to be interested in what you are saying. Look directly at him or her. Then move on to another person, then another. Their interest will energize you.
19. Speak loudly. Project to people in the back.
20. Vary your voice for dramatic effect. Occasionally change pace. Careful use of pauses will greatly enhance your effectiveness. Agood time to pause

is when stating a major result, raising a question or showing a complicated figure.

21. Ask questions or rhetorical questions. Give the audience time to contemplate your questions.

22. It is not necessary to prove anything. If you can provide an insight about a proof with a few words or picture, do so.

23. Don't belittle your own results or downplay your knowledge of the topic. It reduces your credibility to no benefit.

24. DO NOT EXCEED YOUR ALLOTTED TIME. To do so indicates you were poorly prepared and have bad manners!

25. Avoid annoying mannerisms in speaking such as repeated use of "OK" or interrupting yourself with "I mean" or "you know."

26. Have a grand finale. It could be the main result, a conjecture, an open problem or an application.

27. Close by thanking your audience.

28. When you are asked a question, move towards the person who asked it and repeat or rephrase the question for the audience.

29. Plan to stay a while after your talk. People may want to talk with you about it.

30. After your talk, do a self evaluation. Make notes about what went well and what could be done better next time.

APPENDIX III. GRAMMAR TESTS

Noun

1. Make plural of the nouns and pronounce them (don't forget to miss the indefinite article).

1.	a table		24.	a quantum	
2.	a zero		25.	a story	
3.	a fox		26.	a queen	
4.	an axis		27.	a man	
5.	a lady		28.	a shelf	
6.	a knife		29.	an eye	
7.	a chair		30.	a woman	
8.	a bus		31.	a box	
9.	a Negro		32.	a city	
10.	a match		33.	a boy	
11.	a way		34.	a goose	
12.	a house		35.	a watch	
13.	a family		36.	a mouse	
14.	a foot		37.	a dress	
15.	a formula		38.	a photo	
16.	a wolf		39.	a sheep	
17.	a country		40.	a tooth	
18.	a crisis		41.	a child	
19.	a cactus		42.	a life	
20.	a piano		43.	a deer	
21.	a mountain		44.	an ox	
22.	a tree		45.	a tomato	
23.	a roof		46.	a focus	

2. Write down the following word-combinations in plural.

1.	this tea-cup	
2.	this hero	
3.	that leaf	
4.	that picture	

5.	this nucleus	
6.	that cliff	
7.	this baby	
8.	that radio	
9.	this man	
10.	that bench	
11.	this wife	
12.	this safe	

3. Choose one of the options to translate the sentence.

1. Это – книжная полка.

a) That is a bookshelf. b) This is a bookshelf. c) Those are book-shelves.

2. Это диваны?

a) Is this a sofa? b) This is a sofa. c) Are these sofas?

3. То книжный шкаф?

a) Is this a bookcase? b) Is that a bookcase? c) This is a bookcase.

4. То – мячи.

a) That are a ball. b) That is a ball. c) Those are balls.

5. Окна открыты?

a) Are the windows open? b) Is the window open?

c) Is the windows open?

6. Мальчик – возле двери?

a) Are the boys near the door? b) Is the boy near the door?

c) Is the boys near the door?

7. Это – не королева.

a) This is not the queen. b) This is not a queen. c) This is not queen.

8. То – не гусь.

a) This isn't a geese. b) That not is a goose. c) That isn't a goose.

9. Это – овцы.

a) This is a sheep. b) These are sheep. c) These are sheeps.

10. Это – не хорошее яблоко, а плохое.

a) It is not a good apple but a bad one. b) It is not good apple but bad one.

c) It is not the good apple but the bad one.

Articles

4. Choose one of the options to fill in the gaps.

1. Everyone in our country knows Lomonosov, ___ founder of ___ first Russian university.

a) a, the b) the, the c) an, a d) -, the

2. ___ famous Russian poet Nekrasov described ___ life of ___ Russian peasants.

a) a, a, the b) the, the, - c) an, -, the d) the, -, -

3. Swift, ___ famous English writer, was travelling one day on ___ horse-back with his servant.

a) a, - b) the, the c) an, a d) -, -

4. I would like to visit ___ classical concert.

a) a b) the c) an d) -

5. I don't want to miss ___ concert which will take place at ___ Philharmonic on ___ 15th of ___ April.

a) a, the, the, a b) the, the, the, - c) an, a, the, the d) a, -, -, -

6. He graduated from ___ University six years ago.

a) a b) the c) an d) -

7. He studied at ___ Kharkov National Technical University.

a) a b) the c) an d) -

8. He is ___ young scientist.

a) a b) the c) an d) -

9. Though he is ___ youngest scientist in this research institute, his name is well known.

a) a b) the c) an d) -

10. My aunt is ___ teacher of ___ physics.

a) a, - b) the, the c) an, - d) -, a

11. Yesterday I read ___ book by Dickens, ___ famous English writer.

a) a, a b) the, a c) an, the d) -, -

12. I am sorry, I don't know ___ way to ___ nearest cafe: I am ___ stranger here myself.

a) a, the, the b) the, the, a c) an, -, the d) -, a, the

13. ___ town I was born in is on ___ Desna.

a) a, the b) the, the c) an, - d) -, the

14. Who is ___ author of this book?
a) a b) the c) an d) -
15. ___ quarter of ___ hour was left before ___ beginning of ___ concert.
a) a, a, the, the b) the, the, -, a c) a, an, the, the d) -, an, the, the
16. We entered ___ hall and saw ___ group of ___ students of our university.
a) a, a, - b) the, a, the c) an, a, - d) -, a, a
17. During ___ vacation I attended some interesting lectures. I remember two of ___ lectures best of all; they were about ___ Russian music.
a) a, the, - b) the, the, - c) an, a, a d) -, the, a
18. I am sure he won't stay in ___ town for ___ vacation.
a) a, the b) -, the c) an, - d) the, the
19. Two weeks are left before ___ end of ___ second semester, ___ exams are coming.
a) a, -, - b) the, the, the c) an, the, the d) -, the, a
20. On ___ first of ___ June we shall take ___ examination in ___ Maths.
a) a, the, -, the b) the, -, the, - c) an, -, -, - d) -, the, the, a

5. Choose one of the options to fill in the gaps.
1. Today is my day off. I am going to spend ___ day in ___ country.
a) a, the b) the, the c) an, an d) a, the
2. My brother brought ___ new book yesterday.
a) a b) the c) an d) -
3. When I looked at ___ title of the book, I was very glad: it was ___ book which I had wanted to get for ___ long time.
a) a, the, the b) the, the, a c) an, -, - d) the, a, the
4. My sister is acquainted with ___ actor who played ___ leading part in ___ play you saw yesterday.
a) a, the, - b) the, the, the c) an, a, the d) a, a, the
5. What ___ river is ___ longest in ___ Europe?
a) a, the, - b) the, the, - c) an, -, - d) -, the, -
6. Why, what ___ strange question to ask!
a) a b) the c) an d) -

7. Any schoolboy knows that the longest river in ___ Europe is ___ Volga.
a) a, a b) the, the c) an, an d) -, the
8. I am afraid you will have ___ lot of ___ trouble with this business.
a) a, - b) the, the c) an, an d) -, -
9. ___ day was not bright yesterday.
a) a b) the c) an d) -
10. ___ sky was covered with ___ clouds.
a) a, - b) the, - c) an,- d) -, the
11. What ___ long story!
a) a b) the c) an d) -
12. What ___ lovely time we are having today!
a) a b) the c) an d) -
13. My father and mother have ___ lunch at ___ work.
a) a, a b) the, the c) an, an d) -, -
14. What ___ colour is your cat?
a) a b) the c) an d) -
15. I want to know what ___ book you are reading.
a) a b) - c) an d) the
16. ___ Neva flows into ___ Gulf of ___ Finland.
a) a, -, - b) the, the, - c) an, the, - d) -, the, -
17. ___ Pacific Ocean is very deep.
a) a b) the c) an d) -
18. ___ Urals are not very high.
a) a b) the c) an d) -
19. ___ Kazbek is ___ highest peak of ___ Caucasus.
a) -, the, the b) a, a, a c) an, the, - d) -, the, -
20. ___ Alps are covered with ___ snow.
a) a, - b) the, - c) an, an d) -, -
21. ___ Shetland Islands are situated to ___ north of ___ Great Britain.
a) the, the, the b) the, the, - c) an, the, the d) -, -, the
22. ___ USA is ___ largest country in ___ America.
a) a, the, - b) the, the, - c) an, the, - d) the, -, -
23. ___ Crimea is washed by ___ Black Sea.

a) a, a b) an, - c) the, the d) -, the

24. ___ Lake Baikal is ___ deepest lake in ___ world.

a) a, the, - b) -, the, the c) an, -, a d) the, -, the

25. ___ Paris is ___ capital of ___ France.

a) a, the, - b) -, the, - c) an, the, - d) the, -, -

6. Insert articles *a/an, the* if necessary.

Teckle comes from a very old country on ___ Nile. It is called ___ Ethiopia. Ethiopia is ___ beautiful mountainous country. Teckle is ___ young man. He wants to become ___ engineer. He is very happy to be a student of ___ Kiev University. He spends ___ lot of time at the library. He is reading and studying different ___ subjects at present. Very often in ___ evening his new friends and he go out. They walk about ___ city talking about their native countries.

7. Insert articles *a/an, the* if necessary.

Three men came to ___ New York for ___ holiday. They came to ___ very large hotel and took ___ room there. Their room was on ___ forty-fifth floor. In ___ evening ___ friends went to ___ theatre and came back to ___ hotel very late. "I am very sorry," said ___ clerk of ___ hotel, "but ___ lifts do not work tonight. If you don't want to walk up to your room, we shall make ___ beds for you in ___ hall." "No, no," said one of ___ friends, "no, thank you. We don't want to sleep in ___ hall. We shall walk up to our room." Then he turned to his friends and said: "It is not easy to walk up to ___ forty-fifth floor, but we shall make it easier. On ___ way to ___ room I shall tell you some jokes; then you, Andy, will sing us some songs; then you, Peter, will tell us some interesting stories." So they began walking up to their room. Tom told them many jokes; Andy sang some songs. At last they came to ___ thirty-sixth floor. They were tired and decided to have ___ rest. "Well," said Tom, "now it is your turn, Peter. After all ___ jokes, I would like to hear ___ sad story. Tell us ___ long and interesting story with ___ sad end." "___ story which I am going to tell you," said Peter, "is sad enough. We left ___ key to our room in ___ hall."

Degrees of Comparison of Adjectives

8. Choose one of the options to fill in the gaps.

1. She is one of the ___ chess-players in our institute.

a) good b) better c) best

2. It is ___ to study the language when you live in the country where it is spoken.

a) easyer b) easier c) easyest

3. She works ___ than in the previous semester.

a) little b) littler c) less

4. This was the ___ movie I have seen lately.

a) good b) better c) best

5. The ___ you remember the rules, the higher will be your test results.

a) better b) good c) best

6. ___ I know, English is now spoken all over the world.

a) as far as b) so long c) as soon as

7. The ___ the shop, the better the service.

a) expensiver b) more expensive c) most expensive

8. We got up ___ than usual.

a) earlier b) earliest c) earlyer

9. It is much ___ to do nothing than to work hard.

a) easy b) easiest c) easier

10. This is ___ canteen in our institute.

a) comfortabler b) the most comfortable c) more comfortable

11. This test is ___ than the previous one.

a) more difficult b) the most difficult c) difficulter

12. The ___ we climb, the harder it is to breathe.

a) highest b) higher c) high

13. This textbook is twice ___ that one.

a) thickest than b) so thick as c) as thick as

14. This was the ___ moment I have ever experienced.

a) worst b) baddest c) worse

15. Her ___ sister is a nurse.

a) elder b) older c) the oldest

16. You look ___. Have you lost weight?
a) thinner b) thiner c) the thinnest
17. The guides are likely to find ___ route of all possible.
a) good b) better c) the best
18. They found ___ solution ever.
a) the worst b) a worse c) bad
19. My brother is as ___ as my father.
a) tall b) taller c) tallest
20. This woman is not so ___ as my aunt.
a) youngest b) younger c) young

9. Put the adjective in brackets into the proper form.

1. The (strong) ___ the acid, the greater is the tendency to lose protons.
2. This is one of the (little) ___ studied natural phenomena.
3. The stronger the magnification, the (great) ___ is the possibility to detect whether the body is homogeneous.
4. My (old) ___ brother is now studying astronomy at the university.
5. The (fast) ___ an object moves, the greater is the air resistance.
6. The (low) ___ the atomic weight or atomic number of the inert gas, the lower are its boiling and melting points.
7. The dolphin is considered one of the (clever) ___ animals.
8. The larger the diameter, the smaller is the resistance and hence, the (much) ___ current will flow through it.
9. The (great) ___ the difference in temperature between two points, the more heat will flow per second.
10. The greater the number of free electrons in a substance, the (good) ___ that substance conducts electricity.
11. The more difficult is the task, the (interesting) ___ it is to solve it.
12. The streets in the centre of the city are (crowded) ___ than in the suburbs.
13. There are many (famous) ___ cafés in Los Angeles packed with celebrities.
14. This time it took us (little) ___ time to assemble the computer than the day before.

10. Say whether the underlined form of the adjective is correct. If not, give the correct one.

1. I am busier than my sister. _____
2. London is more older than New York. _____
3. It is the most sharp pencil I have. _____
4. This boy is as smart as his brother. _____
5. Be activer at your classes, please. _____
6. He makes more mistakes than you do. _____
7. Baseball is the popularest summer sport in America. _____
8. Yesterday she began feeling more bad. _____
9. Mary's answer is correcter than yours. _____
10. Can you come earlier next time? _____

Numerals

11. Choose one of the options to translate the given word or word combination.

1. Двадцать второе мая

a) twenty-two of May b) twenty-second May c) the twenty-second of May

2. Третий

a) three b) threeth c) the third

3. Пятнадцать

a) fiveteen b) fifty c) fifteen

4. Девятый

a) nine b) the nineth c) the ninth

5. Двенадцатого августа

a) on the twelveth of August b) on the twelve of August

c) on the twelfth of August

6. Девяносто

a) nineteen b) ninetie c) ninety

7. Тридцатый

a) the thirtyth b) thirty c) the thirtieth

8. Сорок

a) forteen b) fourty c) forty

9. Тридцать первый

a) thirty-one b) the thirty-oneth c) the thirty-first

10. Шестьдесят пять

a) sixty-five b) sixty five c) the sixty-fifs

11. 101

a) one hundred and first b) one hundred one c) one hundred and one

12. 342

a) three hundreds and forty-two b) three hundred forty two

c) three hundred and forty-two

13. 4,837,905

a) four million eight hundred thirty-seven thousand nine hundred five

b) four millions eight hundreds and thirty-seven thousands nine hundreds and five

c) four million eight hundred and thirty-seven thousand nine hundred and five

14. Тысячный

a) thousandth b) thousand c) the thousandth

15. Три миллиона

a) three millions b) three millionth c) three million

16. Сотни книг

a) hundred of books b) hundreds books c) hundreds of books

17. Одна третья

a) one thirds b) one thee c) one third

18. Пять восьмых

a) five eighth b) five eightth c) five eighths

19. В пятьдесят первой комнате

a) In room the fifty-first b) In the room fifty-one c) In room fifty-one

20. Седьмая глава

a) Chapter seventh b) The chapter seven c) Chapter seven

21. 2.64

a) Two dot sixty-four b) Two point sixty four c) Two point sixty-four

22. 0.39 тонн

a) Zero point thirty nine a ton b) Zero point thirty-nine tons

c) Zero point thirty-nine of a ton

23. 7.26 грамм

a) Seven point two six of grams b) Seven point two sixth grams

c) Seven point two six grams

24. 564 год до нашей эры

a) Five hundred and sixty-four AD b) Five and sixty-four BC

c) Five hundred sixty-four BC

15. В 1900-м году

a) In nineteen hundredth year b) In nineteen zero zero c) In nineteen hundred

12. Write down in English.

1.	4 часа	14.	52-я капля
2.	$6	15.	17 машин
3.	на восьмом километре	16.	226 частей
4.	12-я буква	17.	80-й день
5.	37 статей	18.	тысячи участников
6.	101 формула	19.	3187 детей
7.	79 процентов	20.	На 35-й странице
8.	1/5 метра	21.	2/5 метра
9.	4/9 фунта	22.	2,8 процента
10.	3 3/4 литра	23.	1/3 литра
11.	1/2 часа	24.	2/37 яблока
12.	6,02 дюймов	25.	0.4 микрона
13.	38,9 секунд	26.	$\pi \approx 0.314159265$

Pronouns

13. Choose one of the options to fill in the gaps.

1. I have ___ subjects at school.

a) much b) many c) little d) a little

2. Ann gave ___ her address.

a) our b) us c) we d) ours

3. Were there ___ pens and a book on the table?

a) any b) some c) nothing d) anything

4. My sister is in ___ thirties.
a) his b) her c) she d) its
5. There are ___ mistakes in your work.
a) any b) nothing c) some d) something
6. We don't know ___ about car engines.
a) nothing b) something c) anything d) everything
7. If they are going for a walk you can go with ___.
a) they b) their c) theirs d) them
8. George knows ___ about economics.
a) much b) many c) plenty d) lots
9. Look! There is so ___ water in the street.
a) many b) much c) few d) a few
10. I saw her ___ but I don't remember where.
a) nowhere b) anywhere c) somewhere d) somebody
11. I want that book, give ___ to me, please.
a) him b) them c) he d) it
12. I heard a knock on the door but when I opened it there was ___ outside.
a) some b) nobody c) anyone d) anything
13. In winter there isn't ___ snow in England.
a) many b) much c) no d) some
14. There are ___ semesters in an academic year.
a) some b) any c) no d) much
15. Can you see ___ magazines on the table?
a) some b) any c) no d) much
16. Can I have ___ more soup?
a) some b) any c) nothing d) many
17. Would you like ___ juice?
a) some b) any c) few d) many

Adverbs

14. Use either an Adverb or an Adjective depending on the meaning of the sentence:

1. I can hear you ___.

a) clear b) clearly
2. Yesterday he felt ___.
a) bad b) badly
3. We were ___ impressed by his speech.
a) strong b) strongly
4. I understand you very ___.
a) good b) well
5. I could ___ believe my eyes.
a) hard b) hardly
6. This is quite ___ to everybody.
a) clear b) clearly
7. I would translate this sentence ___.
a) different b) differently
8. This suit matches you ___.
a) perfect b) perfectly
9. These vectors are equal in ___ value.
a) absolute b) absolutely
10. The answer is ___ wrong.
a) absolute b) absolutely
11. It is ___ that they should reply immediately.
a) important b) importantly
12. Don't come too ___ to the dog.
a) near b) nearly
13. The results are ___ promising.
a) extreme b) extremely
14. The question was quite ___ to answer.
a) easy b) easily
15. He can read English fast but he writes ___.
a) slow b) slowly

Prepositions

15. Choose one of the options to fill in the gaps.

1. There are some tea cups ___ the shelf of the cupboard.
a) in b) among c) on

2. Does your train stop ___ this station?
a) in b) at c) on
3. My friend works at the chemist's ___ the town centre.
a) in b) at c) on
4. Turin is ___ the north of Italy, on the River Po.
a) in b) at c) on
5. Can you see my brother ___ the students of this group?
a) from b) among c) on
6. Is Tom ___ the living-room? – No, he is in the garden.
a) under b) at c) in
7. I have been waiting ___ the bus for 20 minutes.
a) in b) from c) for
8. We are leaving ___ Sunday.
a) in next b) on next c) next
9. The competition starts ___ Monday.
a) in b) at c) on
10. I am taking my driving test at 4.30 ___ the 3rd of July.
a) in b) at c) on
11. My grandfather was born ___ 1926.
a) in b) at c) on
12. The professor is going to the conference ___ a week.
a) at b) in c) on
13. Our university was founded ___ the 19th century.
a) on b) between c) in
14. We take our first exams ___ winter.
a) in b) at c) on
15. Look ___ these two pictures.
a) in b) at c) on
16. Whom do you see ___ these pictures?
a) in b) at c) on
17 Every day Mr. Green gets up ___ 7 o'clock.
a) in b) at c) on
18. In the morning he goes ___ the bathroom, takes a bath and then has breakfast.

a) in b) to c) at

19. He goes to his office ___ bus.

a) in b) by c) on

20. He will arrive there ___ half past five.

a) in b) at c) on

16. Choose one of the options to fill in the gaps.

1. He works ___ week-days.

a) in b) at c) on

2. I'll see you ___ the airport.

a) in b) at c) on

3. Shall we go out ___ Sunday?

a) in b) at c) on

4. He was born ___ September.

a) in b) at c) on

5. We swam ___ the river to the other side.

a) in b) across c) over

6. What is this ring made ___?

a) in b) from c) of

7. He dived ___ the water.

a) into b) in c) to

8. I am very proud ___ my country.

a) by b) at c) of

9. The sun went ___ the cloud.

a) behind b) at c) over

10. What is the distance ___ Kharkov and Kiev?

a) in b) between c) behind

11. Do you go to work ___ car?

a) in b) by c) on

12. He broke his leg when he fell ___ the stairs.

a) from b) with c) in

13. What do you buy your mother ___ her birthday?

a) for b) with c) on

14. Shall I go with you ___ the station?

a) in b) to c) on

15. Are you doing anything ___ the weekend?

a) in b) at c) on

16. She was born ___ December 10th.

a) in b) at c) on

17. He comes ___ Canada.

a) in b) for c) from

18. There was silence when the teacher came ___ the room.

a) in b) to c) into

19. This suit is made ___ France.

a) in b) of c) for

20. Please take your feet ___ the chair.

a) from b) of c) on

17. Choose one of the options to fill in the gaps.

1. I'm looking ___ my pen. Have you seen it?

a) for b) at c) on

2. There is a bridge ___ the river.

a) in b) through c) over

3. They walked home ___ the park.

a) through b) across c) over

4. He was wearing a vest ___ his shirt.

a) in b) over c) on

5. Have a biscuit ___ your coffee.

a) with b) at c) by

6. She sat ___ me at the theatre.

a) beside b) besides c) at

7. The postman took the letters ___ of the postbox.

a) out b) from c) on

8. Would you like to come ___ me to the cinema tonight?

a) on b) to c) with

9. My uncle talks ___ golf all the time.

a) with b) at c) about

10. She walked ___ the street.

a) in b) along c) on
11. This piece of music is ___ Beethoven.
a) by b) at c) on
12. My flat is ___ the third floor.
a) in b) at c) on
13. Are you interested ___ pop music?
a) in b) at c) by
14. Learn this poem ___ heart.
a) with b) at c) by
15. My uncle arrived ___ Chicago 5 days ago.
a) in b) at c) by

Verbs. Indefinite.

To be

18. Choose one of the options to fill in the gaps.

1. The scouts ___ in the forest all this week.
a) were b) are c) will be
2. George ___ in Scotland on holidays last month.
a) was b) am c) are
3. Sheila ___ at the desk in the classroom now.
a) is b) am c) are
4. There ___ a blooming chestnut tree near my house.
a) are b) were c) is
5. There ___ much snow last winter.
a) are b) were c) was
6. Soon there ___ a new film on.
a) is b) will be c) was
7. There ___ many students at the lecture today.
a) are b) is c) will be
8. The anecdote ___ funny. It ___ dull.
a) is, aren't b) are, aren't c) is, isn't
9. Potatoes ___ expensive. They ___ cheap.
a) aren't, are b) isn't, are c) isn't, is
10. Nora's parents ___ always glad to see me.

a) am b) are c) is

11. The children ___ at their entrance exams last week.

a) was b) were c) are

12. I don't know when she ___ at home.

a) are b) will be c) is

13. Don't worry, everything ___ all right.

a) is b) were c) are

14. I wonder what the weather is going to be like and if it ___ warm.

a) will be b) am c) was

15. Call me as soon as you ___ ready.

a) are b) is c) will be

16. She will take care about his dog until he ___ away.

a) will be b) is c) are

17. There ___ no guests at all since I left.

a) are b) have been c) were

18. Jill ___ rude to me. Why didn't you stop her?

a) was b) is c) were

19. ___ he at home when she arrived?

a) Were b) Is c) Was

20. They ___ at the office when you come.

a) weren't b) won't be c) aren't

19. Choose one of the options to fill in the gaps.

1. John ___ very young when he married Lucy.

a) is b) was c) will be

2. The tourists ___ very tired after such a long trip.

a) will b) were c) is

3. Pillows ___ soft. They ___ hard.

a) isn't, are b) are, aren't c) aren't, are

4. Honey ___ sweet. It ___ bitter.

a) are, isn't b) isn't, is c) is, isn't

5. The girls ___ sad now because of low grades.

a) is b) are c) was

6. Yesterday my sister brought a kitten. It ___ nice and funny.

a) is b) was c) are

7. There ___ three piglets near the mother pig.

a) is b) are c) was

8. There ___ a lot of students in the assembly hall yesterday.

a) are b) were c) is

9. I ___ busy since we last met.

a) was b) am c) have been

10. I'll see that everything ___ properly packed and put into store.

a) will be b) was c) is

11. This tool ___ very useful if you treat it right.

a) is b) will be c) was

12. There ___ much work to do last week.

a) were b) is c) was

13. I saw that I ___ mistaken in believing that Uncle Nick had returned from abroad.

a) am b) was c) were

14. When he ___ off duty he'll go there.

a) was b) will be c) is

15. The actors ___ at the rehearsals on Tuesdays.

a) was b) are c) is

16. Taras Shevchenko ___ the soul of the Ukrainian nation.

a) was b) is c) were

17. If Cynthia tells Mike about it I ___ angry with her.

a) was b) am c) will be

18. There ___ much snow in winter.

a) aren't b) are c) is

19. Imagine how much they have learnt since they ___ here.

a) were b) have been c) has been

20. There ___ plenty of biscuits and candies for the guests.

a) are b) is c) was

20. Choose one of the options to fill in the gaps.

1. I ___ to bed late in the evening every day.

a) goes b) went c) will go d) go

2. He ___ last summer in the country.
a) will spend b) spent c) spend d) spends
3. I ___ ice-cream tomorrow.
a) did not eat b) will not eat c) do not eat d) does not eat
4. What ___ you ___ at the shop yesterday?
a) will buy b) did buy c) do buy d) does buy
5. I ___ computer games yesterday.
a) do not play b) did not play c) will not play d) does not play
6. When ___ you usually ___ up?
a) do get b) did get c) will get d) does get
7. My sister always ___ mother in the kitchen.
a) helped b) will help c) helps d) help
8. Our teacher ___ very busy after lessons yesterday.
a) is b) will be c) was d) were
9. She ___ a tasty dinner tomorrow.
a) cooked b) cooks c) will cook d) cook
10. My friend ___ Spanish very well. He is a teacher.
a) knew b) know c) knows d) will know
11. Max Plank first ___ the quantum in 1900 in a study of dark matter radiation.
a) introduces b) introduced c) will introduce d) introduce
12. Some of our graduates ___ researchers in some years.
a) become b) became c) will become d) becomes
13. ___ they ___ industrial training next month?
a) do have b) does have c) will have d) did have
14. ___they ___ entrance examinations last week?
a) do pass b) does pass c) did pass d) will pass
15. The students usually ___ this famous lecturer warmly.
a) greets b) greet c) will greet d) greeted
16. Real gases ___ the perfect gas laws.
a) do not obey b) did not obey c) will not obey d) does not obey
17. The discovery and the interpretation of the Cherenkov effect ___ the Nobel Prize for three Russian scientists in 1958.
a) win b) won c) will won d) wins

18. P. Curie ___ the change in susceptibility with temperature.
a) investigates b) investigate c) investigated d) will investigate
19. The photoelectric effect with visible and ultraviolet light ___ direct evidence for the existence of the photon.
a) provided b) provides c) provide d) will provide
20. ___ social networks ___ the behaviour of young people?
a) do influence b) does influence c) will to influence d) did influenced

21. Put the verb in brackets into the proper form.
1. It ___ (to take) me a lot of time to get there last week.
2. Who ___ (to ring) you up an hour ago?
3. He usually___ (to leave) home for school at 8 o'clock.
4. They ___ (to invite) their cousin to stay with them next summer.
5. I ___ (to write) a letter to my friend yesterday.
6. Our football team ___ (to win) many games last year.
7. They ___ (to grow) tomatoes next summer.
8. He always ___ (to do) his homework.
9. Nick ___ (to tell) this story at home after his trip yesterday.
10. She ___ (to wash) the floor in her room every Sunday.
11. Who usually ___ (to help) passengers to pull their luggage to carriages?
12. The scientists ___ (to test) the device tomorrow.
13. A frequent high tone buzzing ___ (to mean) that the telephone line is engaged.
14. Who ___ (to take) the first steps towards the establishment of the atomic theory?
15. Yesterday we ___ (to solve) a number of problems but there remained one more.
16. The discovery of radioactivity in the late 19-th century ___ (to start) the modern era of the study of atoms.
17. An electric generator ___ (to use) the principle of induced voltage and current to supply electric power.
18. The intensity of an X-ray beam ___ (to depend) on the current heating the filament.

19. In future graphene ___ (to change) the size and type of most electronic devices.
20. The hexagonal crystal structure ___ (to make) graphene flexibility, strength and high stability.

Verbs. All Tenses.

22. Choose one of the options to fill in the gaps.

1. I ___ a very interesting TV programme at the moment.
a) watched b) am watching c) watch d) was watching
2. We can't go for a run. We ___ the right clothes at the moment.
a) aren't wearing b) don't wear c) didn't wear d) not wear
3. My parents always ___ to bed early.
a) are going b) go c) goes d) are go
4. ___ Josie ill yesterday?
a) Did b) Was c) Had d) Is
5. Look. She ___ mother in the kitchen.
a) helps b) helped c) will help d) is helping
6. In the future, there ___ traditional schools.
a) aren't b) won't be c) won't d) is
7. He ___ the poem all the evening yesterday.
a) will be learning b) was learning c) learnt d) learns
8. They always ___ late on Sundays.
a) gets up b) are getting up c) get up d) will have got up
9. ___ see her yesterday?
a) Are you b) Did you c) Will you d) Do you
10. I ___ ice-cream now.
a) was not eating b) will not be eating c) am not eating d) does not eat
11. ___ you ever seen the film *Casablanca*?
a) Did b) Will c) Have d) Does
12. One day people ___ holidays on the moon.
a) will taking b) are taking c) will take d) will took
13. What ___ you ___ at home the whole evening yesterday?
a) will, be doing b) were, doing c) are, doing d) did, do
14. ___ never spoken to a famous person.

a) I've b) I c) I haven't d) I had
15. Have you ever ___ to California?
a) went b) going c) been d) be
16. He ___ in Italy when he had an accident.
a) is traveling b) was traveling c) will be traveling d) had travelled
17. They ___ tennis all day long tomorrow.
a) will not be playing b) did not play c) will not play d) are not playing
18. He ___ to Paris on a business trip when his mobile-phone rang.
a) flew b) was flying c) will be flying d) was flown
19. What ___ you ___ now?
a) will, be drawing b) were, drawing c) are, drawing d) do, draw
20. This time next week we ___ the mid year test.
a) will be sitting b) are sitting c) were sitting d) will sit
21. Tom ___ at the courses for 3 years by May of the next year.
a) has been studying b) had been studying
c) will have been studying d) will study

23. Choose one of the options to fill in the gaps.
1. My sister ___ to school when she met him.
a) was going b) will go c) went d) goes
2. I ___ the tickets by the beginning of the conference.
a) will have bought b) buy c) have bought d) will buy
3. Our pupils ___ a composition at this moment.
a) is writing b) will be writing c) were writing d) are writing
4. He ___ to Malta twice before he took me there.
a) had been b) has been c) have been d) was
5. She ___ for a year before he settled in London.
a) have been traveling b) had been traveling c) will be traveling
d) is travelling
6. She ___ a tasty dinner now.
a) cooked b) cooks c) is cooking d) was cooking
7. She is very tired now. She ___ round the city all the morning.
a) has been walking b) was walking c) will be walking d) walked
8. My friends ___ their homework now. They can not go for a walk.

a) were doing b) will be doing c) do d) are doing

9. I ___ work in India when I leave University.

a) am going to b) was c) did d) am

10. She ___ her trip round the world by the beginning of the next academic year.

a) had finished b) have finished c) will have finished d) has finished

11. The young scientist ___ his research work at the meeting at this moment.

a) introduces b) introduced c) is introducing d) will be introducing

12. They ___ these machine-tools for fifty years already.

a) are using b) use c) have been using d) used

13. When ___ the error in this programme?

a) have you discovered b) you discovered c) were you discover

d) did you discover

14. We ___ TV when she came.

a) are watching b) will be watching c) were watching d) watched

15. How long ___ this person?

a) did you know b) have you known c) are you known d) do you know

16. ___ they ___ this problem all day long tomorrow?

a) were, discussing b) are, discussing c) will, be discussing

d) will, discuss

17. The time of day and other circumstances ___ the body's temperature.

a) affects b) is affecting c) has affected d) affect

18. By now, the worldwide installed capacity of renewable energy ___ that of nuclear power.

a) surpasses b) surpassed c) has surpassed d) had surpassed

19. Dinosaurs suddenly ___ extinct about 65 million years ago.

a) have become b) were become c) had become d) became

20. They ___ their examination from 5 till 7 yesterday.

a) passed b) will pass c) are passing d) were passing

21. Nitric acid ___ with most metals.

a) reacts b) react c) is reacts d) reacting

24. Choose one of the options to fill in the gaps.

1. At present Canada ___ a high-speed rail system.

a) have not b) does not have c) do not have d) is not having

2. By the 17th century, temperatures in the Northern Hemisphere ___ by half a degree Celsius compared with medieval times.

a) was falling b) fell c) has fallen d) had fallen

3. Recently, a scientist at the University of Illinois ___ a tiny device that can measure a wearer's blood flow and wirelessly send that information to a computer.

a) has invented b) invent c) are inventing d) have invented

4. The students ___ in the library the whole last week.

a) will be sitting b) are sitting c) were sitting d) sat

5. Computers ___ such games as chess already.

a) have mastered b) are mastered c) has mastered d) master

6. The human brain ___ a built-in talent for working out depth from flat images.

a) have b) is having c) had d) has

7. He ___ his mobile phone for already 3 hours.

a) has charged b) has been charging c) is charging d) was charging

8. We hope the rain ___ very soon.

a) will be stop b) stops c) had be stopped d) will stop

9. By the time we woke, the snow ___.

a) had melted b) has melted c) melted d) will be melting

10. They ___ this question when the bell rang.

a) discussed b) will be discussing c) were discussing d) are discussing

11. He gave his reasons for what ___.

a) was happened b) had happened c) has happened d) happened

12. She ___ till you come.

a) was working b) is working c) will be working d) worked

13. If he ___ a favourable report on his work, he will work still harder.

a) receive b) will receive c) will be receive d) receives

14. I suspect that ___ an error in these calculations.

a) it is b) there is c) is d) be

15. We will watch you while you ___ this experiment.

a) will be making b) are making c) were making d) make
16. By the end of the week we ___ these samples for a month.
a) will test b) will have been testing c) will be testing
d) will have tested
17. A man was stopped by the policeman when he ___ to cross the street at the red light.
a) was go b) was going c) had been going d) is going
18. He ___ from a business trip by the end of next week.
a) will arrives b) has arrived c) will arrive
d) will have arrived
19. Scientists ___ the existence of neutron stars as long ago as 1934.
a) have predicted b) predicted c) has predicted d) had predicted
20. I ___ an article on internal combustion engines when the teacher came.
a) will be reading b) am reading c) read d) was reading

Verbs. Passive Voice.

25. Choose one of the options to fill in the gaps.

1. She ___ to the party.
a) has invited b) had been invited c) has been invited
2. About 20 people ___ arrested at the demonstration yesterday.
a) were b) were being c) had been
3. When we came, the hall ___ decorated.
a) will be b) was being c) has been
4. The floor in the hospital ___ washed two times a day.
a) is b) is being c) has been
5. The wall ___ painted by the evening.
a) will be b) will have been c) will
6. The book ___ into English last year.
a) translated b) is translated c) was translated
7. Before we came to the party all the food ___.
a) had eaten b) had been eaten c) was eaten
8. Christmas ___ on December 25.
a) is celebrated b) is being celebrated c) celebrates
9. I can not use my car because it ___ now.

a) are repaired b) is repaired c) is being repaired
10. You have nothing to do. All the dishes ___ already.
a) has been washed b) have been washed c) had been washed
11. Jim told me that he ___ on TV the last week.
a) has been shown b) have been shown c) had been shown
12. The article ___ by the end of the week.
a) will be translated b) will translate c) will have been translated
13. Our post ___ two times a day.
a) is being delivered b) is delivered c) has been delivered
14. The streets ___ of snow before we got up.
a) were being cleared b) were cleared c) had been cleared
15. The letter ___ by the secretary when I came in.
a) is being typed b) was being typed c) is typed
16. Rolls-Royce cars ___ in England.
a) are made b) has been made c) made
17. This bridge ___ in 1970.
a) had been built b) was built c) has been built
18. The hall ___ tomorrow.
a) will decorated b) will decorate c) will be decorated
19. The question which ___ now is very important.
a) discusses b) is discussing c) is being discussed
20. All the money ___ already.
a) has been spent b) have been spent c) is being spent
21. The new library ___ by the end of the next year.
a) will have building b) will have been built c) will be building
22. Where is your bicycle? – It ___!
a) have been stolen b) has stolen c) has been stolen
23. We can't live in our room now. It ___.
a) is being repaired b) has been repaired c) is re-paired

26. Choose one of the options to translate the underlined parts of the text.

1. The machine tool <u>measures</u> its production itself.

a) измерила b) измеряет c) измеряется d) будет измерять

2. The machine tool will measure its production itself.

a) измерила b) измеряет c) измеряется d) будет измерять

3. The part is measured with great accuracy.

a) измерила b) измеряет c) измеряется d) будет измерять

4. The builders are planning the road.

a) планируется b) планируют c) планировали d) спланировали

5. The building of the road is being planned.

a) планируется b) планируют c) планировали d) спланировали

6. The building of the road was being planned**.**

a) планируется b) планируют c) планировали d) спланировали

7. The tests have been carried out well.

a) выполняются b) выполнялись c) выполнены

d) будут выполнены

8. The tests were being carried out well.

a) выполняются b) выполнялись c) были выполнены

d) будут выполнены

9. The tests are being carried out well.

a) выполняются b) выполнялись c) выполнены

d) будут выполнены

10. The tests must be carried out well.

a) должны выполнить b) должно быть, выполнены

c) должны быть выполнены d) должны будут выполняться

27. Choose one of the options to translate the sentence.

1. The builders will be shown some models of new bridges.

a) Строителям показали модели новых мостов.

b) Строителям покажут модели новых мостов.

c) Строители покажут модели новых мостов.

2. The design of the dam was worked at by some institutes.

a) Несколько институтов работали над проектом плотины.

b) Проект плотины разрабатывается несколькими институтами.

c) Над проектом плотины должны были работать несколько институтов.

3. Complex calculations were followed by experiments.
a) За экспериментами последовали сложные вычисления.
b) За сложными вычислениями последовали эксперименты.
c) За сложными вычислениями следуют эксперименты.
4. A new block of houses is being built in this street.
a) Новый жилой массив был построен на этой улице.
b) На этой улице строится новый жилой массив.
c) На этой улице строили новый жилой массив.
5. This plane can be refueled in the air.
a) Этот самолет дозаправили в воздухе.
b) Этот самолет может дозаправляться в воздухе.
c) Этот самолет может дозаправлять в воздухе.
6. She was given a box of chocolates for her birthday.
a) Шоколадные конфеты мне подарили на день рождения.
b) На день рождения ей подарили коробку шоколадных конфет.
c) Она подарила на день рождения коробку шоколадных конфет.
7. My uncle has been made a captain.
a) Моего дядю произвели в капитаны.
b) Мой дядя был капитаном.
c) Моего дядю произведут в капитаны.
8. You will be told when the train leaves.
a) Тебе сказали, когда отправляется поезд.
b) Тебе скажут, когда отправляется поезд.
c) Вы сказали, когда отправляется поезд.
9. I was sent off to bed.
a) Меня отослали спать.
b) Я пошел спать.
c) Меня отправят спать.
10. He was shown a new TV.
a) Он показал новый телевизор.
b) Его показали по новому телевизору.
c) Ему показали новый телевизор.

Modal Verbs.

28. Fill in the gaps with an appropriate modal verb: *can, can't, may, have to, should, shouldn't, must, mustn't, needn't.*

1. He was sleeping heavily and didn't hear the alarm clock. So to be in time for the train he ___ call a taxi.
2. If you want to drive a car you ___ get a driving license.
3. You ___ be in a hurry. The train starts in 2 hours.
4. You ___ listen to the advice of your parents.
5. On Sundays I ___ get up early.
6. The performance is great. You ___ miss seeing it.
7. My sister has got a job in Kiev, so she will ___ leave Kharkov soon.
8. What ___ we see on this map?
9. ___ you speak Spanish? – No, unfortunately I ___.
10. ___ I come in?
11. You ___ cross the street at the red light.
12. ___ I take your book? – I am afraid not, I need it.
13. He ___ speak English yet.
14. I have very little time, I ___ go.
15. You ___ read this text, it is easy enough.

29. Choose one of the options to fill in the gaps.

1. I heard Arthur make a slight noise which ___ a sigh or a chuckle.

a) may have been b) may be c) might be

2. Shall I go and see if he has done the work? He ___ it yesterday.

a) was to finish b) must have been finished c) was finish

3. He felt so tired that he ___ make himself get up and leave.

a) cannot b) could not c) will not be able to

4. He must ___ to tell them about the meeting. That is possibly why they are absent.

a) forget b) to forget c) have forgotten

5. She worried that he hadn't come in time. Something ___ to him.

a) can happen b) may happen c) might have happened.

6. I needn't tell you why this ___ right away.

a) must be done b) are to be done c) are allowed to be done

7. You ___ that I wrote the letter because I didn't.
a) can have proved b) can't have proved c) can't prove
8. You should take your rain-coat. It ___.
a) can rain b) should rain c) may rain
9. They ___ that their fellow was in London.
a) mustn't hear b) must hear c) must have heard
10. You ___ tomorrow. I'll be busy.
a) needn't come b) may come c) are able to come
11. I ___ there for a quarter of an hour waiting and thinking about it before I saw the letter.
a) must have been sitting b) must sit c) must be sitting
12. You ___ him yesterday on horseback.
a) should see b) should have seen c) shouldn't see
13. We ___ wait for him.
a) didn't have to b) haven't to c) doesn't have to
14. He ___ spend most evenings playing chess last month.
a) would b) can c) may
15. Angela opened the door and walked in. Her daughter was still up. "You ___, waiting for me," said Angela.
a) needn't have stayed up b) need stay up c) need have stayed up
16. One day the headmaster came on Jack, who ___ on the sports ground, sitting comfortably in a gardener's shed reading a book and eating a large piece of cocoa-nut ice.
a) should sweat b) should have been sweating
c) shouldn't have been sweated
17. He made two or three attempts to strike his lighter, but it ___ work.
a) ought to b) must c) wouldn't
18. Our teacher ___ her students' notebooks yesterday because she had to take another teacher's class.
a) can't check b) couldn't check c) isn't able to check
19. Tomorrow is your sister's birthday. I think you ___ give her a present.
a) has to b) was to c) should
20. I ___ yet to give you a definite answer on Monday.
a) won't be able b) could c) may

30. Choose one of the options to fill in the gaps.

1. He ___ to become a publisher in the first place, but once he had taken it up the profession had appeared to absorb all his interests.

a) may not have wanted b) may want c) might want

2. Ask him if we ___ look round the laboratory.

a) is able to b) may c) are allowed

3. When he married her she ___ more than sixteen.

a) can be b) couldn't have been c) may not be

4. It's getting dark. What time ___ it be now?

a) can b) could c) might

5. He thought it likely that Blair ___ away unnoticed.

a) may get b) need get c) might have got

6. He's got a big family. I can easily imagine that he ___ be looking for a better job.

a) are able to b) isn't allowed to c) might

7. I see one of my statuettes has been broken. – I can't think what ___ to it.

a) should happen b) could have happened c) must happen

8. I ___ to work very hard this week.

a) must b) should c) have

9. Mrs. Cromwell took us round the yacht. There was no doubt that it ___ her a lot of money.

a) needn't have cost b) mustn't have cost c) must have cost

10. It's an important question. You ___ it with your scientific adviser.

a) needn't have discussed b) can't discuss c) should have discussed

11. At half past two I heard Hudson grunt, put down his book and switch out the light. He ___ since midnight.

a) must have been reading b) must read c) must have read

12. Your task is very simple. You ___ all the books in the alphabetical order.

a) shouldn't arrange b) should have arranged c) ought to arrange

13. He ___ often fall asleep with a book in his hands and spectacles on his nose.

a) would b) wouldn't c) need

14. She bought a loaf of bread. – She ___ it. We have enough bread. It will be stale.
a) needn't have bought b) need buy c) needn't buy
15. He was driving at a great speed. He knew that about this hour the guests ___ at his house.
a) might arrive b) might have been arriving c) might have been arrived
16. I asked his wife what was wrong with him, but she ___ answer.
a) is able to b) needn't c) wouldn't
17. Unfortunately I ___ speak to my father. I didn't catch him at home.
a) can't b) won't be able to c) couldn't
18. Everything is settled. Now I ___ go to London.
a) don't have to b) haven't c) didn't have to
19. She ___ this car. It's so expensive. Now she is short of money.
a) shouldn't have been bought b) shouldn't has bought
c) shouldn't have bought
20. Shall I tell you how it all happened? – No, you ___. I know all about it.
a) need b) needn't c) needn't to

Sequence of Tenses.

31. Choose one of the options to fill in the gaps.

1. The teacher told his students that he ___ to give them a test.
a) were going b) was going c) is going
2. I told him that I ___ his brother for a long time.
a) hasn't seen b) hadn't seen c) haven't seen
3. The engineer told his workers that he ___ with their work.
a) is pleased b) were pleased c) was pleased
4. I asked my friend ___ me outside the cinema at six o'clock.
a) met b) meets c) to meet
5. Mary said that she ___ to wear her old dress.
a) didn't want b) don't want c) doesn't want
6. The old man told the little girl ___ across the street.
a) do not run b) to run not c) not to run
7. Tom asked Bob ___.
a) where lives his uncle b) where did his uncle live

c) where his uncle lived

8. Jack asked me if I ___ to the cinema with him.

a) go b) will go c) would go

9. Tom said he ___ the doctor the next day.

a) visits b) would visit c) will visit

10. He told me he ___ ill.

a) is b) was c) will be

11. She told me that Tom ___ to work the day before.

a) does not come b) had not come c) did not come

12. I told my sister that she ___ cold.

a) might catch b) may catch c) might to catch

13. She told me she ___ in the garden for an hour.

a) had been working b) has been working c) have been working

14. He said that while crossing the English Channel they ___ on deck all the time.

a) had stayed b) stay c) have stayed

15. The woman said she ___ sick while crossing the Channel.

a) feels b) had felt c) has felt

16. She said she ___ bad that day.

a) is feeling b) have feeling c) was feeling

17. The old man told the doctor that he ___ pain in his right side.

a) have b) has c) had

18. He said he ___ just been examined by a good doctor.

a) have b) had c) was

19. He said he ___ to school until Monday.

a) would not go b) will not go c) did not go

20. The man said he ___ a month at a health resort.

a) had spent b) has spent c) spends

32. Choose one of the options to fill in the gaps.

1. He said that his health ___ greatly improved since then.

a) has b) had c) will have

2. Annie asked Tom if he ___ the film several months before.

a) saw b) had seen c) has seen

3. Boris told me that he ___ to build a summer house.
a) wanted b) wants c) will want
4. Jack said that he often ___ to see Bob.
a) goes b) will go c) went
5. Lydia asked if I ___ those pictures yet.
a) has seen b) will have seen c) had seen
6. Mike said he ___ Dickens' novels very much.
a) likes b) liked c) will like
7. She promised me that she ___ some bread on her way home.
a) buy b) would buy c) will buy
8. Mother told me ___ for dinner.
a) not to be late b) do not to be late c) to not be late
9. She asked me when I ___ Mary last.
a) see b) had seen c) will see
10. George said it ___ very difficult to play that role.
a) has b) is c) was
11. The woman told him ___ and go home.
a) not to worry b) do not worry c) to not worry
12. He told me that he ___ that watch the day before.
a) will buy b) had bought c) has bought
13. Could you tell me where ___?
a) was the post office b) the post office is c) is the post office
14. Do you know what ___?
a) does this word mean b) this word means c) did this word mean
15. Can't you remember ___ your car?
a) where did you park b) where you parked c) where do you park
16. She asked me what ___ in my spare time?
a) I did b) did I c) I do
17. He wanted to know how long ___ for this company.
a) I had been working b) I have been working c) had I been working
18. He wondered what time ___.
a) did the banks close b) the banks closed c) the banks close
19. Do you know what qualification ___.
a) she has b) has she c) does she have

20. Did you know why ___ for a new job.
a) had she applied b) she has applied c) she had applied

Conditionals. Subjunctive Mood.

33. Put the verb in brackets in proper form.

1. If he works hard at his English, he ___ (to pass) his exam well.
2. If we ___ (to use) new methods, we would save a lot of time.
3. He will come home at 7 if he ___ (to finish) this work on time.
4. If they ___ (to buy) all the necessary equipment, they will be able to carry out their experiment.
5. If you ___ (to press) the button, the device will start working.
6. If ordinary gases ___ (to be) greatly compressed, they become liquids.
7. If we ___ (to look) around, we can see that electricity is serving us in one way or another.
8. If the phone ___ (to be answered), he would have made an excuse about the wrong number.
9. This iron tool would be covered with rust if you ___ (to keep) it moist.
10. Were he here we ___ (to give) him considerations about the results of our experiment.
11. Had he informed me in time I ___ (to avoid) that awkward situation.
12. If he ___ (not to be absorbed) in his thoughts he might have taken notice of her remark.
13. I wished he ___ (to ask) that question when we first met.
14. "Have you got my letter?" – "Yes. I wish you ___ (not to write) it"
15. I wish I ___ (can) go round the world.
16. I wish you ___ (to ask) her about the party when you see her.
17. Ideal behaviour requires that intermolecular forces ___ (to be) negligible.
18. It was suggested that they ___ (to have) some time for discussion at the end of their meeting.
19. Even though he ___ (to be) free, he wouldn't go with us.
20. He looks as if he ___ (to know) nothing about what has happened.
21. If I ___ (to be) you I would not buy that coat.
22. If I ___ (to be) rich I would buy a castle.

23. If I had gone to the party last night I ___ (to be tired) now.
24. If you ___ (not to drink) so much wine yesterday, you would not have such a terrible headache now.

34. Choose one of the options to fill in the gaps.

1. If you ___ a taxi you would catch the last train.
a) will take b) have taken c) took d) would take
2. The scientist would start the experiment if he ___ all the necessary equipment.
a) would get b) will get c) get d) got
3. If I had had time, I would ___ you.
a) help b) have helped c) helped d) has helped
4. If you ___ them, they will be very glad.
a) will invite b) are invited c) invite d) will be invited
5. If we ___ a telegram from him, we wouldn't worry.
a) received b) would received c) had been received d) was received
6. If you make so much noise I ____ be able to sleep.
a) will b) will not c) would d) would not
7. I wish I ____ my clothes yesterday.
a) has washed b) had washed c) have washed d) will have washed
8. I need this computer but it is very expensive. I ___ it if I have more money.
a) would buy b) will buy c) buy d) have bought
9. If he had been able to speed up his research, he ____ his thesis by now.
a) would complete b) had completed c) would have completed
d) completed
10. If she ____ my advice, she will feel much better.
a) followed b) follows c) would follow d) had followed
11. You will not be able to solve this problem unless you ___ the research team.
a) will join b) would join c) joins d) join
12. He will come home when he ___ this work.
a) will finish b) finish c) am finishing d) finishes

13. If I had more free time today, I ___ the book I borrowed from the library.
a) read b) will read c) would read d) had read
14. If she uses computer presentation, her report ___ much more interesting.
a) would be b) would have been c) was d) will be
15. What would happen if I ___ that button?
a) pressed b) had pressed c) would press d) would have pressed
16. If she ___ the job, I think she would take it.
a) offered b) had been offered c) would offered d) was offered
17. If you ___ them, they will come.
a) will invite b) invite c) are invited d) will be invited

Infinitive.

35. Choose one of the options to fill in the gaps.

1. He seems ___ this problem for two hours.
a) to solve b) to be solving c) to have solved d) to have been solving
2. The teacher made them ___ the exercise.
a) to rewrite b) to have rewrite c) rewrite d) be rewriting
3. It is necessary ___ the room.
a) to me clean b) for me to clean c) for me clean d) to me to clean
4. I heard somebody ___ at the door.
a) knock b) to knock c) to be knocking d) knocks
5. I can't find my keys. I must ___ them.
a) have lost b) to have lost c) lose d) to lose
6. My father wants me ___ medicine.
a) study b) to study c) studies d) be studying
7. He is said ___ a new car last week.
a) to buy b) to have bought c) buy d) to have been buying
8. This problem can't ___ without special knowledge.
a) to solve b) to be solved c) solve d) be solved
9. Our football players are expected ___ the game.
a) to be winning b) to have won c) to win d) win
10. Nobody likes ___ bad news.

a) to be telling b) to be told c) tell d) to have told
11. Don't make me ___ the dishes.
a) to wash b) wash c) to be washing d) to have washed
12. I can't find him. Where is he? – He must ___ in the library.
a) to work b) has worked c) to be working d) be working
13. I want ___ to my place.
a) him to come b) he to coming c) his come d) him come
14. He is known ___ three textbooks already.
a) to publish b) to be publishing c) to have published d) publish
15. He saw the thief ___ the bag.
a) steals b) have stolen c) to steal d) steal
16. The chief wants the work ___ immediately.
a) to do b) to be done c) be done d) do
17. He is said ___ a new car next week.
a) to buy b) to have bought c) buy d) to have been buying
18. Don't let the instrument ___.
a) to have overheated b) overheats c) to overheat d) overheat
19. It is easy ___ this rule.
a) for anyone understand b) for anyone to understand
c) to anyone to have understood d) with anyone to understand
20. He seems ___ the way.
a) to have been knowing b) to be knowing c) know d) to know

36. Choose one of the options to translate the sentence.

1. Им было трудно решить эту задачу.
a) Them was difficult to solve this problem.
b) 1t was difficult for them to solve this problem
2. Наша задача – помочь ему.
a) Our task is to help him.
b) Our task help him
3. Было слишком темно, чтобы продолжать путь.
a) It was enough dark to continue the way.
b) It was too dark to continue the way.
4. Он рад, что его показали по телевизору.

a) He is glad to be shown on TV.
b) He is glad to have been shown on TV.
5. Он, должно быть, сейчас гуляет в парке.
a) He must is walking in the park.
b) He must be walking in the park.
6. Я хочу, чтобы он подписал этот документ.
a) I want that he signs this document.
b) I want him to sign this document.
7. В мой день рождения он позвонил первым.
a) On my birthday, he called first.
b) On my birthday, he was the first to call.
8. У тебя есть что-нибудь поесть?
a) Do you have anything eating?
b) Do you have anything to eat?
9. Считается, что он лучший шахматист страны.
a) He considers be the best chess-player of the country.
b) He is considered to be the best chess-player of the country.
10. Я не помню, чтобы я говорил это.
a) I don't remember said this.
b) I don't remember to have said it.
11. Мне нечего читать.
a) Me nothing to read.
b) I have nothing to read.
12. Он написал контрольную первым.
a) He was the first writing the test paper.
b) He was the first to write the test paper.
13. Ему было трудно встать рано утром.
a) Him was difficult to get up early in the morning.
b) It was difficult for him to get up early in the morning.
14. Я слышал, как он разговаривал по телефону.
a) I heard him talk over the telephone.
b) I heard him to talk over the telephone.
15. Я счастлив, что наконец с вами познакомился.
a) I am happy to meet you at last.

b) I am happy to have met you at last.
16. Я хочу, чтобы письмо отправили немедленно.
a) I want the letter to send immediately.
b) I want the letter to be sent immediately.
17. Говорят, что она уже сдала экзамен.
a) She said to pass the exam.
b) She is said to have passed the exam.
18. Я рад, что мне показали город.
a) I am glad to show the city.
b) I am glad to have been shown the city.
19. Известно, что он приезжает на следующей неделе.
a) He is known to come next week.
b) He knows to come next week.
20. Слова, которые нужно запомнить, даны перед текстом.
a) The words to remember are given before the text.
b) The words to have remembered are given before the text.

Gerund.

37. Choose one of the options to translate the sentence.

1. Прекратите бегать!
a) Stop running! b) Stop having run! c) Stop being run!
2. Вы уже закончили чтение этого текста?
a) Have you finished having read this text? b) Have you finished reading this text? c) Finished you reading this text?
3. Она не могла не улыбнуться.
a) She could not help smile. b) She not help smiling.
c) She could not help smiling.
4. Вы не против того, чтобы открыть окно?
a) Would you mind being opened the window?
b) Would you mind opening the window?
c) Would you mind having opened the window?
5. Продолжайте идти в том же направлении.
a) Keep having gone the same direction. b) Keep being gone the same direction. c) Keep going the same direction.

6. Бесполезно ждать его, он не придет.
a) It is no use waiting for him, he will not come.
b) It is no use being waited for him, he will not come.
c) It is no use to wait for him, he will not come.
7. Я с нетерпением жду встречи с вами.
a) I am looking forward to meet you. b) I am looking forward meeting you. c) I am looking forward to meeting you.
8. Профессор настаивал на том, чтобы продолжить эксперимент.
a) Professor insisted on continue the experiment. b) Professor insisted on continuing the experiment. c) Professor insisted on being continued the experiment.
9. Продолжайте говорить.
a) Go on talking. b) Go on to talk. c) Go on having talking.
10. Я очень люблю, когда меня слушают.
a) I like having listened. b) I like being listened to. c) I like listening.

38. Open the brackets using the proper form of Gerund.
1. The machine needs ___ (to clean).
2. The old man could not stand ___ (to tell) what to do.
3. This performance is worth ___ (to see).
4. The child insisted on ___ (to send) home at once.
5. He was angry at ___ (to interrupt) any other moment.
6. I don't remember ___ (to ask) this question by anybody.
7. I don't remember ever ___ (to meet) your sister.
8. She was proud of ___ (to award) the champion's cup.
9. Excuse me for ___ (to break) this beautiful vase.
10. David was very glad of ___ (to find) his notebook.
11. The clothes want ___ (to wash).
12. She accused him of ___ (to steal) her purse.
13. He mentioned ___ (to read) about this in the newspaper.
14. He was very glad of ___ (to help) in the difficulty.
15. The results of the experiment must be checked and rechecked before ___ (to publish).
16. David was tired of ___ (to scold) all the time.

17. They accused him of ___ (to deceive) them.
18. She enjoys ___ (to photograph) because she thinks she is beautiful.
19. She hates ___ (to ignore).
20. This place is worth ___ (to visit).
21. Can you remember ___ (to see) this man before?
22. After ___ (to correct) by the teacher, the student's papers were returned to them.
23. I was surprised at my mother's ___ (to allow) the journey.
24. She denied ___ (to be) at home last night.
25. I do not object ___ (to see) them that evening.
26. She denied ___ (to take) my watch.
27. He was afraid of ___ (to put) into prison.
28. She showed no sign of ____ (to surprise).
29. The girl was proud of ___ (to choose) to represent her college at the coming competition.
30. She said that she knew nothing about the door ___ (to leave) open.
31. Excuse me for ___ (to throw away) your papers.
32. He was afraid of ___ (to bite) by a wasp.
33. He didn't remember ___ (to invite) to the meeting last week.
34. Thank you for ___ (to send) me such beautiful flowers.

39. Use either Infinitive or Gerund of the verb in brackets.

1. When making a report, avoid (to repeat) ___ yourself.
2. His attention was drawn by a colourful advertisement and he stopped (to read) ___ it.
3. Somebody called his name. He stopped (to read) ___ his newspaper and looked around.
4. It isn't too late for him (to start) ___ (to learn) ___ English.
5. After (to complete) ___ the project, he suggested (to celebrate) ___ it in a cafe.
6. Would you like something (to drink) ___?
7. I am very fond of (to walk) ___ by the seaside.
8. It seems to me she doesn't feel like (to do) ___ anything at all tonight.
9. Don't forget (to phone) ___ the doctor tomorrow morning.

10. I will never forget (to talk) ___ to this prominent person.
11. The customs officer made us (to open) ___ our suitcases.
12. We expect our teacher (to explain) ___ this rule to us again.
13. Your fridge badly needs (to defrost) ___.
14. We decided (to buy) ___ a new laptop.
15. Will you let me (to use) ___ your camera?

Participle.

40. Choose one of the options to fill in the gaps.

1. The device ___ will help to detect microwaves.
a) was created b) creating c) creates d) created
2. ___ the article he consulted the dictionary.
a) translating b) was translating c) translate d) translated
3. A ___ kindness deserves no thanks.
a) to force b) was forced c) forcing d) forced
4. The applicants ___ good English have better chances to get a job.
a) speaking b) were speaking c) speak d) spoken
5. Information ___ over the Internet travels from one computer to another.
a) sent b) was sent c) sending d) send
6. A ___ man will catch at a straw.
a) drowning b) to drown c) drowned d) being drowned
7. The information ___ is very valuable.
a) obtained b) was obtained c) has obtained d) obtaining
8. ___ from the very early times people worked with different structural materials.
a) started b) starting c) to start d) have started
9. My mother likes ___ fish.
a) fried b) fry c) was fried d) frying
10. Engineers ___ in one field may collaborate closely with engineers in other fields.
a) were working b) working c) worked d) work
11. Citizens ___ into poverty by unfair government policies will usually support a new candidate.
a) forcing b) to force c) were forced d) forced

12. Today the Internet is a system ___ millions of computers worldwide.
a) connected b) connects c) connecting d) was connecting
13. The design ___ the day before was corrected.
a) finished b) finishing c) was finished d) to finish
14. ___ a gas we turn it into a liquid.
a) compress b) compressed c) compressing d) to compress
15. The substance ___ was made up of two elements.
a) has formed b) was formed c) formed d) forming
16. Young engineers ___ their career usually work under the supervision of experienced specialists.
a) begin b) beginning c) begun d) began
17. A friend in power is a friend ___.
a) was lost b) losing c) lost d) has lost
18. ___ man came to know the structure of matter.
a) to experiment b) experimented c) was experimenting
d) experimenting
19. The answer ___ by the student was not correct.
a) to give b) giving c) given d) was given
20. ___ interested in mechanics, he became an engineer.
a) be b) to be c) been d) being
21. Almost all exams are "___ books" exams.
a) closed b) to close c) closing d) close
22. A word ___ in time may have very important results.
a) spoken b) was spoken c) speaking d) spoke
23. The pizza ___ here is delicious.
a) was made b) made c) making d) makes

41. Choose one of the options to fill in the gaps.
1. The method ___ is simple.
a) describes b) describe c) describing d) described
2. ___ the report at least a dozen times, he knew it almost by heart.
a) having read b) having been read c) read d) being read
3. ___ the results, Greg could take part in the conference.
a) having been obtained b) obtained c) having obtained

d) being obtained

4. ___ a lot of lectures, Alec failed the examination.

a) being missed b) missing c) missed d) having missed

5. The engineers examined the device ___ to establish the cause of the failure.

a) tried b) having been tried c) trying d) being tried

6. ___ of steel and glass, the house looks very modern.

a) being made b) having made c) make d) making

7. On the basis of the newly ___ data it will be necessary to update the report.

a) having processed b) processed c) processing d) being processed

8. The data ___ varied with the calculation method used.

a) being obtained b) obtaining c) obtained d) having obtained

9. Problems ___ university graduates need some counseling.

a) being faced b) faced c) having faced d) facing

10. ___ our work, we went home.

a) having finished b) finished c) having been finished

d) being finished

11. The cars ___ now at our works are very good.

a) being produced b) having been produced c) producing

d) having produced

12. ___ two centuries ago, the house has no lift.

a) having built b) building c) build d) having been built

13. ___ about the new design, he said that it had solved many problems.

a) speaking b) spoken c) having been spoken d) being spoken

14. ___ this problem, we decided to change the design.

a) considered b) having been considered c) being considered

d) having considered

15. A lot of ideas are feeding back from the ___ sciences into the pure science.

a) applied b) having applied c) being applied d) applying

16. The aim of the research is to work out a system ___ high level purification from carbon oxides.

a) guaranteed b) guaranteeing c) having guaranteed
d) guarantees

42. Choose one of the options to fill in the gaps.

1. ___ the necessary results, we stopped our experimental work.
a) having obtained b) having been obtained c) being obtained
d) obtained
2. ___ the programme, he found some errors.
a) debugging b) having debugging c) having been debugged
d) being debugged
3. ___, the device began working much better.
a) repairing b) having repaired c) having been repaired
d) being repaired
4. The ___ composites do not meet modern requirements.
a) existed b) being existed c) having existed d) existing
5. ___ cobalt to electrode materials we can increase their catalytic characteristics.
a) adding b) having added c) added d) being added
6. The persons ___ a committee are required to submit several documents to the Board.
a) having formed b) forming c) being formed d) formed
7. Industries ___ steel and chemicals require very large quantities of raw materials.
a) having produced b) produced c) producing d) being produced
8. A country ___ to limit its population may discourage immigration and encourage emigration.
a) being wished b) having wished c) wished d) wishing
9. With his experience ___, he became wiser.
a) grown b) being grown c) grows d) growing
10. This problem can be solved by creating a metal layer with the ___ characteristics.
a) controlling b) having controlled c) being controlled d) controlled
11. All preparations ___, the installation was put into operation.
a) having made b) being made c) making d) made

12. Chromium ___, the strength and hardness of steel increases.
a) having added b) adding c) added d) been added
13. The article deals with microwaves, particular attention ___ to radio location.
a) paid b) having paid c) paying d) being paid
14. A body can move uniformly and in a straight line, there ___ no cause to change that motion.
a) having been b) been c) being d) had been
15. ___ the possible relationship between capacity and expected output, we now examine the output changes.
a) having been explored b) being explored c) having explored
d) explored

APPENDIX IV. IRREGULAR VERBS

Infinitive	Past Indefinite	Participle II	Translation
be	was; were	been	быть, находиться
bear	bore	born	носить, выносить
become	became	become	становиться
begin	began	begun	начинать(ся)
bind	bound	bound	связывать
bite	bit	bitten	кусать
blow	blew	blown	дуть
break	broke	broken	ломать
bring	brought	brought	принести
build	built	built	строить
burn	burned / burnt	burnt	жечь, гореть
burst	burst	burst	взорваться
buy	bought	bought	купить
catch	caught	caught	ловить
choose	chose	chosen	выбирать
come	came	come	приходить
cost	cost	cost	стоить
cut	cut	cut	резать
deal	dealt	dealt	иметь дело
dig	dug	dug	копать
do	did	done	делать
draw	drew	drawn	рисовать, тащить
dream	dreamed / dreamt	dreamt	видеть сны, мечтать
drink	drank	drunk	пить, выпить
drive	drove	driven	везти, ехать
eat	ate	eaten	кушать, есть
fall	fell	fallen	падать
feed	fed	fed	кормить(ся)
feel	felt	felt	чувствовать
fight	fought	fought	бороться

Infinitive	Past Indefinite	Participle II	Translation
find	found	found	находить
fly	flew	flown	летать
forbid	forbade	forbidden	запретить
forget	forgot	forgotten	забыть
forgive	forgave	forgiven	простить
freeze	froze	frozen	замерзнуть
get	got	got	получить
give	gave	given	давать
go	went	gone	идти, ехать
grind	ground	ground	точить, молоть
grow	grew	grown	расти, выращивать
hang	hung	hung	висеть, повесить
have	had	had	иметь
hear	heard	heard	слышать
hide	hid	hidden	прятать(ся)
hit	hit	hit	ударить
hold	held	held	держать, проводить
hurt	hurt	hurt	ранить
keep	kept	kept	хранить, держать
know	knew	known	знать
lay	laid	laid	класть
lead	led	led	вести
learn	learned / learnt	learnt	учить(ся)
leave	left	left	оставлять, уезжать
lend	lent	lent	давать взаймы
let	let	let	позволять
lie	lay	lain	лежать
lose	lost	lost	терять
light	lit	lit	зажигать, освещать
make	made	made	делать
mean	meant	meant	значить
meet	met	met	встретить

Infinitive	Past Indefinite	Participle II	Translation
pay	paid	paid	платить
put	put	put	класть
read	read	read	читать
ride	rode	ridden	ездить верхом
ring	rang	rung	звонить
rise	rose	risen	подниматься
run	ran	run	бежать
saw	sawed	sawn	пилить
say	said	said	говорить, сказать
see	saw	seen	видеть
seek	sought	sought	искать
sell	sold	sold	продавать
send	sent	sent	послать
set	set	set	ставить, заходить
shake	shook	shaken	трясти
shoot	shot	shot	стрелять
show	showed	showed / shown	показывать
shut	shut	shut	закрывать
sing	sang	sung	петь
sit	sat	sat	сидеть
sleep	slept	slept	спать
slide	slid	slid	скользить
smell	smelled / smelt	smelt	пахнуть, нюхать
speak	spoke	spoken	говорить
speed	sped	sped	ускорять, спешить
spend	spent	spent	тратить
split	split	split	расщепить(ся)
spoil	spoiled / spoilt	spoilt	портить
spread	spread	spread	распространиться
stand	stood	stood	стоять
steal	stole	stolen	украсть
stick	stuck	stuck	приклеить(ся)

Infinitive	Past Indefinite	Participle II	Translation
swim	swam	swum	плыть
take	took	taken	взять, брать
teach	taught	taught	обучать, учить
tear	tore	torn	рвать
tell	told	told	рассказывать
think	thought	thought	думать
throw	threw	thrown	бросать
understand	understood	understood	понимать
wake	woke	woken	просыпаться
wear	wore	worn	носить
win	won	won	выигрывать
wind	wound	wound	заводить (часы), виться
write	wrote	written	писать

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