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Refrigerating engineering

Электронные учебные материалы
по дисциплине «Иностранный язык (английский)» для
специальности 1-36 20 01 «Низкотемпературная техника»

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Электронные учебные материалы предназначены для организации профессионально-ориентированного обучения английскому языку студентов специальности «Низкотемпературная техника». Представленные в пособии задания направлены на освоение профессиональной лексики, развитие навыков разговорной и письменной речи.

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ПРЕДИСЛОВИЕ

Предлагаемые учебные материалы предназначены для организации методического обеспечения обучения по дисциплине «Иностранный язык (английский)» для студентов, обучающихся по специальности «Низкотемпературная техника».

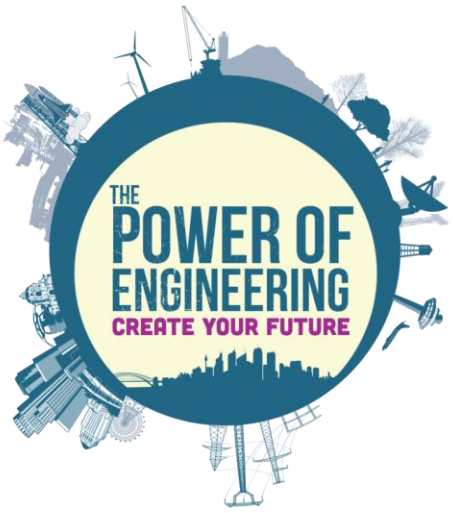
Цель учебных материалов – формирование и развитие языковых и коммуникативных компетенций, необходимых студентам как для изучения специализированных технических текстов, так и для профессионально ориентированного общения.

Материалы содержат двенадцать тематических разделов, контрольные задания, дополнительные тексты и приложения. В каждом тематическом разделе представлены коммуникативные задания, а также дается анализ значений отдельных слов и устойчивых выражений, характерных для английской научно-технической литературы.

Тематика лексического материала разделов подобрана с учетом профессиональной направленности студентов и нацелена на их будущую специальность. Разделы объединяются по тематическому принципу и охватывают такие области знания, как инженерная наука, измерения и вычисления, машиностроительные материалы, история низкотемпературной техники, холодильная техника. Лексический материал направлен на формирование навыков чтения, перевода, аннотирования и реферирования текстов по специальности, а также на развитие умений профессионального общения на английском языке. Раздел контроля знаний включает двенадцать контрольных тестов по основным темам дисциплины и по грамматике английского языка в соответствии с учебной программой.

Большинство текстов пособия заимствовано из источников оригинальной английской литературы, интернета и подверглись определённой адаптации в учебных целях. Большинство разделов имеют задания на развитие навыков письменной речи, и сопровождаются развёрнутыми образцами.

ОГЛАВЛЕНИЕ



Unit 1 ENGINEERING IN OUR LIFE

1. Match the following words (1—3) and their definitions (a—c).

A Practical application of scientific knowledge in the design, construction and control of machines.

B A machine with moving parts that produces energy (heat, electricity).

C A person who designs, builds, maintains engines, bridges, buildings, etc.

1 engine	
2 engineer	
3 engineering	

2. Translate the following sentences into Russian.

1. This car has got a new engine.
2. This bridge is the best example of modem engineering.
3. She's studying engineering at the University.
4. He got an engineering degree last year.
5. There are three main areas in engineering.
6. This is the best engineer in this field.
7. These students are going to become engineers.
8. Something has happened to the engine—it's not working.

3. Read the following headlines (A—D). What do you think each paragraph will be about?

A. Engineers use a method to solve problems.
B. Anyone can use engineering ideas.
C. Engineering is everywhere.
D. Engineering is both theoretical and practical.

4. Read the following text and match the headings (A—D) from Ex. 3 with its parts (1—4):

1. _____

Almost everything we use in modem life is made by engineers. For example, if

a manufacturer **wants a faster car, a smaller personal stereo, or a better pen, they will ask a design engineer to find a practical** solution.

2. _____

Engineers use theory (ideas about engineering) to produce practical answers. The design solution must be a reasonable price, safe, and reliable. A new idea that is **expensive,** dangerous, or doesn't always work is not a good solution.

3. _____

Generally, engineers solve problems in a **methodical** way. Engineers:

— **define** the problem;
— **design** a solution;
— test the solution;
— **evaluate** the solution. If the solution isn't right, the process is repeated. When a good solution is found, the next step is to:
— communicate the solution.

4. _____

This method of problem-solving is useful in **everyday** life. For example, you can use the five steps next time you prepare for a test.

1. Define the problem: I want to pass my test next week.
2. Design a solution: I will study for three hours a day.
3. Test the solution: Study for three hours a day and take the test.
4. Evaluate the solution: Have I passed the test with a good mark? Yes = a good solution. No = a bad solution, so think of a better one.
5. Communicate the solution: Tell your friends about your test-passing technique.

5. Decide if the sentences (1—4) are true (T) or false (F).

1	Lots of things are made by engineers.	T	F
2	Engineering isn't practical.	T	F
3	Engineers must think carefully.	T	F
4	Only engineers can solve problems.	T	F

6. Match the words in bold type with their meanings (1—8) from exercise4.

1 plan	
2 cost much money	
3 a business	
4 answer	
5 careful, step-by-	
6 assess the success	
7 normal	
8 say exactly	

7. Find the English equivalents to the following expressions from the text of exercise4.

• современная жизнь • найти практическое решение
• конкретные (практические) решения • разумная стоимость
•неверное решение • решать проблемы • определить проблему
• разработать решение • провести испытание
•оценить результат • следующий шаг к • повседневная жизнь

8. Match the words with their definitions.

• engineering • solution • to manufacture engineer • to communicate
• methodical • engine • to evaluate • to design

1. A well- organized and careful way of doing something.	
2. A person who designs, builds, maintains engines, bridges, buildings, etc.	
3. To study the facts and then form an opinion about something.	
4. A way of finding the answer to a problem or dealing with difficult situation.	
5. To be in contact with somebody by using different methods of sending information (telephone, radio, voice, gestures, body language, etc.).	
6. A machine with moving parts that produces energy (heat, electricity).	
7. To invent, plan and develop something for a particular purpose.	
8. To make something in large quantities using machines.	
9. Practical application of scientific knowledge in the design, construction and control of machines.	

9. Translate the following sentences into Russian. Translate the idea, not word for word.

1. These goods are made at our factory.
2. Where is the manufacture situated?
3. We don't like the quality of these goods, send them back to the manufacturer.
4. The case is very important for us, so we should find a practical solution immediately.
5. Was it difficult to find a good solution?
6. Your practical solution is quite reasonable.
7. Engineers solve problems in a methodical way.
8. It means that there are several steps in the problem-solving process.
9. At first you should clearly define a problem.
10. It's not sometimes easy to define a problem.

11. I don’t like the way you evaluate the situation.
12. You should be more careful when you try to evaluate something.
13. These goods were produced with the help of modem techniques.
14. The technique of problem-solving process includes five steps.
15. You need to check up the engine.

MECHANICAL ENGINEERING

MY GLOSSARY

mechanical engineering- машиностроение
pressure vessel - камера давления, резервуар высокого давления
computer-aided design - машинное проектирование
computational fluid dynamics - вычислительная гидродинамика
simulation - моделирование; воспроизведение, имитация
computer-aided manufacturing - автоматизированное [компьютеризованное] производство
drafting - черчение, подготовка рабочих чертежей

1. Before you read the passage, try to give extended answers to these questions.

1 What types of problems do mechanical engineers fix?
2 What kinds of computer methods do mechanical engineers use?

If you can’t answer use the information below.

Mechanical engineers fix a wide variety of problems. They are involved in the design and manufacture of industrial plants and machinery, vehicles, engines, ships and many more things. This means they are required to fix problems in all of these areas. If a machine breaks as soon as it is used mechanical engineers will look for solution to stop this happening again.

Mechanical engineers now use a number of computer methods to do their job better. Most modern products are designed with the help of computer aided design (CAD) rather than drafting. The behaviors of these designs are then tested using computer stimulations before they are even built, for instance using computational fluid dynamics. Finally, these designs, once finalized are used as the basis for building the actual parts using computer-aided manufacturing (CAM).

2. Read the page from the website of a mechanical engineering firm. Then, read the summary of the passage. Fill in the blanks using words from the word bank.

At Sharp & Co, we specialize in designing and building **pressure vessels**. We offer many kinds of services.

These include:

Creating a physical **prototype** of systems in the design phase
Creating virtual models of systems with **CAD** (computer-aided design)
Testing conditions with **CFD** (computational fluid dynamics) **simulations**
Drafting of **mechanism**
Building parts to specifications using **CAM** (computer-aided manufacturing)
Studying and testing of **stresses**

Building a pressure vessel system requires expert skill and knowledge. Let our **mechanical engineering** team help build your system today. Please call or email us for more details.

WORD BANK

CAD ***stresses*** ***services*** ***prototypes*** ***CAM*** ***pressure***

Sharp and Co is the company that designs and builds **1** _____ vessels. The company offers a variety of **2** _____ . Its engineers make physical **3** _____ of systems. And they also make virtual models of systems using **4** _____ . They build the parts of the pressure vessels using **5** _____ . They also test for **6** _____ .

3. Match the words (1-5) with the definitions (A-E).

1 _CFD
2 _pressure vessel
3 _CAD
4 _stress
5 _CAM

A - a container that holds liquid or gas
B - the use of computer technology to build machines
C - the use of formulas to study how fluids and gases more
D - using technology to create computer models
E - a force that presses against an object

4. Read a conversation between a customer and an employee of Sharp & Co. Mark the following statements as true (T) or false (F).

Employee: Sharp and Company. How can I help you?
Customer: Hi. I need a custom pressure vessel for a gas line.
Employee: Um, we can build a physical prototype or we can work with a computer model.
Customer: Hmm. What would you recommend?
Employee: Well, computer models are faster. And they let us perform a lot of simulations.
Customer: But you also test physical prototypes, right?

Employee: Yes. But obviously, you can do a lot more with a computer model.
Customer: Okay. Let's talk about that.

1 _ The customer needs a pressure vessel for gas.
2 _ A physical prototype is faster than a computer model.
3 _ The customer chooses the physical prototype.

5 With a partner, act out the roles below. Then switch roles.

USEFUL LANGUAGE: *I need a custom pressure vessel.*
We can … or we can …
What would you recommend?

Student A: You need a pressure vessel. Talk to Student B about: -types of models -recommendations| -testing prototypes
Student B: You work for an engineering firm. Answer Student A's questions.

HISTORY OF ENGINEERING

Read the text and decide if the sentences (1—5) are true (T) or false (F).

1	The invention of a wheel is an example of ancient engineering.	T	F
2	The words "engine" and "engineer" appeared at one and the same time.	T	F
3	The word "engineer" has a military origin.	T	F
4	Engineering and science are two terms (= words) for one and the same thing.	T	F
5	Nowadays engineering is everywhere.	T	F

The *concept* of engineering has existed since ancient times as humans thought up fundamental inventions such as a wheel. Each of these inventions is consistent with the modern definition of engineering, exploiting basic mechanical principles to develop useful tools and objects.

The term *engineering* itself has a much more recent etymology, deriving from the word *engineer*, which itself dates back to 1325, when an *engineer* (literally, one who operates an *engine*) originally referred to "a constructor of military engines". The word "engine" itself is of even older origin, deriving from the Latin "*ingenium*", meaning "innate quality, especially mental power, hence a clever invention".

Nowadays engineering is a large field which deals with problem-solving process for the good of mankind. It is closely connected with the science, but it's not the same. It is in close interaction with such disciplines as medicine, biology, art, computing and many other social areas of life.

WHAT IS ENGINEERING?

Read the text and fill **in the gaps with the following words.**

• engineering • engineer • mathematical • design • discipline

Engineering is the (*1)* ……, art and profession of using technical, scientific, and (2) ……. knowledge to design and put into practice materials, structures, machines, devices, systems, and processes that safely realize a desired objective or invention.

The American Engineers' Council for Professional Development (ECPD) has defined (*3)* ……. as follows: "The creative application of scientific principles to (*4)* ……. or develop structures, machines, apparatus, or manufacturing processes and to forecast their behavior under specific operating conditions."

One who practices engineering is called an (5) ……. . Engineers may have more formal designations such as Professional Engineer, Chartered Engineer, Incorporated Engineer, or European Engineer. The broad discipline of engineering includes a range of more specialized sub-disciplines. Each of these sub-disciplines has a more specific emphasis on certain fields of application and particular areas of technology.

• knowledge • serviceability • mathematics • produce • design • solutions

Engineers apply the sciences of physics and (6) ……. to find suitable (7) ……. to problems or to make improvements to the status quo. More than ever, engineers are now required to have *(8)* ……. of different relevant sciences for their design projects, as a result, they have to keep on learning new material throughout their career.

If multiple options exist, engineers think of different design choices and their advantages (or pluses) and choose the solution that best matches the requirements. The most important and unique task of the engineer is to identify, understand, and forecast the possible future result of a design in order to (9) …… a successful product.

It is usually not enough to build a technically successful product; it must also meet further requirements.

Engineers should foresee different available resources, physical, imaginative or technical limitations, flexibility for future modifications and additions, and other factors, such as requirements for cost, safety, marketability, productibility, and *(10)* …… . By understanding these factors, engineers *(11)*…… specifications for the limits within which a successful system may be produced and operated.

Answer the following questions about the text.

1. What is engineering?
2. What does the word “engineer” mean?
3. Why do engineers have to keep on learning all their lives?
4. What is important in engineering in order to produce a successful product?

PROBLEM-SOLVING PROCESS

Read the text and fill in the gaps with the following words:

• discipline • Testing • solutions • knowledge
• evaluate • find • known

Engineers use their (*1*) ……. of science, mathematics, and appropriate experience to *(2)* ……. suitable solutions to a problem. Engineering is considered a branch of applied mathematics and science. Creating an appropriate mathematical model of a problem allows them to analyze it (sometimes definitively), and to test potential (*3*) ……. .

Usually there may be several reasonable solutions, so engineers must (4) ……. the different design choices on their merits and choose the solution that best meets their requirements.

Engineers typically attempt to predict how well their designs will perform to their specifications prior to full-scale production. They use, among other things, prototypes, scale models, simulations, destructive tests, nondestructive tests, and stress tests. (5) ……. ensures that products will perform as expected.

Engineers as professionals take seriously their responsibility to produce designs that will perform as expected and will not cause unintended harm to the public at large. Engineers typically include a factor of safety in their designs to reduce the risk of unexpected failure. However, the greater the safety factor, the less efficient the design may be.

The study of failed products is (6) ……. as forensic engineering, and can help the product designer in evaluating his or her design in the light of real conditions. This (*7)* ……. is of greatest value after disasters, such as bridge collapses, when careful analysis is needed to establish the cause or causes of the failure.

Answer the following questions about the text.

1. What should an engineer do if there are many possible solutions to a problem?
2. How can possible solutions be evaluated?
3. Why is testing so important?
4. Does a high degree of safety always mean the efficiency of the design?

Unit 2 REFRIGERATING ENGINEERING

MY GLOSSARY

branch – отрасль
versatile – разносторонний
capacity – мощность
mixture – смесь
nitrogen – азот
load – нагрузка
perishable – скоропортящийся
shipment – отгрузка, перевозка товаров
manufacture – производство
confectioneries – кондитерские изделия
dyes – красители
gasoline – бензин
lubricants - смазочные материалы
preliminary – предварительный
processing – обработка, переработка продуктов
heavy-duty – высокопроизводительный

Refrigerating Engineering the *branch* of engineering that deals with the production and use of refrigeration in the temperature range from 10° to – 150°C. The production of temperatures below – 150°C is the task of cryogenic engineering.

Refrigerating machines, whose refrigerating *capacities* range from several hundred watts to a few megawatts, are the most widely used and *versatile* sources of refrigeration in engineering. Freezing *mixtures*, water ice, dry ice, and liquefied gases—such as liquid *nitrogen*—are also used to produce temperatures below the environmental temperature. Thermoelectric cooling is employed for low refrigeration loads.

Refrigeration is widely used in the food industry for the cooling, freezing, and storage of *perishable* food products. In most cases, the *shipment* of perishable products also requires the use of refrigeration. In addition, refrigeration is required for the production of water ice and dry ice, as well as in the *manufacture* of, for example, ice cream and certain confectioneries.

The modern chemical and petroleum-refining industries also use refrigeration. In the chemical industry, refrigeration is employed in the synthesis of ammonia and *dyes*, for the liquefaction and separation of gas mixtures, and for the precipitation of salts from solutions. In the petroleum-refining industry, refrigeration is required in the production of, for example, high-octane gasolines and certain grades of lubricants. Refrigeration has been used extensively in the gas industry, for example, to liquefy natural gas and to remove condensable components from natural gas during *preliminary processing*. The refrigerating systems for the chemical, petroleum-

refining, and gas industries are often *heavy-duty* systems, with capacities of up to a few megawatts, and produce cooling over a very wide temperature range.

Refrigeration is also used in machine building (for example, for contraction fits), construction, and medicine; it is also employed in such activities as the construction of artificial skating rinks for year-round use and the desalination of seawater.

In the overwhelming majority of cases, air conditioning in public, industrial, and residential buildings is carried out by means of refrigerating machines, which are used both to reduce the temperature of the conditioned air and to dehumidify the air.

1. Read the sentences. Are they true of false to the text.

1. Refrigerating Engineering deals with the use of refrigeration in the temperature range from 5° to –18°C.
2. *Capacities* refrigerating machines range from several hundred watts to a few megawatts.
3. Freezing *mixtures*, dry ice, and liquefied gases are used to produce temperatures below the environmental temperature.
4. Thermoelectric cooling is employed for high refrigeration loads.
5. Refrigeration is required in the *manufacture* of ice cream and certain confectioneries.
6. The modern chemical and petroleum-refining industries don't use refrigeration.
7. In the chemical industry, refrigeration is employed for the liquefaction and separation of gas mixtures.
8. Refrigeration has been used extensively in the gas industry to remove condensable components from natural gas.
9. The refrigerating systems for the chemical, petroleum-refining, and gas industries produce cooling over a very wide temperature range.
10. Refrigeration is also used in polygraphic industry, construction, and medicine.
11. Refrigerating machines, which are used both to reduce the temperature of the conditioned air and to humidify the air.

2. Use the given prompts to make true sentences

shipment of perishable products	refrigeration is employed	in the production of certain grades of lubricants
in the chemical industry	use refrigeration	in the synthesis of ammonia
in the petroleum-refining industry	refrigeration is required	to preserve goods
in the gas industry	refrigeration is used	for contraction fits
in medicine		for storage of vaccines
in machine building		to remove condensable components

3. Find synonyms

1. perishable	a. volume
2. versatile	b. varied
3. capacity	c. easily spoiled
4. mixture	d. consignment
5. load	e. production
6. modern	f. up-to-date
7. shipment	g. division
8. In addition	h. tint
9. manufacture	i. amount
10. processing	j. treatment
11. branch	k. combination
12. dyes	l. extra

4. Find in the text English equivalents for the next word partnerships

Синтез аммиака, термоэлектрическое охлаждение, подавляющее большинство, криогенная техника, универсальные источники, для осушения воздуха, сжиженные газы, жидкий азот, ниже температуры окружающей среды, нефтеперерабатывающая промышленность, для снижения температуры, высокооктановый бензин, холодильная техника, охлаждение широко используется, в таких видах деятельности как, сжижение и разделение, широкий диапазон температур, осаждение солей из растворов, высокопроизводительные системы, кондитерские изделия, смазочные материалы.

REFRIGERATION AND AIR CONDITIONING

MY GLOSSARY

storage - сохранение, хранение
cover - крышка, колпак, колпачок
requirements - требование; необходимое условие
construction - сооружение, строительство, стройка
commission – ввод в эксплуатацию
report - сообщать, рассказывать; давать отчёт, докладывать
maintain - обслуживать; содержать в исправности
fault find – находить дефекты
attribute - отличительная черта, характерное свойство; неотъемлемый признак
practitioner – специалист практик
reliable – надежный
installation - установка; сборка; инсталляция

crucial - ключевой; критический, решающий

substandard - нестандартный, с отклонениями от стандарта; некондиционный; не отвечающий техническим условиям

undermine - подрывать, расшатывать, разрушать, подтачивать

issue - проблема; дело; тема; пункт

resolve - разрешать (сомнения и т. п.); решать (задачу, проблему и т. п.)

wellbeing - благополучие; благосостояние

scope - масштаб, размах; сфера, область действия

impact - сильное воздействие; влияние

A refrigeration and air conditioning engineer works on commercial, residential, public and industrial projects, including transportation and *storage*. There is a direct relationship between the nature and quality of the product and service required and the resulting cost and price; therefore this branch of engineering *covers* a wide range of products and services. It is also essential for the refrigeration and air conditioning engineer to meet high and growing standards of service in order to comply with the *requirements* of the customer and maintain and grow the business. Refrigeration and air conditioning is closely associated with other parts of the *construction* and transportation industries at all stages, and is equally affected by rapid change in these sectors, including growing environmental trends and requirements.

The refrigeration and air conditioning engineer generally works inside domestic, commercial or public buildings during and after construction and production, and on projects of all sizes and types. He or she will plan and design, install, test, *commission*, *report*, *maintain*, fault find and repair systems to a high standard. Work organization and self-management, communication and interpersonal skills, problem solving, flexibility and a deep body of knowledge are the universal *attributes* of the outstanding *practitioner*.

Whether the refrigeration and air conditioning engineer is working alone or in a team the individual takes on a high level of personal responsibility and autonomy. From ensuring a safe and *reliable* installation and maintenance service, in accordance with relevant standards, through to diagnosing malfunctions, upgrading and commissioning, and fault finding and correction, the skills of concentration, precision, accuracy and attention to detail at every step in the process are *crucial*. Mistakes may be very expensive and damaging, while substandard work will

significantly undermine the performance of the building or equipment that it is intended to serve.

In broad terms, the most talented and skilled refrigeration and air conditioning engineers will work on larger and more complex projects, and the most challenging refrigeration and air conditioning issues. These personnel are most likely to help lead the industry relating to climate and environment. Affecting economies and community wellbeing and development, including health, the modern refrigeration and air conditioning engineer has immense scope for make a positive impact locally and globally.

1. Answer the following questions.

1. What projects does a refrigeration and air conditioning engineer work on?
2. Why does this branch of engineering cover a wide range of products and services?
3. Why is it essential for the refrigeration and air conditioning engineer to meet high standards of service?
4. Is refrigeration closely related with the construction and transportation industries?
5. What is refrigeration and air conditioning affected by?
6. Where does the refrigeration and air conditioning engineer generally work?
7. What will the refrigeration and air conditioning engineer have to do?
8. What are the universal attributes of the outstanding practitioner?
9. What does the engineer have to ensure?
10. How can the engineer maintain relevant standards?
11. What is crucial in the process his work?
12. What issues engineers help resolve for the industry?
13. What scope of impact do refrigeration and air conditioning engineers have?

2. Match the words from the text with their corresponding definitions.

commercial	to do what you have to do or are asked to do
residential	a feeling of being comfortable, healthy, and happy
industrial	a particular type of help or work that is provided by a business to customers, but not one that involves producing goods
product	something that is grown or made in a factory in large quantities, usually in order to be sold
service	relating to industry or the people working in it
comply	concerning business, marketing
customer	the quality of being very exact or correct
challenging	difficult in an interesting or enjoyable way
skilled	someone who has the training and experience that is needed to

	do something well
wellbeing	relating to homes rather than offices or businesses
precision	someone who buys goods or services from a shop, company etc.

3. Make word partnerships.

1. resulting	a. installation
2. environmental	b. impact
3. public	c. scope
4. reliable	d. cost
5. maintenance	e. service
6. diagnose	f. malfunctions
7. expensive	g. attributes
8. positive	h. trends
9. immense	i. buildings
10. universal	j. mistakes

4. Fill in the correct prepositions, translate the phrases, then choose any five word combinations and make up sentences of your own.

Systems …….. a high standard, …….. every step, in accordance …….. relevant standards, attention …….. detail, …….. broad terms, work …….. complex projects, …….. resolving issues, relationship …….. the nature and quality of the product, it is essential …….. the engineer, …….. all stages, in order …….., comply …….. the requirements, is closely associated …….., affected …….. rapid change, a wide range …….. products.

5. Fill in the gaps with the words from the table.

thermodynamics designing refrigerators mechanical manufacturers market problems engineers residential restaurant knowledge trucks interest procedures

1)…….. may seem like a mundane fixture of everyday life, but refrigeration engineering requires a well-rounded skill set and solid grasp of 2)…….. With a four-year bachelor's degree in 3)…….. engineering, potential refrigeration engineers can enter the job 4)…….. to design, create, and refine refrigeration systems for a wide variety of uses.

Refrigeration engineering involves planning, 5)……., and project management of refrigeration systems for commercial 6)…….. Refrigeration 7)…….. are expected to develop designs for, oversee fabrication of, and troubleshoot 8)…….. with complex refrigeration systems for 9)…….. and industrial use, including 10)…….. units,

refrigerated healthcare equipment, and insulated 11)…….. and trailers. For those with 12)…….. of thermodynamics (the use and transfer of energy), an 13)…….. in hands-on engineering work and a respect for safety 14)……., a career in refrigeration engineering may be the perfect fit.

6. We all work or will work at our jobs with many different kinds of people. In your opinion, what some important characteristics of a co-worker (someone you work closely with) are? Use reasons and specific examples to explain why these characteristics are important. You should write at least 250 words.

Model answer:

A large number of people spend most of their time at work. Our life is divided into three equal parts: 8 hours - sleep, 8 hours - work, 8 hours - family time. So, in most cases, one's co-worker plays an important role in one's life. In my opinion, the essential characteristics of a co-worker are the following.

First of all, a person who works closely with me must like his job. I think it is very important for a person to feel satisfaction with his job. My husband is a software developer. He is fond of his job and people enjoy working with him because they see how much energy he puts into his job. Secondly, my co-worker must be persistent and never give up. I like when people who came across a problem try to solve it, find a good decision instead of looking for another person to hand it over. Another important aspect of this is that a good worker should always ask himself "What can be improved?" and suggests new solutions.

In addition, he must be a good team player. In the modern world good communication skills and the ability to work in a team are among the common position requirements. Personally, I think it is great to help each other, share new ideas, develop new solutions, etc. It helps create a team spirit and improve labor productivity. Finally, my co-worker must be punctual. He or she should finish the job on time. I think that it is unacceptable to make the rest of a team wait while a person finishes his or her job. Also, my "ideal co-worker" should always be ready to offer his or her help and be supportive. To summarize, I think if a co-worker possesses all of these qualities mentioned above he can make work with him really enjoyable and productive.

Unit 3 NUMBERS AND CALCULATIONS

MY GLOSSARY

metric measurements - метрические измерения
imperial – английская, имперская
product specifications - характеристики продукта
whole numbers - целые числа
decimal numbers - десятичное число
nought point - ничто , нуль
negligible – незначитльный
fraction – доля
one hundredth – одна сотая
one thousandth – одна тысячная
rounding error – ошибка при округлении
square – квадрат(геометрическая фигура) , квадрат(степень числа)
multiplied by – умноженный на
equals – равняется
the square of – квадрат числа
4 times 4 is – четыре умножить на четыре
the sum of – сумма (каких-либо чисел)
add 16 to 9 – к 16 прибавить 9
the square root of – квадратный корень (из числа)
added together – сложенные (вместе числа)
subtract one from the other – вычесть одно число из другого
25 minus 16 (25 less 16) – 25 минус 16
divide that by – разделить число на (другое число)

DECIMALS AND FRACTIONS

A manufacturer is thinking about giving both *metric measurements* (for example, millimeters) and *imperial* measurements (for example, inches) in its product specifications. One of the company's engineers is giving his opinion on the idea at a meeting.

'One problem is, when you convert from metric to imperial you no longer have whole numbers - you get long decimal numbers. For example, one millimetre is nought point nought three nine three seven inches as a decimal. So to be manageable, decimals have to be rounded up or down. You'd probably round up that number to two decimal places, to give you zero point zero four. Now, you might say the difference is negligible - it's so small it's not going to affect anything. But even if it's just a tiny fraction of a unit - one hundredth of an inch (1/100), or one thousandth of

an inch (1/1000) - and those numbers are then used in calculations, the rounding error can very quickly add up to give bigger inaccuracies.'

1mm = 0.03937 inches ≈ 0.04 inches

Addition, subtraction, multiplication and division

During a TV programme about garden design, the presenter is explaining the calculations required to make a large setsquare which can be used for setting out.

To make one of these, you need To use Pythagoras's Theorem. So, a quick geometry lesson. Measure a length of timber for one of the sides adjacent to the right-angle. I've made -this b feet long. Then square that number — 3 multiplied by 3 equals 9. Then do the same with the other side adjacent to the right-angle. I've made this one 4 feet long. Work out the square of that. So, 4 times 4 is 16. Then work out the sum of those two numbers — so if I add 16 to 9 ... 16 plus 9 is 25. Then, calculate the square root of that. The square root of 25 is 5. That means the longest side — the hypotenuse — needs to be 5 feet long. And it doesn't matter what length you make the two adjacent sides — if the square of the hypotenuse is equal to the square of each of the adjacent sides, added together, you'll have a perfect right-angle.

A large setsquare for setting out

Now you can also start by making the hypotenuse, square the length of that, then make one of the other sides, square the length of that, and then subtract one from the other, for this example, that would be 25 minus 16. So, 25 less 16 is 9. And the square root of 9 is 3, which gives me the remaining side. Alternatively, you can make both the adjacent sides equal — make them the same length. So, take the square of the hypotenuse, which is 25, divide, that by 2, which is 12.5, then work out the square root of 12.5, which ... requires a calculator! That's why it's easiest to use a 3-4-5 triangle, like this, which conveniently works with whole numbers. And that's also why I'm measuring in Imperial, because 3 feet by 4 feet by 5 feet is a practical size to work with.

1. Match the Arabic and Roman numbers.

• 40 • 500 • 1000 • 10 • 100 • 50 • 1 • 5 • 800 • 60
• M • I • D • C • L • LX • V • XL • X • DCCC

2. Which numbers are used in mathematics? Why?

3. Match the numbers below with the words in the table.

Note: In English, you write a point (.) not a comma (,) in decimal numbers. You say the numbers after the point separately, for example "23.34" is pronounced as "twenty-three point three four".

• $^1/_2$ • 1,000,000 • 2.5 • 327 • 2,580 • 0 • $^1/_4$ • $^2/_3$ • 3.6%

1	two thirds	
2	three point six per cent	
3	a quarter	
4	zero/nought	
5	two point five	
6	one million	
7	two thousand, five hundred and	
8	three hundred and twenty-seven	
9	a half	

4. Read the text and fill in the gaps with the following words or numbers.

• half • -5° • -40° • 88% • hundreds
• 200 • 14,000 • 1989 • 4,000 • 5,000 m^2

THE JUKKASJARVI ICEHOTEL

The Jukkasjarvi Icehotel in Sweden is an interesting and cold place for a holiday. It started life as an igloo (a small house made of snow) at an art exhibition in *(1)* …… .

(2) …… of people visited the exhibition and some even slept there, so the builders decided to make it a hotel.

The Icehotel is open for less than (*3*) ……. of the year. Every May it melts and every November it is rebuilt. It now measures *(4)* ……. and it needs (5) ……. tons of ice and 30,000 tons of snow to build it. This actually means that it is more than (*6*) ……. snow.

The temperature inside the hotel is usually about *(7)* ……. . Outside in Jukkasjarvi itself the temperature can be much lower even as low as (*8*) ……. !

Last year more than *(9)* ……. visitors travelled *(10)* ……. km north of the Arctic Circle to sleep in thermal sleeping bags. They got a cool reception!

5. Write the numbers in words.

1. 1.793.....
2. 1/100 mm .... millimetre
3. 1/1000 mm ..... millimetre
4. 0 .....or.....

6. Complete the descriptions of the numbers using the words given above.

1. 0.25 = 1/4 The first number is a decimal, and the second is a ……. .
2. 0.6368 ≈ 0.637 The second number is ……. to three ……. ……. .
3. 7.5278 ≈ 7.5 The second number is ……. to one ……. ……. .
4. 8, 26, 154 The numbers aren't fractions or decimals. They're ……. numbers.
5. Error: 0.00001% The error is so small that it's ……. .
6. 0.586 kg x 9,000 = 5,274 kg
0.59 g x 9,000 = 5,310 kg This difference is the result of a ……. ……. .

7. Complete the calculations using the words in the box. Sometimes there is more than one possible answer. Look at the text "Addition, subtraction, multiplication and division" to help you.

Divided minus plus square root subtract times Less multiplied square squared sum

1. 14 + 8 = 22 Fourteen ……. eight equals twenty-two.
2. 100 x 20 = 2,000 One hundred ……. twenty is two thousand.
3. 7 x 11 = 77 Seven ……. By eleven equals seventy-seven.
4. 400 ÷ 8 = 50 Four hundred ……. by eight equals fifty.
5. 95 + 2 = 97 The ……. of ninety-five and two is ninety-seven.
6. $8^2 = 64$ The ……. of eight is sixty-four.
7. 50 - 30 = 20 If you ……. thirty from fifty, it equals twenty.
8. √100 =10 The ……. of a hundred is ten.
9. $11^2 = 121$ Eleven ……. is a hundred and twenty-one.
10. 48 - 12 = 36 Forty-eight ……. twelve equals thirty-six.

8. Use your knowledge of basic geometry to complete the sentences. Use one or two words from the text "Addition, subtraction, multiplication and division" to fill each gap.

1. The ……. of the three angles in a triangle equals 180 degrees.
2. The area of a circle is equal to the ……. of its radius ……. 3.14.

3. The area of a right-angle triangle is equal to the length of one adjacent side, ……. the length of the other adjacent side, ……. two.
4. The length of each side of a square is equal to the ……. of the square's area.
5. If each angle in a triangle is 60°, then the lengths of its sides are ……. .

9. Write down a few examples of some calculations you did recently, or ones that you do frequently, and then explain them.

10. Write the following numbers correctly.

1 thirty-four point five per cent	
2 six point nine seven	
3 one third	
4 four thousand five hundred and sixty-seven	
5 three thousand nine hundred and fifty-eight	
6 fifty-five per cent	
7 a half	
8 seven point six five	

11. Search the Internet and find the answers to the following questions.

(a) Who introduced Arabic numbers to European maths?
(b) Who developed the idea of "zero"?

12. Read the following text.

POPULATION IN THE UK

There were (1) *twelve point one million* children aged under *(2) sixteen* in *(3) two thousand*: *(4) six point two million* boys and (5) *five point nine million* girls. This is fewer than in (6) *nineteen seventy-one*, when there were (7) *fourteen point three million* children.

In (6) *two thousand*, (9) *thirty percent* of children in the UK were under five, (*10) thirty-two per cent* were aged five to nine years and (*11*) *thirty- eight per cent* were aged ten to fifteen. These proportions were similar in the *(12) nineteen seventies.*

13. Choose the correct answers to the questions below.

1. Where is the text from?
(a) A government information leaflet.
(b) A teenage magazine.

2. What is the text about?

(a) How many children watch TV in Britain.

(b) How many children there are in Britain.

3. Who is this information useful for?

(a) People planning educational resources.

(b) Teachers and parents.

14. Read the text above again and write the numbers in italics from the text in figures.

1	12.1 m	7	
2		8	
3		9	
4		10	
5		11	
6		12	

15. Read the text again and decide if the sentences below are true (T) or false (F).

1 There are more boys than girls in Britain.	T	F
2 The total number of children has increased since a census in 1971.	T	F
3 In 1971 the same percentage of children were under five.	T	F

Unit 4 AREA, SIZE AND MASS

MY GLOSSARY

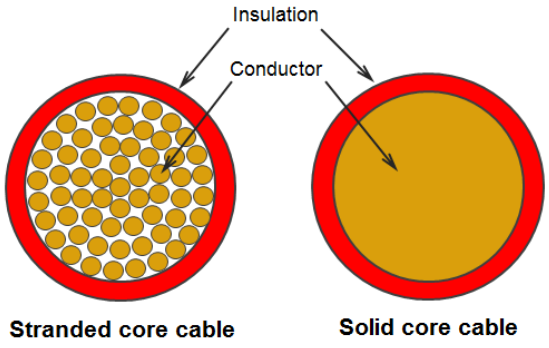
area – площадь
square millimetres – квадратные миллиметры
cross-sectional area – площадь поперечного сечения
millimetres – миллиметры
surface area – площадь поверхности
small-section – малого сечения (проводник)
large-section – большого сечения
weigh – вес
mass – масса
gravity – сила тяжести
weightless – невесомый
volume – объем, масса
density – густота, плотность, концентрация
kilograms per cubic metres – килограмм на кубический метр
per unit of volume – за единицу объема
lightweight – легковесный, нетяжелый (имеет малый вес)
dense – плотный, сжатый , густой

AREA

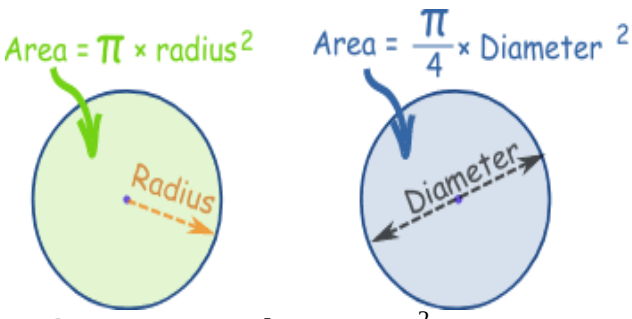
The textbook extract below looks at different aspects of *area*.

DIMENSIONS OF WIRES AND CABLES

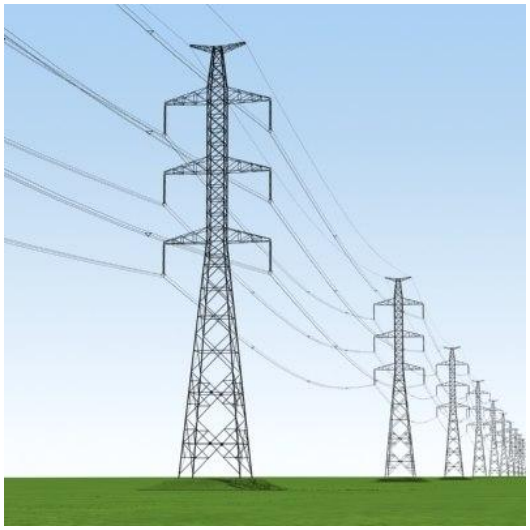
The sizes of electrical wires are specified by a number which gives an area in *square millimetres*. For example, in a home, a 6 mm^2 wire may be specified to supply an electric oven in a kitchen. This number gives the *cross-sectional area* of the conductor. Increasing the cross-sectional area allows the conductor to carry more current safely, without overheating.



Cross-section of 6 mm^2 wire



Cross-sectional area = πr^2
$=3.14 \times 1{,}38^2 = 6$



In high-voltage power lines, it is not only the cross-sectional area of conductors that is important, but also their **surface area** - the amount of surface that is in contact with the air, to allow cooling. Therefore, instead of using single cables with large sections for each conductor, power lines often use groups of two, three or four **small-section** cables, to give more surface area than a single, **large-section** cable.

Weight, mass, volume and density

In everyday language, the term **weight** means how heavy things are (how much they **weigh**), and **grams** and **kilograms** are used as units of weight. But in physics and in engineering, grams and kilograms are units of **mass.** Whether an object is on earth - where it is subjected to **gravity** (the pull of the earth) - or floating **weightless** in space, its mass is always the same. The mass of an object depends on:

■ **the volume** of the object, measured in **cubic metres** (m^3) - as an object's volume increases, its mass increases

■ **the density** of the object, measured in **kilograms per cubic metre** (kg/m^3) - as density increases, mass per **unit of volume** increases.

The mass of an object is the object's volume multiplied by its density. The weight of an object is the force exerted on the object's mass by gravity.

Some materials are very **dense**, and therefore very heavy. An example is lead (Pb), which has a density of 11,340 kg/m^3. Other materials, such as expanded polystyrene (which can have a density as low as 10 kg/m^3), are very **lightweight.**

1. The component below is made of mild steel. It has a radius of 40 mm and it is 1,200 mm long. Complete the calculations using the words in the box.

cross-sectional area	density	mass	surface area	volume

(1) ..... of mild steel: 7,850kg/m^3

(2) . ..... : $\pi r^2 = 3.14 \times 40^2 = 5\,024 mm^2 = 0.005024 m^2$

(3) ..... : $0.005024 m^2 \times 1.2 m = 0.0060288 m^3$

(4) ..... : $0.0060288 m^3 \times 7{,}850 kg/m^3 = 47.32608 kg$

Circumference: 2rrr = 3.14 x 40mm = 251 mm = 0.251 m

Total [5]....to be painted: $0.251 m \times 1{,}2 m + 0.005 m^2 + 0.005 m^2 = 0.311 m^2$

2. Now write all the words for the unit abbreviations in the calculation 1 above. The first one has been done for you.

1 m *metre*	4 m^2	7 kg/m^3
2 mm	5 m^3	
3 mm^2	6 kg	

3. Complete the extract from an article about satellite design using the words in the box.

cubic	gravity	lightweight	mass	square	weigh	weightless

Satellites need to be designed to cope with two very different phases: deployment (the journey into space by rocket) and operation (working in space). For the first phase, engineers are faced with the problem that every (1) ……. metre of volume taken up within the rocket will add millions of dollars to its ticket into space. And each extra gram of (2) ……. added to the craft will increase the fuel needed to propel it upwards against the pull of (3) ……. That extra fuel, in turn, will (4) ……. a little more, further adding to the total weight of the craft. With the cost of kilograms so high, the satellite must therefore be as (5) ……. as possible. In the second phase, with the orbiting satellite now (6) ……., its mass is practically irrelevant. As for the amount of space occupied, the situation is completely reversed. The satellite's solar panels, which transform sunlight into battery power, must unfold to cover as wide an area as possible - opening out to cover an area of several (7) ……. metres - in order to maximize their exposure to the sun.

4. Talk about different materials that are suitable for specific engineering uses due to their density - because they are either very dense, or very lightweight.

Unit 5 MEASURABLE PARAMETERS

MY GLOSSARY

capacity – мощность, нагрузка; производительность
supply – снабжение, поставка
period – период; промежуток времени, срок
consumed – потреблять, расходовать
cumulative – накопленный, суммарный
average – средний
consumption - потребление, расход
rate – скорость; частота; интенсивность
constant – постоянная величина, константа
averaged out – вычислить среднюю величину; составить среднюю величину
demand – потребность; требование, потребление, расход
fluctuations – флуктуации; колебания; пульсация; отклонение
peak times – время пика (импульса)
off-peak times – периоды относительного спада
meet demand – удовлетворять спрос/требования
peak – пик, высшая точка, (резкий) максимум
run to capacity –
spare capacity - резервные производственные возможности
inefficient – плохо действующий, неэффективный; неподходящий
input – ввод; подвод; подача; загрузка
output – производительность; выработка; выпуск
loss – потеря
efficient – действенный, результативный, эффективный
gain – увеличение; усиление;
efficiency – эффективность, результативность, действенность

Supply, demand and capacity

The article below is from the technology section of a business magazine.

Calculating the *capacity* of an electricity grid - the amount of energy it needs to *supply* to users - might seem simple. Just add up the power supplied over a given *period* of time to give the total amount *consumed* by users. Then, divide the *cumulative* amount of power used during the whole period by the number of hours in the period. The result is an *average* level of *consumption* per hour. But there's one problem with this method - and it's a major one.

The *rate* of power consumption - the amount that's being consumed at a particular moment - is not *constant*. In other words, consumption does not stay at the same level all the time. So electricity *supply* requirements cannot simply be *averaged out* over time. People use more power at certain times of day, and less at other times, which

means that *demand* for power *fluctuates* significantly. Generally, it rises to a maximum in the evening (*peak* demand is at evening mealtimes), and falls to its lowest levels during the night. These *fluctuations* are so big that at *peak times* consumption can be twice as high as it is during *off-peak times*. Clearly, the grid needs to have sufficient capacity to *meet demand* when consumption *peaks*. But since each peak is brief, the grid will only *run to capacity* - at or close to its maximum capability - for a few moments each day. This means, most of the time, it has significant *spare capacity.*

Input, output and efficiency

Power lines and transformers are relatively *inefficient,* wasting energy - mainly by giving off heat. As a result, there is a difference between *input* - the amount of energy put into the grid by power stations, and *output* - the amount used by consumers. On a typical grid, the difference between input and output is about 7% - there is a 7% energy *loss*. But if electricity is generated at the place where it's consumed, and not transmitted through long-distance power lines, this loss can be avoided. Consequently, locally produced electricity is more *efficient* than grid-supplied power, as there is a *gain* in *efficiency* of around 7%.


Photovoltaic solar panels

One way to produce power locally is with photovoltaics (PVs) - often called solar panels. However, many PV installations are still connected to the electricity grid. This means that when there is *surplus* power - when electricity is being produced by the solar panels faster than it is needed in home - it is fed into the grid. If consumption *exceeds* production - if electricity is being used in the home faster than the solar panels can produce it - then power is taken from the grid. Homes with low consumption may therefore become *net* producers of power, producing more electricity than they consume.

1. An engineer is talking to a colleague about the design of a fuel tank for a water pump. Complete the explanation using the words in the box.

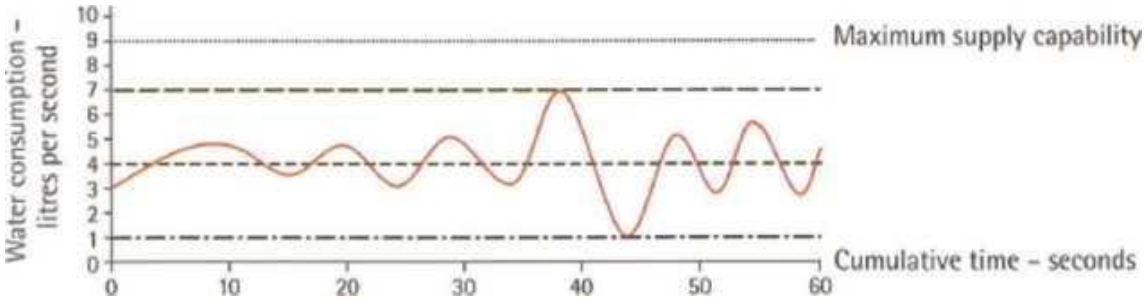
average	constant	consumption	duration
capacity	consume	cumulative	rate

Fuel (1) ……. -for this engine is about- l.5 litres per hour. Of course, sometimes it'll (2) ……. a bit more, sometimes a bit less, depending on the workload. But 1.5 is an (3) ……. figure. And let's say the (4) ……. of a work shift is 8 hours. The pump will have to be stopped occasionally, to clean the intake filter, so it won't be 8 hours of (5) ……. running. But we'll say 8 hours, to be on the safe side. So 8 hours of running at a (6) ……. of 1.5 litres per hour gives 12 litres of (7) …… consumption

over a shift. So if we want the pump to have sufficient fuel autonomy for an 8-hour shift, the (8) …… of -the fuel tank needs to be 12 litres, minimum.

2. The graph below shows water consumption in a washing process at a manufacturing plant. Write figures to complete the comments.

1. Water consumption fluctuated between ……. and ……. litres per second.
2. Averaged out over the period shown, consumption was roughly …… litres per second.
3. Consumption peaked at a rate of ……. litres per second.
4. If the process ran to capacity, it could use water at a rate of ……. litres per second.
5. When consumption peaked, the process had spare capacity of ……. litres per second.



3. Choose the correct words from the brackets to complete the explanations from a guided tour of a manufacturing plant.

1 A lot of heat is generated in this part of the process. And all of that (input / output) is recycled - it provides a (demand / supply) of heat for the next stage of the process. So it's quite an (efficient / inefficient) system.

2 Sometimes, there's (insufficient / surplus) heat, and it can't all be recycled. At other times there isn't quite enough recycled heat to keep up with (peak / off-peak) demand for heat energy further along the process.

3 Some material is lost in the washing process, but the mass of water absorbed is greater than the mass of material lost. So there's a net (loss / gain) in total mass.

4. Think of an energy-consuming appliance you're familiar with. Imagine you are starting a project to redesign it, in order to improve its efficiency. Answer the following questions:

- How much energy does the appliance consume? Is consumption constant or fluctuating? Describe any fluctuations, in terms of average and peak consumption.
- How efficient is the appliance? What are the main reasons for inefficiencies? What are your first thoughts on how efficiency could be improved?

Unit 6 MATERIALS AND THEIR PROPERTIES

1. Do you know the following materials? Match the materials to their definitions below.

• glass • plastic • metal

1. A type of solid substance that is usually hard and shiny, that conducts heat and electricity.	
2. Hard, transparent substance (material), produced by mixing sand with soda by glass-blowing process; usually used in windows.	
3. A light strong material that is made with chemicals and is used for making many different kinds of objects.	

What can be made of these materials?
Which material is the best for dishes?

2. Which is the best material for the following objects and why?

A fork, a football, a window, a bicycle, a plate.

3. Read the information in the table below and put each heading into the correct column (A, B, or C). What is the order of materials in column A?

A	**B**	**C**
1. aluminium	light, easy to shape	aircraft, window and door frames, cooking foil
2. brass (copper and zinc)	doesn't rust in contact with air and water, strong	valves, taps
3. cement	mixed with water it dries to a hard material	pre-made building blocks, to hold bricks together
4. copper	easily made into wire, carries electricity well	electrical wire, tubing
5. diamond	hardest natural material, can cut glass and metal	industrial cutting and grinding
6. glass	clear, hard, breaks easily	windows, bottles
7. iron	hard	engineering
8. mild steel (iron +0.15-0.3% carbon)	hard, strong, quite easy to shape	bridges, ships, cars
9. optical fibre	carries light and coded	lighting, cable TV,

	messages	telecommunications
10. plastic	light, strong, easy to shape	hard hats, computer casing

4. Read the information in the table of Ex. 3 again and find out which material is best for:

(a) water pipes;
(b) a knife for cutting a microscope lens;
(c) connecting a socket to the electricity supply;
(d) a bicycle frame;
(e) television casing.

5. Study the table in Ex. 3 again and complete the following table.

Verbs	Adjectives

6. Match the properties from the table with their opposites below. Use your glossary or dictionary to help you.

• heavy • tough • opaque • rigid • weak • soft

1. breaks easily	
2. clear	
3. easy to shape	
4. hard	
5. light	
6. strong	

7. Find as many materials in the following line as you can (11 words).

glassircementoptironsebrasssteelydimanplasticrzidiamondcopperon-fibrealuminiumzincopl

8. Answer the following questions.

What material... (or what materials...):
— is the strongest?
— is/are easy to shape?
— conduct(s) electricity well?
— is/are found in people and fruits?
— break(s) easily?

— can be mixed with water?
— is/are very light?
— don't (doesn't) rust?
— can carry coded messages?
— is/are used in jewellery?
— is/are used in beer (or juice) production?
— is/are used a lot on a building site?
— is/are used in city advertising process?
— is/are used in manufacturing of cars, buses, aeroplanes etc.?
— is/are widely used in cooking process?
— is/are used in industry to cut hard materials?

9. Look at the following materials and complete the table.

	A Material	B Properties	C Uses
1	wood		
2	rubber		
3	china		

10. What is the best material for the following things and why?

A cup, a car tyre, a frying pan, engineering tools, a mobile.

11. Fill in the gaps in the following sentences with suitable words from the exercises 3 and 6.

1. ……. is a light silver-coloured metal that is easy to shape and that is used in window and door frames, and to make cooking foil.
2. "……." means difficult to shape (= opposite to "easy to shape").
3. ……. is used in cable TV and communications because it can light and coded messages.
4. In a building process ……. is used to hold bricks together.
5. Windows are made of ……. because this material is ……. (or transparent).
6. Dishes that are made of ……. are beautiful but not practical because this material ……. easily.
7. "……." means not easily broken. The opposite to this word is "…….".
8. Industrial cutting and grinding often use …… because it is the hardest natural material.
9. ……. is used to make electrical wires because it is ……. to shape this material and it electricity well.
10. ……. is widely used today practically everywhere: to make dishes, to make computer (TV, radio, mobile telephone, etc.) casing, tubes because it is ……., ……., easy to shape.
12. "……." means "easy to lift", "not heavy".

12. Translate the following sentences into English. Translate the idea, not word for word.

“…(material) is ... (properties)”

1. Пластик легкий и крепкий.
2. Латунь — крепкий материал, не подвергающийся коррозии.
3. Алюминий — легкий материал, который легко гнется.
4. Сталь — твердый и крепкий материал, которому довольно легко придать нужную форму.
5. Алмаз — самый твердый природный материал.
6. Медь — материал, который легко гнется.
7. Стекло — прозрачный, твердый материал, который легко бьется.
8. Оптическое волокно — материал, который может передавать сигналы.

“... (material) is used for/in/for manufacturing of...”

9. Сталь используется для строительства мостов, кораблей.
10. Алюминий используется в авиастроении.
11. Оптическое волокно применяется для кабельного телевидения.
12. Из пластика делают каркасы для телевизоров, компьютеров, магнитофонов.
13. Железо применяется для создания инженерного оборудования.
14. Из меди делают провода.
15. Цемент используют для производства кирпичей.
16. Из алюминия делают оконные рамы.

"... is/are made of/from ... (material)”

17. Окна делают из дерева (пластика) и стекла.
18. Каркас телефона сделан из пластика.
19. Электрические провода сделаны из меди.
20. Пищевая фольга сделана из алюминия.
21. Мосты делают из стали.
22. Трубы делают из пластика или латуни.
23. Эта дверь сделана из дерева.
24. Строительные каски делают из пластика.

MATERIALS

Read the text and fill in the gaps with the following words.

• manufacturing • production • discipline • made • divided • properties ($^{x}2$) • materials • components • oil

Material is synonymous with substance. It is anything that is (*1*) ……. of matter—hydrogen, air, and water are all examples of materials. Sometimes the word "material" is used more narrowly and refers to substances or *(2)* ……. with certain physical (3) ……. that are used in production or *(4)* …… .

In this sense, materials are the components that we need when we want to make something else (from buildings to computers).

A material can be anything: a finished product or a raw material.

Raw (5) ……. are materials that are taken from the earth and (6) ……. into a form that can be easily transported and stored. Then they are processed into semi-finished materials. These can be input into a new cycle of (7) ……. to create final products. The examples of raw materials are: cotton, coal, *(8)* ……., etc.

In chemistry materials can be divided into metals and non-metals. Different materials have different *(9)* ……. . Materials and their properties are studied by a special (*10)* that is called Materials science.

MATERIALS SCIENCE

Read the text and fill in the gaps with the following words.

• focus • engineering • important • discipline • chemistry • characteristics

Materials science is a *(1)* ……. that studies the properties of matter and its applications to various areas of science and . This science study the relationship between the structure of materials at atomic or molecular scales and their macroscopic properties. It includes elements of applied physics and *(2)* ……. . Nowadays scientists *(4)* ……. their attention on nanoscience and nanotechnology, so materials science has been introduced to many universities. It is also an *(5)* ……. part of forensic engineering and failure analysis. Materials science also deals with fundamental properties and *(6)* ……. of materials.

• properties • science • engineering • technologies • scientist

Materials (*7)* ……. is a very old scientific discipline. In ancient times the choice of the material gave the name to the era — for example the Stone Age, the Bronze Age, the Steel Age. Materials science is one of the oldest forms of (*8*) ……. and applied science, deriving from the manufacture of ceramics. Modern materials science evolved directly from metallurgy, which itself had evolved from mining. A major breakthrough in the understanding of materials occurred in the late 19th century, when the American (*9)* ……. Josiah Willard Gibbs demonstrated that the thermodynamic properties related to atomic structure in various phases are related to the physical (*10)* ……. of a material. Important elements of modem materials science are products of the space race: the understanding and engineering of the metallic

alloys, and silica and carbon materials, used in the construction of space vehicles. Materials science is driven by the development of revolutionary *(11)* ……. such as plastics, semiconductors, and biomaterials.

• classified • materials • departments • properties • understand

Before the 1960s many *(12)* ……. of materials science at universities were named "metallurgy" departments. It was because of the fact that from the 19th and to early 20th century scientists put emphasis on metals. Since then the field has broadened and now includes every class of *(13)* ……. — ceramics, polymers, semiconductors, maghetic materials, medical implant materials, and biological materials.

In materials science, the main aim is to (*14)* ……. materials in order to be able to create new materials with the desired *(15)* ……. .

Materials science divides materials into various classes. Each of this class may form a separate field. Materials are sometimes (*16*) ……. by the type of bonding between the atoms: ionic crystals, covalent crystals, metals, intermetallics, semiconductors, polymers, composite materials, vitreous materials.

characterized • Electronic • Metallurgy
industry • divided • Biomaterials • Glass

Materials science can be *(17)* ……. into different disciplines that study different materials and their properties. For example:

(*18*) …….— the study of metals and their alloys, including their extraction, microstructure, and processing.

(*19*) …….— materials that are derived from and/or used with
biological systems.

(20) ……. and magnetic materials — materials such as semiconductors used to create integrated circuits, storage media, sensors, and other electrical devices.

(21) …… science — the study of any non-crystalline material including inorganic glasses, vitreous metals, and non-oxide glasses.

Materials science also study:

Polymer properties, synthesis and characterization, for a specialized understanding of how polymers behave, how they are made, and how they are *(22)* ……. .

Biomaterials, physiology, biomechanics, biochemistry, for a specialized understanding of how materials integrate into biological systems, e.g. through materiomics.

Semiconductor materials and semiconductor devices, for a specialized understanding of the advanced processes used in *(23)* ……. (e.g. crystal growth techniques, thin-film deposition, ion implantation, photolithography), their properties, and their integration in electronic devices.

Alloying, corrosion, thermal or mechanical processing, for a specialized treatment of metallurgical materials — with applications ranging from aerospace and industrial equipment to the civil industries, etc.

3. Make a summary of this text. (List the materials mentioned and their main properties.)

Try to make up your own small text about properties of *wood*, *gold* (or any other material of your choice).

NON-FERROUS METALS AND POLYMERS

MY GLOSSARY

copper – медь
magnesium – магний
brass – латунь
tin – олово
lead – свинец
conductor – проводник
plating - нанесение покрытия
galvanizing – оцинковывание
galvanizing - нанесение покрытия способом окунания в подогретый пропиточный состав
electrolyte – электролит
cathode – катод
anode – анод
anodizing – анодирование
aluminium oxide – алюминивая окись

COMMON NON-FERROUS ENGINEERING METALS

These website extracts look at the engineering applications of some *non-ferrous metals* - that is, metals that do not contain iron.

Aluminium is widely used, often in alloy forms. An example is duralumin, an alloy used in aircraft manufacturing, which also contains *copper* (4.4%) and *magnesium* (1.5%). Aluminium can also be alloyed with *titanium* to produce very strong, lightweight metals.

Copper is an excellent electrical conductor, which makes it ideal for use in electric wires. Good ductility also makes it suitable for pipes. Copper is widely used in alloys, notably brass (copper and zinc) and bronze (copper and *tin*, and sometimes *lead*).

Silver is a *precious metal* - a reference to its high cost. It is a better electrical conductor than any other material, so it is often used for electronic connections. Another precious metal - *gold* - is also an excellent conductor, and is highly corrosion-resistant.

Notes: For more on metals and alloys, see Unit 11. For more on ductility, see Unit 18.

The chemical symbol for aluminium = Al, copper = Cu, magnesium = Mg, titanium = Ti, zinc = Zn, tin = Sn, lead = Pb, silver = Ag and gold = Au.

PLATING WITH NON-FERROUS METALS

Non-ferrous metals can be used to protect steel from corrosion by *plating* it - that is, covering it with a thin layer of metal. An example is *galvanizing* (zinc plating).

Steel can be *hot-dip galvanized*, by placing it in *molten* (liquid) zinc. It can also be *electro- galvanized*, which is a type of *electroplating*. With this technique, the steel component is placed in a liquid (often an acid) - called the - and connected to the *negative terminal* (-) of an electrical supply, to become the (the negative side). A piece of zinc is also placed in the electrolyte, and is connected to the *positive terminal* (+) of the supply. This then becomes the (the positive side). An electric current then flows between the pieces of metal, through the electrolyte. This causes a chemical reaction, which deposits zinc on the cathode, plating the component.

A related process, called, is used to protect aluminium. The component to be *anodized* is connected to the positive terminal (to become the anode) and placed in an electrolyte, with a cathode. As electricity flows, *aluminium oxide* is deposited on the anode. As this is harder than aluminium metal, it provides protection.

1. Make correct sentences using one part from each column. Look at the first text above to help you.

1 Duralumin	can be mixed with copper to make	silver.
2 Titanium	resists corrosion better than the other precious metal,	brass.
3 Zinc	has a high strength-to-weight ratio and is often	aluminium.

	alloyed with	
4 Copper	is an aluminium alloy that also contains copper and	bronze.
5 Gold	can be mixed with tin and lead to produce	magnesium.

2. Complete the word groups below using the names of the metals in 1 above. You will need to write some names more than once. Look at the first text opposite to help you.

Metal elements	
Alloys	
Precious metals	

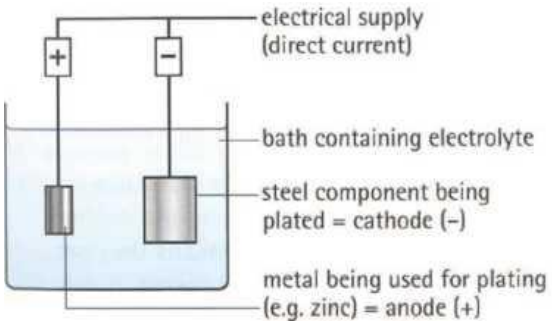
3. Complete the checklist for electroplating using the words in the box. Look at the second text to help you.

anode	electrolyte	galvanizing	plated	cathode	negative	electroplating	positive

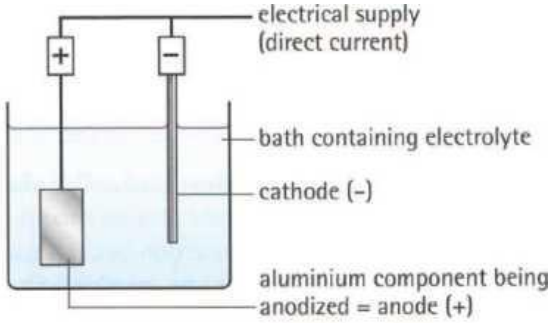
✓ Check that there is sufficient (1) ……. in the bath to completely cover the component, in order to ensure that the component will subsequently be (2) ……. over its entire surface area.

✓ Ensure that the component is connected to the (3) ……. terminal of the electrical supply. During the (4) ……. process, the component should function as the (5) ……. .

✓ Ensure that the metal being used for plating - e.g. zinc for (6) ……. is connected to the (7) ……. terminal of the electrical supply. During the process, it should function as the (8) ……. .



Electroplating



Anodizing

4. How are non-ferrous metals used in your industry, or an industry you're familiar with? Is electroplating common? If so, what kinds of metals are used for plating, and why are these specific metals chosen?

Unit 7 MATERIAL TYPES

MY GLOSSARY

metal	металл, металлический предмет
non-metals	металлоид, неметаллический элемент
ferrous metals	чёрные металлы
non-ferrous metals	цветные металлы
chemical composition	химический состав
constituents	компонент(а), составная часть
chemically bound	химически связанный
a compound of	строение,структура
mixtures	перемешивание, смешивание, смесь
alloys	сплав
iron-carbon alloy	железоуглеродистый слав
composite materials	композиционный материал, композит
reinforcement	укрепление, упрочение, усиление
reinforcing material	укрепляющий материал

METALS AND NON-METALS

Engineering materials can be divided into:

- **metals** - examples of **metallic** materials are iron (Fe) and copper (Cu)
- **non-metals** - examples of **non-metallic** materials are carbon (C) and silicon (Si).

As iron is such a widely used material, metals can be divided into:

- **ferrous metals** - those that contain iron
- **non-ferrous metals** - those that do not contain iron.

ELEMENTS, COMPOUNDS AND MIXTURES

With regard to the **chemical composition** of materials - the chemicals they contain, and how those chemicals are combined - three main categories can be used:

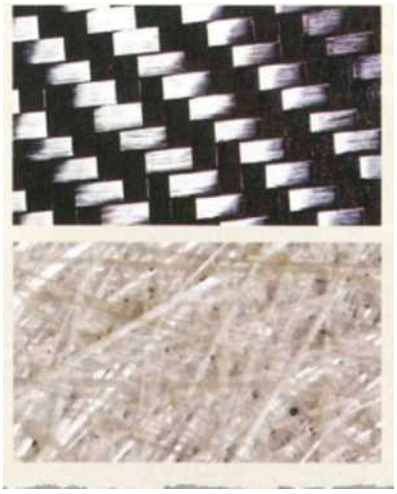
- Elements are pure materials in their most basic form. They cannot be broken down into different **constituents** (‘ingredients’). Examples of elements widely used in engineering materials are iron, carbon and aluminium (Al).
- **Compounds** consist of two or more elements that are **chemically bound** - that is, combined by a chemical reaction. An everyday example is water, which is **a compound of** hydrogen (H) and oxygen (O).
- **Mixtures** consist of two or more elements or compounds which are mixed together, but which are not chemically bound. In engineering, common examples are **alloys** - that is, metals which have other metals and/or non-metals mixed with them. A common example is steel, which is an **iron-carbon alloy**, and can include other **alloying metals** - metals which are added to alloys, in small quantities relative to the

main metal. Examples of widely used alloying metals are chromium (Cr), manganese (Mn) and tungsten (W)

COMPOSITE MATERIALS

The article below is from an engineering journal.

MATERIALS UNDER THE MICROSCOPE: COMPOSITES



When you think of examples of hi-tech materials, **composite materials** come to mind - such as carbon-fibre, used in aerospace and Formula 1 cars. But although we think of **composites** as hi-tech and highly expensive, that's not always true. The earliest examples of composite materials were bricks made from mud and straw. Or, to use the correct composite terms, from straw **reinforcement** - the structural network that reinforces the material inside, and a mud **matrix** - the material surrounding the reinforcement. These terms explain what a composite material is: a matrix with a **reinforcing material** inside it. A modern, everyday example is fibreglass - correctly called **glassreinforced plastic (GRP)** – which has a plastic matrix **reinforced with** glass fibres.

1. **Complete the sentences using the words in the box.**

metal	non-metal	metallic	non-metallic	ferrous	non-ferrous

1. Carbon (C) is a ……. .
2. Copper (Cu) is a ……. metal.
3. Aluminium (Al) is a common ……. .
4. Steel (Fe + C) is a widely used ……. metal.
5. Although it is used in steel, carbon is ……. .
6. Aluminium is relatively lightweight for a ……. material.

2. Decide whether the sentences below are true or false, and correct the false sentences.

1. The elements that make up a compound are chemically bound.
2. Alloys are chemical compounds that are frequently used in engineering.
3. Alloys can contain both metallic and non-metallic constituents.
4. In an alloy, an alloying metal is the biggest constituent, by percentage.
5. Steel is a metallic element.

3. Complete the extract about concrete and steel, using suitable forms of the word *reinforce*. Sometimes there is more than one possible answer.

(1) ……. concrete is one of the most widely used construction materials, and one we take for granted. However, using steel bars to (2) ……. concrete structures located outdoors is only possible thanks to a fortunate coincidence: concrete and steel have practically the same coefficient of thermal expansion - in other words, as atmospheric temperature varies, the concrete and the steel (3) ……. expand and contract at the same rate, allowing uniform movement. Using a (4) ……. material with a different coefficient of expansion would not be feasible. For example, (5) aluminium-…….. concrete would quickly disintegrate.

4. Read the text below and find two elements, two compounds, an alloy and a composite.

Generally, the steel used in reinforced concrete will have previously been exposed to water and to the oxygen in the air. As a result, it will usually be partly corroded, being covered with a layer of iron oxide (rust). However, once the steel is inside the hardened concrete, it will be protected from air and water, which prevents further rusting. Additionally, the cement in concrete does not react aggressively with the iron in steel.

Element	Compound	Alloy	Composite

5. Think of some of the materials used to make products or structures you know about. Say whether the materials are elements, compounds, mixtures, alloys or composites. If they are composites, what materials are used (a) as the matrix, and (b) as reinforcement?

STEEL

MY GLOSSARY

steel – сталь
iron – железо
carbon – углерод
grades – сорта, классы
mild steel - мягкая (низкоуглеродистая) сталь
medium carbon steel – среднеуглеродистая сталь
high carbon steel - высокоуглеродистая сталь
alloy steels – легированная сталь
low alloy steels – низколегированная сталь

molybdenum – молибден
vanadium – ванадий
stainless steels – нержавеющая сталь
tool steels – рабочая сталь
cobalt - кобальт
high-speed steel - быстрорежущая (инструментальная) сталь
iron oxide – железная руда
oxide – окись
oxidizing – ржавление, окисление
goes rusty – проржавевший
rust – коррозия

CARBON STEELS

This extract from an article in an engineering journal is about different types of steel.

Steel is the most widely used engineering material. Technically, though, this well-known alloy of *iron* and *carbon* is not as simple as one might think. Steel comes in a huge range of different *grades*, each with different characteristics. For the inexperienced, it can be difficult to know where to begin.

A good place to start is with the two main types of steel. The first, *carbon steels*, consist of iron and carbon, and contain no significant quantities of other metals. Carbon steels can be divided into three main grades:

■*Mild steel* - the most widely used grade - is a low carbon steel which contains up to approximately 0.3% carbon.
■contains between approximately 0.3% and 0.6% carbon.
■contains between approximately 0.6% and 1.4% carbon.

Note: The chemical symbol for iron = Fe, and carbon = C.

ALLOY STEELS

The article goes on to look at *alloy steels*.

The second main category of steel is alloy steels, which consist of iron, carbon and one or more alloying metals. Specific grades of alloy steel include:

■ *low alloy steels*, which contain 90% or more iron, and up to approximately 10% of alloying metals such as *chromium*, *nickel*, *manganese*, *molybdenum* and *vanadium*

■ *high strength low alloy steels* (HSLA), which contain smaller quantities of the above metals (typically less than 2%)

■ *stainless steels*, which contain chromium as well as other metals - such as nickel - and which do not *rust*.

■ *tool steels*, which are extremely hard, and are used in cutting tools. They contain *tungsten* and/or *cobalt*. A widely used grade of tool steel is *high-speed steel*, which is used in cutting tools that operate at high temperatures, such as drill bits.

Notes: The terms carbon steel and alloy steel can cause confusion, as carbon steels are also alloys, and alloy steels also contain carbon.

The chemical symbol for chromium = Cr, cobalt = Co, nickel = Ni, manganese = Mn, molybdenum = Mo, tungsten = W, and vanadium = V.

CORROSION

One weakness of mild steel is that it corrodes - its surface progressively deteriorates due to a chemical reaction. This reaction takes place between the iron in the steel and the oxygen (O2) in the air, to form *iron oxide*. When iron corrodes, we say that it rusts. In some metals, such as aluminium (Al), the presence of *corrosion* is not a problem, as the layer of *oxide* around the metal remains hard, which prevents it from *oxidizing* any further. However, when mild steel *goes rusty*, the *rust* on the surface comes off continuously, and a new *rusty* layer forms, progressively 'eating into' the metal.

1. Decide whether the sentences below are true or false, and correct the false sentences.

1 Steel is an alloy of iron and carbon.
2 Mild steel is a high carbon steel.
3 Alloy steels contain carbon.
4 Chromium and nickel are used as alloying metals in steel.
5 Low alloy steels contain more chromium than iron.
6 Stainless steel is an alloy steel.
7 Tungsten is added to steel to make it softer.
8 High-speed steel is suitable for making cutting tools that get very hot.

2. Complete the table with words related to corrode, oxide and rust. Then use the words to complete the sentences below. There is more than one possible answer.

Verb	Noun	Adjective
		corroded
		oxidized
/ go rusty		

1 When steel is exposed to air and water, it ……. .
2 A brown/red material on the surface of steel is called ……. .
3 The strength of steel is reduced if it is ……. .

3. Complete the article about a special type of steel, using words from from exercise 2.

WEATHERING STEEL

The perennial problem with mild (1) ……. is that it (2) ……. when exposed to air and water. Generally, the only solution is either to apply a protective coating, or to use another (3) ……. of steel that is resistant to the (4) ……. process - the most well-known being (5) ……. steel, which contains significant quantities of (6) ……. and, often, nickel.

There is. however, an alternative solution. So-called weathering steel is a special alloy suitable for outdoor use. But rather than being completely protected from corrosion, the surface of the steel is allowed to go (7) ……. . Once a layer of (8) ……. has formed on the surface, it stabilizes and forms a hard protective layer. This layer differs from ordinary (9) ……. oxide, as it does not continue to eat into the metal. While not everyone may like the 'rusty look', weathering steel has been widely used in architectural applications and outdoor sculptures.

4. Think about some items you're familiar with that are made of steel, but which are not protected (for example, by paint). How serious is the potential problem of corrosion? How is it prevented or limited - for example, by using a specific grade of steel?

5. Modern technology is creating a single world culture. Do you agree or

disagree with the following statement? Give reasons for your answer and include any relevant examples from your own knowledge or experience. You should write at least 150 words.

Model answer:

Man, through the ages, has undergone many changes from the time when he depicted a herd of mammoths on the walls of the cave to these days when he can chart with someone on the other side of the globe. Modern technology is rapidly changing the world's living standards that results in creating a single world culture. New technologies including Internet, television, electronic media, means of transportation, etc has a great impact on creating a similar culture all around the globe. Bellow I will list my reasons to support my opinion.

First of all, Internet and e-mail have changed the way people communicate to each other. Internet brought many benefits. It is a new means of communication, a fast access to information and news. People communicate with each other, share their ideas, happiness and difficulties. We have a great opportunity to find out more about countries and their history.

Second of all, the modern means of transportation allows people to move from one place to another very quickly. A few centuries ago it was impossible to imagine waking up in one country and falling asleep in another.

Finally, as a result of all mentioned above the boundaries between countries, their traditions and customs are erased. Many people migrate during their lives. Some of them are looking for a better place to live, others want to get new experience and knowledge or just pleasure. So, many families are created between people from different countries. Traditions fuse and evolve into other ones or just vanish.

To sum up, modern technology has a great impact on the way people live now. It is creating a new single world culture where traditions and distances are no longer of that importance.

UNIT 8 REFRIGERATION HISTORY

1. Find the translation of the following words and expressions.

To harvest, to insulate, advent, evaporative cooling, rapidly, kinetic energy, sodium nitrate, potassium nitrate, to come into vogue, to rotate, saltpeter, solution, artificial, perishable, porous, trough, crock, to retard decomposition, to obtain.

2. Read the text carefully and do exercises below.

Refrigeration History

The practice of cooling bodies below the temperature of the atmosphere has been followed for centuries. It was already in prehistoric times when man found that his game would last during times when food was not available if stored in the coolness of a cave or packed in snow. Before the advent of modern refrigeration one of the methods of obtaining low temperatures consisted of the construction of artificial caves or cellars in the ground, into which perishable goods were placed to retard decomposition.

In most countries a temperature of 50º to 60º F. may be obtained in these cellars. In China, for instance, before the first millennium, the ice, after being harvested in winter, was stored in caves in the ground. It is also known, that Hebrews, Greeks, and Romans placed large amounts of snow into storage pits dug into the ground and insulated with wood and straw. In this manner man was able to preserve his perishable foods during the summer.

A device still used in some areas is a room built with porous walls over which water is made to trickle. As the water evaporates the room is cooled. A spring of cold water often determined the site of an American pioneer's home. A springhouse was built over the flowing water, and the cooling fluid was led through troughs in which crocks of butter and cream were placed. In winter, farmers stored ice in icehouses for use in the summer. Similarly, natural ice from commercial icehouses was used in cities until artificial methods of producing ice were initiated.

In localities where the atmosphere was warm and dry one of the early methods of storing food consisted of the evaporation of a part of the liquid to be cooled by putting the liquid into porous vessels which were hung in a current of cool moving air. The ancient Egyptians are known to have filled earthen jars with boiled water and put them on their roofs, thus exposing the jars to the night's cool air.

In India, evaporative cooling was employed. When a liquid vaporizes rapidly, it expands quickly. The rising molecules of vapor abruptly increase their kinetic energy and this increase is drawn from the immediate surroundings of the vapor. These surroundings are therefore cooled.

Another early method of obtaining low temperatures consisted of the use of freezing mixtures. Such mixtures as water and saltpeter, snow or ice and saltpeter,

snow and salt, etc., have been used for ages. So instead of cooling water at night, people rotated long-necked bottles in water in which saltpeter had been dissolved. This solution could be used to produce very low temperatures and to make ice.

The intermediate stage in the history of cooling foods was to add chemicals like sodium nitrate or potassium nitrate to water causing the temperature to fall. Cooling wine via this method was recorded in 1550, as were the words "to refrigerate", and by 1600 in France cooling drinks quickly came into vogue.

Thus from the creation of man until nearly modern times the only available means of producing refrigeration were those mentioned above. It was not until the year 1755 A. D. that the first experiments were performed in order to discover a means of producing refrigeration mechanically. Therefore mechanical refrigeration may be said to date from the year 1755, at which time the temperature-pressure relations of certain refrigerating fluids were observed.

3. Find international words in the text that help you understand it without using a dictionary.

4. Answer the following questions to the text.

1. What helped ancient people survive during the periods of unsuccessful hunting?
2. What were the early methods of preserving perishable foods?
3. Why was a spring of cold water always associated with the American pioneer's home?
4. The knowledge of which physical laws helped the ancient people living in warm countries preserve perishable foods over long periods?
5. When was the first application of the word "to refrigerate" recorded?
6. Which mixtures were used to cool the things and in which way?
7. Why can the year 1755 be considered the date of birth of mechanical refrigeration?

5. Match the words with their definitions given below.

Perishable, locality, advent, harvest, insulate, come into vogue, to insulate, to dissolve, vapor, invention, to preserve, to refrigerate, beverage.

- arrival;
- to gather something;
- quickly or easily going bad;
- to cover or separate with non-conducting materials to prevent loss of heat;
- Place, district, neighborhood;
- to come into fashion;
- To make something such as food or liquid cold in order to preserve it;

- To cover or protect something so that heat cannot get in;
- a mass of small drops of liquid which float in the air because the liquid has been heated;
- to make, design or produce something new for the first time;
- to store food for a long time after treating it so that it will not decay;
- to mix something with a liquid and become part of it;
- a hot or cold drink.

6. Fill in the gaps with the words from the box.

preserve, insulated, dissolves, solution, refrigeration evaporative, beverages, frozen, store

1. Saltpeter … can be used to produce ice.
2. The ancient ice houses were usually … with straw and sawdust.
3. Nowadays people usually … food in refrigerators.
4. … food has been stored at a very low temperature in order to … it.
5. Meat must be kept under … .
6. Sugar easily … in water.
7. The process to keep food cold by using a … cooling system goes back a long time.
8. The government banned the sale of alcoholic … to the young people under 18.

7. Make up a plan to the text that will help you to write a brief summary.

8. Choose a suitable word to fill in the blanks.

Beside the above (1…) methods of food (2…) in different cultures there existed special (3…) known (4…) ice houses. They were (5…) used to store ice (6…) the year, prior (7…) the invention of the refrigerator. The (8…) common designs (9…) underground chambers, usually man-made, (10…) (11…) close to natural sources of winter ice (12…) freshwater lakes. (13…) the winter, ice and snow would be taken into the ice house and packed with insulation, often straw or sawdust. It remained (14…) for many months, often until the (15…) winter, and could be used as a source of ice during summer months. This could be used simply (16…) drinks, or allow ice-cream and sorbet desserts to be created. Ice houses allowed a trade in ice that was a major part of the early economy of the New England region of the United States, which saw many fortunes (17…) (18…) people (19…) shipped ice in straw-packed ships to (20…) and colonies throughout the Caribbean Sea.

1.	A. mention	B. mentioning	C. mentioned
2.	A. preservement	B. preserving	C. preserve
3.	A. constructor	B. constructions	C. constructs

4.	A. so as	B. as well as	C. as
5.	A. built	B. builders	C. buildings
6.	A. three	B. through	C. throughout
7.	A. till	B. for	C. to
8.	A. many	B. most	C. little
9.	A. involved	B. evolved	C. involves
10.	A. who	B. which	C. what
11.	A. were built	B. were build	C. were building
12.	A. such as	B. so as	C. some
13.	A. For	B. On	C. During
14.	A. frozen	B. freezing	C. freezed
15	A. following	B. follows	C. falling
16.	A. cooling	B. to cool	C. cools
17.	A. made	B. done	C. produced
18.	A. of	B. with	C. by
19.	A. those	B. who	C. what
20.	A. countries	B. countrys	C. countres

9. Match the words in column A with their synonyms in column B.

A		**B**
1) air conditioning	a)	to enlarge
2) to cause	b)	to keep
3) substance	c)	air cooling
4) to install	d)	to effect
5) to refrigerate	e)	to equip
6) to preserve	f)	to cool, to freeze
7) to create	g)	material
8) to increase	h)	to make, to produce

10. Find some more information about refrigeration while finding the right endings of sentences.

1 Refrigeration, the process of removing heat from	a) yeast, and mold inhibit.
2 In the industrialized nations refrigeration	b) become widespread in more developed nations.
3 At low temperatures the destructive action of bacteria,	c) a substance for the purpose of lowering the temperature.
4 Many perishable products can be frozen	d) is chiefly used to store foodstuffs at low temperatures.
5 Freezing permit to keep food for months and	e) with little loss in nutrition or flavor.
6 Air-conditioning for comfort cooling	f) ice transported from the mountains.

has also	
7 Ancient peoples cooled their food with	g) even years with little change in appearance.

11. Put the verbs in brackets in the correct tense of Passive Voice.

Before mechanical refrigeration systems (1) ____ (introduce), ancient peoples, including the Greeks and Romans, cooled their food with ice transported from the mountains. Wealthy families made use of snow cellars, pits that (2) ____ (dig) into the ground and (3) _____ (insulate) with wood and straw, to store the ice. In this manner, packed snow and ice could (4) ___ (preserve) for months. Stored ice was the principal means of refrigeration until the beginning of the 20th century, and it (5) ___ still ____ (use) in some areas.

In India and Egypt evaporative cooling (6) ____ (employ). If a liquid (7) ___ rapidly ____ (vaporize), it expands quickly. The rising molecules of vapour abruptly increase their kinetic energy. Much of this increase (8) ____ (draw) from the immediate surroundings of the vapour, which (9) ___ therefore ____ (coole). Thus, if water (10) ____ (place) in shallow trays during the cool tropical nights, its rapid evaporation can cause ice to form in the trays, even if the air does not fall below freezing temperatures.

12. Complete the text with the words from the box.

technique Glasgow expansion built centuries machine American ethyl ether practical artificial century

Cooling caused by the rapid (1) ____ of gases is the primary means of refrigeration today. The (2) ____ of evaporative cooling, as described heretofore, has been known for (3) ____, but the fundamental methods of mechanical refrigeration were only discovered in the middle of the 19th (4) ____. The first known (5) ____ refrigeration was demonstrated by William Cullen at the University of (6) ____ in 1748. Cullen let (7) ____ boil into a partial vacuum; he did not, however, use the result to any (8) ____ purpose. In 1805 an (9) ____ inventor, Oliver Evans, designed the first refrigeration (10) ____ that used vapour instead of liquid. Evans never constructed his machine, but one similar to it was (11) ____ by an American physician, John Gorrie, in 1844.

13. Use the above information to make questions about refrigeration history. Make a dialogue with the partner by asking and answering questions.

14. You have the opportunity to visit a foreign country for two weeks. Which country would you like to visit? Use specific reasons and details to explain your choice. You should write at least 150 words.

Model answer:

I am a person who likes to travel. I think traveling is a great opportunity to meet new people, gain more knowledge and experience, and learn new customs and traditions. I haven't travelled travel a lot yet, but I am sure I will have a chance to do it. So, if I had the opportunity to visit a foreign country I would visit Egypt. I think it is a great and very interesting country with marvelous history. In the following paragraphs I will give some reasons to support my choice.

First of all, I always dreamed to visit Egypt pyramids. My aunt visited Egypt a few years ago. She was very excited after that trip and said that she would return there one more time at any cost. She said that Egypt had impressed her very much with its glorious pyramids and ancient buildings. Second of all, I think that in that country one can touch history, feel the hard breath of workers building a pyramid under the parching sun, and see the chain of camels walking in the desert with the huge trunks full of presents for Cleopatra on their humps. Finally, I want to see a real dessert and ride the camel. All my friends who rode the camel say that it is an unforgettable experience.

I believe that I will have a chance to visit this beautiful country someday. Unfortunately, now I have plenty of plans and things to do, so, I am afraid that I will not be able to travel for the next two years. I want to finish my education and then find a job, and these things have higher priority than traveling. My husband wants to visit this country too and we made an agreement to make our trip to Egypt on our five years anniversary which is in two years.

In conclusion, I want to add that after my trip to Egypt I will definitely visit Australia. This country is the second one on my list the most wanted to see.

Unit 9 HOW REFRIGERATORS WORK

MY GLOSSARY

leftovers – остатки еды
beverages – напитки
refrigerant – хладагент
slow down – замедлять
decrease – увеличивать
rubbing alcohol – медицинский спирт
heat-exchanging pipes – теплообменные трубки
expansion valve – расширительный клапан
pure ammonia – чистый аммиак
coils – змеевик
dissipate – рассеивать, разгонять
pressurization – нагнетание
expand – расширять
chlorofluorocarbon – хлорфторуглерод
dichlorodifluoromethane – дихлордифторметан
pose a threat – угрожать
leak – просачиваться
receiver - сборник; приёмник; ресивер накопитель

How Refrigerators Work

by Marshall Brain

In the kitchen of nearly every home in America there is a refrigerator. Every 15 minutes or so you hear the motor turn on, and it magically keeps things cold. Without refrigeration, we'd be throwing out our leftovers instead of saving them for another meal.

The refrigerator is one of those miracles of modern living that totally changes life. Prior to refrigeration, the only way to preserve meat was to salt it, and iced beverages in the summer were a real luxury.

The basic idea behind a refrigerator is very simple: it uses the evaporation of a liquid to absorb heat.

The Purpose of Refrigeration

The fundamental reason for having a refrigerator is to keep food cold. Cold temperatures help food stay fresh longer. The basic idea behind refrigeration is to slow down the activity of bacteria (which all food contains) so that it takes longer for the bacteria to spoil the food.

For example, bacteria will spoil milk in two or three hours if the milk is left out on the kitchen counter at room temperature. However, by reducing the temperature of the milk, it will stay fresh for a week or two – the cold temperature inside the refrigerator decreases the activity of the bacteria that much. By freezing the milk you can stop the bacteria altogether, and the milk can last for months.

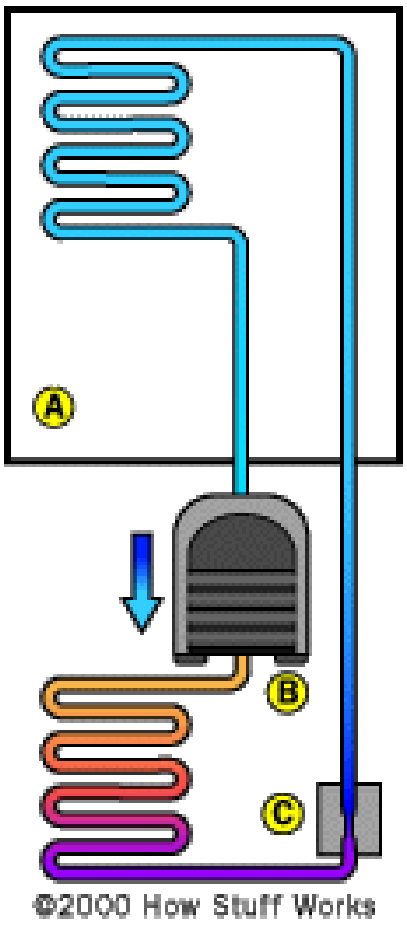
Refrigeration and freezing are two of the most common forms of food preservation used today.

As we learned in the introduction, the basic idea behind a refrigerator is to use the evaporation of a liquid to absorb heat. You probably know that when you put water on your skin it makes you feel cool. As the water evaporates, it absorbs heat, creating that cool feeling. Rubbing alcohol feels even cooler because it evaporates at a lower temperature. The liquid, or refrigerant, used in a refrigerator evaporates at an extremely low temperature, so it can create freezing temperatures inside the refrigerator. If you place your refrigerator's refrigerant on your skin (definitely NOT a good idea), it will freeze your skin as it evaporates.

There are five basic parts to any refrigerator (or air-conditioning system):

- compressor
- heat-exchanging pipes - serpentine or coiled set of pipes outside the unit
- expansion valve
- heat-exchanging pipes - serpentine or coiled set of pipes inside the unit
- refrigerant - liquid that evaporates inside the refrigerator to create the cold temperatures

Many industrial installations use pure ammonia as the refrigerant. Pure ammonia evaporates at -27 degrees Fahrenheit (-32 degrees Celsius).



The basic mechanism of a refrigerator works like this:

The compressor compresses the refrigerant gas. This raises the refrigerant's pressure and temperature (orange), so the heat-exchanging coils outside the refrigerator allow the refrigerant to dissipate the heat of pressurization.

As it cools, the refrigerant condenses into liquid form (purple) and flows through the expansion valve.

When it flows through the expansion valve, the liquid refrigerant is allowed to move from a high-pressure zone to a low-pressure zone, so it expands and evaporates (light blue). In evaporating, it absorbs heat, making it cold.

The coils inside the refrigerator allow the refrigerant to absorb heat, making the inside of the refrigerator cold. The cycle then repeats. Modern refrigerators use a regenerating cycle to reuse the same refrigerant over and over again.

The Refrigeration Cycle

The refrigerator in your kitchen uses a cycle that is similar to the one described in the previous section. But in your refrigerator, the cycle is continuous. The refrigerant being used is pure ammonia, which boils at -27 degrees F. This is what happens to keep the refrigerator cool:

1. The compressor compresses the ammonia gas. The compressed gas heats up as it is pressurized (orange).
2. The coils on the back of the refrigerator let the hot ammonia gas dissipate its heat. The ammonia gas condenses into ammonia liquid (dark blue) at high pressure.
3. The high-pressure ammonia liquid flows through the expansion valve. You can think of the expansion valve as a small hole. On one side of the hole is high-pressure ammonia liquid. On the other side of the hole is a low-pressure area (because the compressor is sucking gas out of that side).
4. The liquid ammonia immediately boils and vaporizes (light blue), its temperature dropping to -27 F. This makes the inside of the refrigerator cold.
5. The cold ammonia gas is sucked up by the compressor, and the cycle repeats.

Pure ammonia gas is highly toxic to people and would pose a threat if the refrigerator were to leak, so all home refrigerators don't use pure ammonia. You may have heard of refrigerants know as CFCs (chlorofluorocarbons), originally developed by Du Pont in the 1930s as a non-toxic replacement for ammonia. CFC-12 (dichlorodifluoromethane) has about the same boiling point as ammonia. However, CFC-12 is not toxic to humans, so it is safe to use in your kitchen. Many large industrial refrigerators still use ammonia.

In the 1970s, it was discovered that the CFCs then in use are harmful to the ozone layer, so as of the 1990s, all new refrigerators and air conditioners use refrigerants that are less harmful to the ozone layer.

1. Answer the questions.

1. Why do people think of a refrigerator as a real luxury?
2. What are cold temperatures used for?
3. What will spoil milk in two or three hours if the milk is left out on the kitchen counter at room temperature?
4. What can decrease the activity of the bacteria?
5. What is the basic idea of functioning of a refrigerator?
6. Why do water, rubbing alcohol and ammonia create different cool feelings?
7. What are basic parts to any refrigerator?
8. What is the task of the compressor when it compresses the refrigerant gas?
9. What happens when the liquid refrigerant moves from a high-pressure zone to a low-pressure zone?
10. Where does the hot ammonia gas dissipate its heat?
11. Why home refrigerators don't use pure ammonia?

2. Match the two parts of the sentences.

1. By reducing the temperature of the milk,	a) it uses the evaporation of a liquid to absorb heat.
2. Refrigerant used in a refrigerator evaporates at an extremely low temperature,	b) it will stay fresh for a week or two.
3. As the refrigerant cools, it condenses into liquid form	c) common forms of food preservation used today.
4. Modern refrigerators use a regenerating cycle	d) so it can create freezing temperatures inside the refrigerator.
5. Refrigeration and freezing are two of the most	e) and flows through the expansion valve.
6. all new refrigerators and air conditioners use refrigerants	f) to reuse the same refrigerant over and over again.
7. The compressor compresses the ammonia gas	g) which heats up as it is pressurized.
8. The ammonia gas condenses into	h) ammonia liquid at high pressure.
9. Pure ammonia gas is highly toxic to people	i) and would pose a threat if the refrigerator were to leak
10. CFCs originally developed by Du Pont in the 1930s	j) as a non-toxic replacement for ammonia.
11. The basic idea behind a refrigerator is very simple:	k) that are less harmful to the ozone layer.

3. Complete the text using the words in the box.

travels discharges motor the refrigerant-control device the evaporator the receiver the refrigerator heat coils compressor a liquid

The Electric Refrigerator

The electric refrigerator is a compression-type refrigeration unit powered by an electric (1)_____. A home electric refrigerator consists of five basic parts: the receiver, (2) _____, the evaporator, the compressor, and the condenser.

At the beginning of the refrigeration cycle, the refrigerant leaves (3) ____ (storage tank) under high pressure. The refrigerant (4) ____ through pipes to the refrigerant-control device. This mechanism reduces the pressure of the refrigerant as it enters (5) ____. The evaporator is the coldest spot in (6) ____ and serves as the freezing unit. It consists of pipes or (7) ____ on the walls or sides of the cabinet, or surrounding the ice-tray compartment. At a low pressure, the liquid refrigerant evaporates inside these coils and absorbs (8) ____. This causes refrigeration to take place. The (9) ____ pumps the refrigerant from the freezing unit as a vapor, and raises its pressure. It then (10)

____ high-pressure gas into the air-cooled condenser. There the gas loses the heat it gained in the evaporator and condenses into (11) ____ at the high pressure, which flows back to the storage tank.

4. Form all possible nouns from the verbs listed below. Find sentences in the text *The Electric Refrigerator* **where the nouns you have formed are used in the attributive function.**

To compress, to refrigerate, to evaporate, to condense, to receive, to store.

POLYMERS

MY GLOSSARY

molecules - молекулы
atoms - атомы
rubber – каучук, резина
latex - латекс
natural – естественный, природный
natural polymer – природный полимер
synthetic - синтетический
synthetic polymers – синтетический полимер
manmade – созданный руками человека, искусственный
thermoplastics - термопласты
moulds – лекало, литейная форма
sets – схватывается, затвердевает
moulded - отлит
thermosetting plastics – термоусадочные пластмассы
cure - затвердевать
epoxy resins – эпоксидная смола
polyimides – полиимиды
engineering plastics – инженерные пластмассы
elastomers – эластомеры

NATURAL AND SYNTHETIC POLYMERS

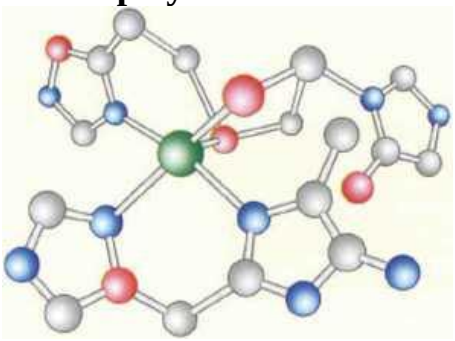
The web page below, from a website for engineering students, provides an introduction to polymers.

With names such as polytetrafluoroethyline and polyethyleneteraphthalate, it's not surprising that polymers are usually called by their more common name, plastic.

But what, exactly, is a polymer or a plastic?

Polymers are compounds made up of several elements that are chemically bound. Most compounds consist of large numbers of tiny **molecules**, which each contain just a few **atoms**. For example, a water molecule - H2O - contains two hydrogen atoms and one oxygen atom. But the molecules of polymers contain huge numbers of atoms, joined together in long chains.

Rubber, thanks to its many uses from rubber bands to car tyres, is one of the best-known polymers. It comes from **latex**, a **natural** liquid which comes from rubber trees. Rubber is therefore a **natural polymer**. However, most of the polymers used in industry are not natural, but **synthetic**. The term 'plastic' is generally used to refer to **synthetic polymers** - in other words, those that are **manmade**.



A polymer chain

Note: Rubber can be natural (natural rubber) or synthetic (synthetic rubber).

THERMOPLASTICS AND THERMOSETTING PLASTICS

The page goes on to look at types of polymer.

Synthetic polymers can be divided into two main categories:

Thermoplastics can be melted by heat, and formed in shaped containers called **moulds**. After the liquid plastic has cooled, it **sets** to form a solid material. A thermoplastic is a type of plastic that can be heated and **moulded** numerous times. Examples of thermoplastics that are common in engineering include:

- **ABS** (acrylonitrile butadiene styrene) - stiff and light, used in vehicle bodywork
- **polycarbonate** - used to make strong, transparent panels and vehicle lights
- **PVC** (polyvinylchloride) - a cheaper plastic used for window frames and pipes.

Thermosetting plastics, also called **thermosets**, can be heated and moulded like thermoplastics. They may also be mixed from cold ingredients. However, during cooling or mixing, a chemical reaction occurs, causing thermosets to **cure**. This means they set permanently, and cannot be moulded again. If a thermoset is heated after curing, it will burn. Examples of thermosets used in engineering are:

- **epoxy resins** - used in very strong adhesives
- **polyimides** - strong and flexible, used as insulators in some electric cables.

Two more categories of polymer are **engineering plastics** and **elastomers**. Engineering plastics are mostly thermoplastics that are especially strong, such as ABS and polycarbonate. Elastomers are very elastic polymers which can be stretched by force to at least twice their original length, and can then return to their original length when the force is removed.

1. Circle the correct words to complete the text.

A lot of rubber is made from latex, a (1) *natural/synthetic* polymer which comes from rubber trees. However, not all rubber comes from trees. Synthetic rubber is a (2) *manmade/natural* polymer with similar properties to latex. Plastics are also polymers. Like rubber, they consist of long chains of (3) *atoms/molecules* which form extremely large (4) *atoms/molecules*.

2. Read the extract describing a plastic panel manufacturing process. Then decide whether the sentences below are true or false, and correct the false sentences.

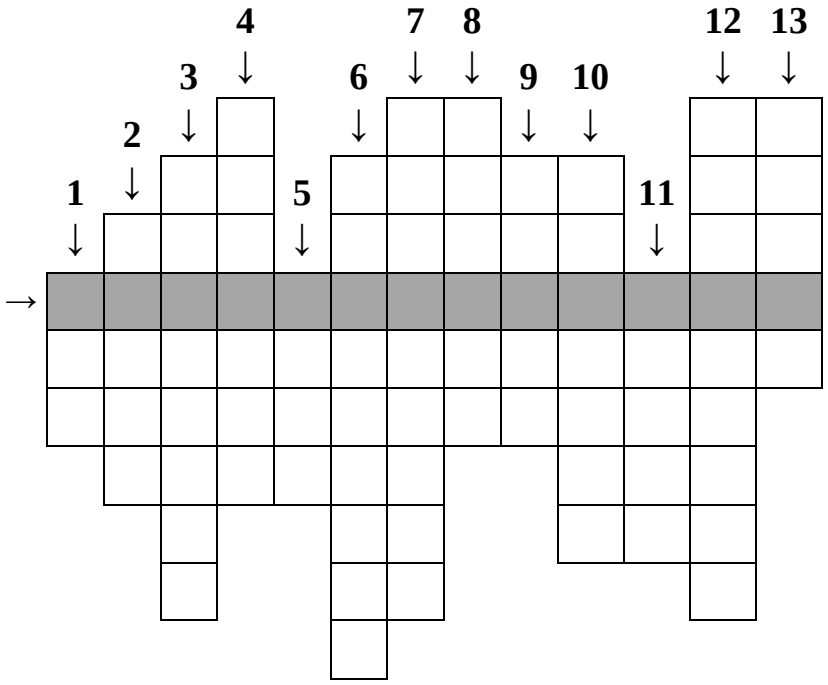
By this stage of the process, the plastic is solid, and has fully cooled. Selected panels can now undergo quality-control testing, to check they are strong enough to cope with the tough conditions they will be exposed to in use. Tests include tensile testing, where narrow lengths of panel are subjected to high tension loads to check they do not stretch or fracture. More tests are carried out to check the panels' resistance to impacts and scratching. Any products that fail the tests are returned to the beginning of the production process, melted down, and their material is reused.

1. The plastic was heated earlier in the process.
2 . The plastic has now set.
3 . The plastic is now liquid.
4. To pass one of the tests, the plastic must be an elastomer.
5 . The description suggests the plastic is a type of engineering plastic.

6 . The material is a thermosetting plastic.
7 . The material is a thermoplastic.

3. Complete the word puzzle and find the word going across the page.

1 a shorter name for polyvinylchloride
2 used for forming melted plastic
3 a group of atoms
4 a long chain of atoms
5 to set permanently
6 a very elastic polymer
7 a plastic that sets permanently
8 a natural polymer
9 a very strong thermoset resin
10 not natural
11 particles that form molecules
12 another word for ‘not natural’
13 material used to make rubber



4. Talk about specific types of polymer that are used in your industry, or an industry you're familiar with. How are they used? Which of the categories mentioned in the texts above do the polymers belong to?

ORAL PRACTICE

5. Прочитайте диалог *Two Technology students are talking about plastics* **и заполните таблицу.**

Ann: I think that this assignment on the history and properties of plastics should be quite interesting.

Nancy: Yeah, I'm looking at the British Plastics Federation website, that's www.bpf.co.uk. It's got some good stuff about the history of plastics. You know plastics can be used to produce almost anything nowadays. ,

Ann: Yes. Just look at your toothbrush, these files, the table lamp, the street lights outside, even the while lines on the road; they're all made of plastic.

Nancy: It says here that the first plastic was made of cellulose in the mid-eighteen hundreds and was used to make billiard balls! That was a great step forward in the world of science. Apparently, people were worried that there weren't enough elephants to provide ivory for making billiard balls so they had to find a substitute. The first balls were made of coated celluloid.

Ann: Celluloid is the plastic made from cellulose, isn't it?

Nancy: Yes, and cellulose comes from plants. The problem was that this could be explosive. The inventor liked to tell stories of the early balls exploding when they were hit hard! Imagine that!

Ann: I found a book in the college library called "Plastics", and it says that another problem with the early plastics such as celluloid was that you couldn't make things to a high standard of quality. Apparently, it wasn't until they started using petroleum and natural gas in the mid-nineteen hundreds that plastics production was really able to take off

Nancy: Yes, it says here that using petroleum and natural gas led to the development of so many different plastics: polyethylene, nylon, polyester, and they've all got different properties so you can always find one that's suitable for your product.

Ann: Exactly! They're really versatile. Today, the plastics industry is mainly based on oil so we can produce household and industrial items cheaply. But we are running out of oil, what are we going to do then?

Nancy: Recycle! On this website, www.chcmsoc.org there are loads of facts about plastics. Today, manufacturers have the technology to produce things such as rubbish bins, plastic sacks, and even clothes from recycled plastic and I'm sure we'll be able to extend this range of goods soon. I'm sure we'll be recycling large quantities of plastic in the future. But we'll have to find good systems for collecting plastic for recycling. That's not Very effective at the moment.

Ann: We'll also have to find alternative raw materials for producing new plastic. There are already new technologies available which allow us to use other raw materials.

Nancy: Yeah, look! I've just found in www.worldccntric.org that companies are now able to make bioplastics from the starch in wheat, and even oranges! Some manufacturers are already producing things like food wrapping from these bioplastics.

Ann: I think they are still expensive to produce, so more research will have to be done to allow us to produce these plastics more cheaply. But I'm sure that these will be important for the future for plastics.

Raw material	Plastic
cellulose	_____
_____and_____	polyethelene, nylon, polyester
Starch from plants (e.g. wheat)	_____

6. Some people say that computers have made life easier and more convenient. Other people say that computers have made life more complex and stressful. What is your opinion? Use specific reasons and examples to support your answer. You should write at least 250 words

Model answer:

Some people say that the computer is a great invention. However, other people think that computers make their life more stressful. I agree with those people who think that computers brought many benefits and play a very important role in our modern life. First of all, every company nowadays uses a computer to store its data and make different kinds of operations. It is very difficult to imagine life without computers. A company would have to store millions of papers and documents. Moreover, a customer would have to wait hours to check his balance or get a piece of information about his transactions at his bank, while an employee was looking through those papers. Another important aspect of this is that people are able to type all their information, make corrections, print or send documents using computers. It makes life much easier. One can spend the rest of the time watching TV with his family or working on something new. We use computers every day sometimes even not knowing it. When we go to a store and use our credit cards many computers process our information and perform transactions. When we need to get some cash we use money access machines that are computerized too. Second of all, computers provided a great means of communication - the Internet.

I think it is the easiest and cheapest way to get in touch with relatives, friends, business colleagues, etc. Nowadays the world becomes smaller and smaller. When I was a little girl, I could not imagine that it would be possible to communicate with people from all around the world in so easy way. A person can get latest news, become friends with someone from another country, find his old friends, ask for a piece of advice, etc. Finally, in addition to these practical benefits people can shop

without leaving their house. They just use an Internet access, a computer and their cards to make a payment. It is kind of difficult to imagine that a few years ago people had to spend their time in lines buying tickets. Now, a person can choose a destination, company, date and time and get tickets delivered to his door.

I think it is amazing. To sum up, I believe that computers made our lives easier. They change our attitude towards life. I think with the invention of computers people became closer and friendlier.

Unit 10 Household refrigerators and freezers

MY GLOSSARY

Crisper - отсек холодильника для хранения овощей при пониженной температуре
storage lives - сроки хранения
imply - подразумевать
dessication – высушивание
crusher – дробилка
dispenser – дозатор
undergo - подвергаться

1. Read the text and answer the questins.

Household refrigerators and freezers are intended for keeping small volumes of many different foods and drinks simultaneously at low temperatures, as can be found in any household. These items require diverse storage temperatures (and relative humidities in many cases) and have different storage lives. With the exception of air conditioning, domestic refrigeration systems are primarily used for food storage.

The use of these appliances by untrained people implies that their operation and maintenance must be very simple. In addition, domestic refrigerators must withstand frequent use and provisions must be made for economical and effective servicing in case of malfunction or damage.

These features condition the design and operation of household refrigerators and freezers, which have little in common to those of commercial storage chambers and industrial freezers. The design of domestic refrigerators must also deal with the overall appearance of the appliance (size, shape, color, and surface finishing) and provide special-purpose storage compartments. There is a wide variety of these compartments: some are widespread like vegetable crispers (normally with high humidity and tight-fitting to reduce product dessication), meat keepers (with the possibility of a special compartment for fish at approximately −1°C) and butter keepers. In many cases, modern refrigerators and freezers also include additional facilities such as automatic icemakers, crushers, and dispensers or chilled water and juice dispensers.

In addition, these apparatus must make use of nontoxic and nonflammable refrigerants; their operation must be as silent as possible and must be energy efficient. To this end, overall energy efficiency is important both because government standards impose consumption limits and because rising energy costs increase operation costs.

Household refrigerators appear with many of their distinctive characteristics at the beginning of the third decade of the past century and since then they have undergone continuous improvements parallel to those of other home appliances.

1. What are household refrigerators and freezers intended for?
2. Why do consumers need diverse storage temperatures in a refrigerator?
3. Why must domestic refrigerators withstand frequent use?
4. What must the design of domestic refrigerators also deal with?
5. What are the main compartments of a refrigerator?
6. Do modern refrigerators have any additional facilities?
7. What are the main requirements for refrigerants?
8. Why energy efficiency is an important feature of refrigerators and freezers?

2. The following statements are grammatically incorrect. Find 2 mistakes in each and correct them.

1. Inadequate domestic refrigeration are frequently cited as a factors in incidents of food poisoning.
2. These items requires diverse storage temperatures and relative humidities in many cases.
3. Managers of a large company do not pay much attention on one's solutions and suggestion.
4. A global household refrigerators and freezers market size is expect to reach USD 125.68 billion by 2025.
5. Refrigerators household and freezers buyers are very sensitive about buying inappropriate models with low prices and high electricity consumptions.
6. Increasing electrification and widely usage of internet sales are expected to propel the market for household refrigerators and freezers at rural and semi-urban areas.
7. Energy efficient model help in reducing electricity consumption and ultimately reduced costs related to units.

Types of Household Refrigerators.

Side-by-side refrigerators

Side-by-side refrigerators put fresh food at eye-level in the refrigerator. When considering a side-by-side, look carefully at capacity and interior flexibility. In some models, the compartments are narrower than those you will find in top- or bottom-mount models, and may not accommodate larger items or packages you frequently store, like bulky pizza boxes in the

freezer. If possible, select a refrigerator with adjustable bins and shelves so you can conform the available space to suit your storage needs. Look for models that offer space-saving freezer features such as in-door ice makers that move ice to the freezer door and free up a lot of valuable shelf space.

Standard side-by-side refrigerators range from approximately 31 inches to 36 inches. Depths range from about 28 inches to 34 inches and the heights of most models range between 66 inches and 69 inches, making them taller than top-mounts. Typically this type of refrigerator will require more kitchen space than other types because of the overall size and the area needed to open both doors.

1. Find synonyms for the following words in the text.

Requirement, to vary, inside, large, to hold, adaptable, to choose, often, to release, place.

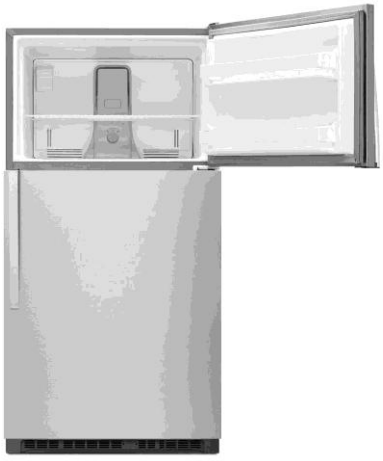
2 Complete the following sentences using ideas from the text.

1. Taking into account the depth and height of a side-by-side we come to the conclusion that ...
2. Having decided to buy a side-by-side refrigerator one should ...
3. Being a double door type of a refrigerator, a side-by-side requires ...
4. Having a habit of storing many boxes of pizza at home, one should ...
5. Being equipped with adjustable bins and shelves, a side-by-side refrigerator ...

3 Divide the following features of a side-by-side refrigerator into positive and negative ones. Explain your choice.

- food is stored at eye-level
- in-door ice maker
- narrow compartments
- adjustable bins and shelves
- separate doors for a freezer and a refrigerator itself

Freezer on top



This is the most common type of refrigerator available, with the most extensive selection of styles. Narrow down your choices before you shop—first by price range, then by interior features. Think about capacity and which of the dozens of performance options, such as filtered water dispensers and temperature-controlled crispers, will be most valuable for your household.

Standard widths for top-mount refrigerators range from 23 inches to approximately 36 inches. Depth, 27 inches to 33 inches, including the door handle. Most top-mount refrigerators are 60 inches to 69 inches in height. Because of their configuration, top-mounts typically offer more capacity than other model types. Eye-level freezers also offer easier access to food stored in the freezer.

1 Build different parts of speech from the words below. Translate the pairs of words.

access→ adj
to extend→ adj
to select→ noun
typical→ adv
to freeze→ noun
approximate→ adv
to perform→ noun
wide→ noun
deep→ noun

2 Find English equivalents in the text. Try to explain them in English.

Дверная ручка, имеющийся в наличии тип холодильника, эксплуатационные параметры, сосуд для хранения продуктов, сократить выбор, широкий выбор, диапазон цен.

3 Agree or disagree with the following statements.

1. Interior features of top-mount refrigerators are more important than the price.
2. A refrigerator should have as many performance options as possible.
3. The position of the freezer doesn't affect the access to food.

Freezer on bottom

Bottom-mount freezers are not as widely available as other refrigerator types yet, but *most major manufacturers*[1] offer *at least*[2] one model. The bottom-mount design is a good option for households that want fresh food selections at eye level.

The dimensions of bottom-mount refrigerators are generally the same as *those*[3] of the larger top-mounts. The average width is around 33 inches, the average depth ranges between 32 inches and 35 inches, and average height is between 66 inches and 69 inches.

1 Find synonyms for the following words and word combinations.

Choice, bottom-placed, size, main, accessible, to vary, layout, producer.

2 Choose the best translation of the words and expressions from the text in italics.

1. а) самые основные производители; б) большинство основных производителей; с) большая часть из основных производств.
2. а) по крайней мере; б) самую маленькую; с) в конце концов.
3. а) те; б) эти; с) размеры.

3 Answer the following questions.

1. Why are refrigerators with bottom-mount freezers not so popular?
2. What advantages and disadvantages can you find in this model?

4 Complete the table using information from the previous texts. Then in pairs make short reports on the enumerated factors. As an example you may use the model below.

type of a fridge	occupied space	position of a freezer	adjustable elements	capacity
side-by-side				
freezer on top				
freezer on bottom				
compact refrigerator				

DC-Powered Solar Refrigerators and Freezers




Solar Medical Refrigerator	Solar Refrigerator	Solar Fridge/Freezer	Solar Freezer

dc power supply - источник постоянного тока
RV's campgrounds – кемпинги рекреационных автомобилей
Data logger - Регистратор данных

Green Energy Innovations offers an entire line of solar powered refrigerators, solar powered fridge-freezer, solar powered freezers and our newest addition the solar powered medical refrigerator. All our units are dc powered and can operate independent of the electric grid. Requiring as little as 45W of power the entire line of dc powered solar refrigerators can operate using a single solar panel and a single battery. All units can work with either a 12V or 24V battery and can provide multiple days of operation on a single charge. If electricity is available, an optional ac adapter may be added to provide additional security and backup power in case the batteries are fully discharged.

The entire line of dc powered solar refrigerators operates fully on dc power. What this means is that you do not require an inverter to operate our solar powered refrigerators. Ideally suited for off grid locations or locations where power interruptions are common and daily occurrences. Now you can keep your food fresh and safe even if your power is unreliable. The solar powered refrigerator may be used in boats, RV's campgrounds, etc. By using a dc powered solar refrigerator, you can save 100's of dollars a year in lowered electricity costs or fuel bills.

The newest products in our line up of dc powered solar refrigerators are the medical refrigerators and freezers. The medical line includes products with digital programmable thermometers with multiple alarms. Data loggers allow these products to record the temperature at regular intervals throughout the day. The units may be placed vertically or horizontally and have a lockable door. Ideally suited for storage of blood, vaccines, medicines and tissue samples. The solar medical refrigerators are ideally suited for countries and remote locations where power is not easily available or unreliable.

The company offers a large selection of solar refrigerators, freezers, medical refrigerators of various sizes to meet consumer needs. Sizes vary from as small as 45 liters to the largest freezer which is 318 liters. The solar showcase is ideal for displaying cold drinks and chilled beer and is perfectly suited for locations where a chilled drink is a perfect solution to a hot summer day.

1. What are the benefits of a solar powered refrigerator?
2. Can a solar powered refrigerator operate using only a single solar panel?
3. Where can a solar powered refrigerator be used?
4. Is a solar powered refrigerator economical device?
5. What products are equipped with digital programmable thermometers?
6. What are the functions of data loggers?
7. How are refrigerators usually used in hospitals?

8. Why does the company manufacture refrigerators of various sizes?
9. What kind of refrigerators is used for cold drinks and beer?

1 Make word partnerships from the words of two columns

solar	independent
electricity	powered
remote	suited
operate	costs
fully	the day
ideally	samples
throughout	locations
additional	discharged
power	interruptions
tissue	security

2 Translate the following expressions into Russian

Data logger, a perfect solution, a chilled drink, placed vertically, dc power supply, multiple alarms, electric grid, solar panel, single charge, lockable door, suited for storage, unreliable power, consumer needs, the largest freezer.

3 Make a short oral report of 5-6 sentences about a solar powered refrigerator. Would you like to use one or not? Why ?

Handling a Refrigerator

1 Last week an interesting phone-in program devoted to handling a refrigerator was held. Read some typical questions asked by people. Agree or disagree with the answers of the experts.

Handling a Refrigerator

1. – That is Mrs. Hopps calling. I live in a mountainous area and we have had a lot of problems with electricity recently. What can I do to preserve my food during a power interruption? – If the electricity in your house goes off, call the Power Company and ask how long it will be off. If there is no power for 24 hours or less, keep both refrigerator doors closed to help food stay cold and frozen.

If there is no power for more than 24 hours remove all frozen food and store it in a cold place. You may also place some dry ice in the freezer. This will keep the food frozen for two to four days. If no dry ice is available, consume or can perishable food at once.

2. – Hello. This is Mrs. Johnson. We got married a month ago and I am a young housewife now. We've just bought a new fridge and I wonder what the best way to clean my refrigerator is.

– Clean both the refrigerator and freezer compartments about once a month to prevent odors from building up. Wipe up spills immediately. Unplug refrigerator or disconnect power. Remove all removable parts from inside, such as shelves, crispers, etc. Hand wash, rinse, and dry removable parts and interior surfaces thoroughly, using a clean sponge or soft cloth and mild detergent in warm water. To help remove odors, you can wash interior walls with a mixture of warm water and baking soda.

3. – It's Mrs. Brown. I'm a pensioner. I'm going to buy a new fridge but I'm in two minds what model to buy: either a self-defrosting one or a manually defrosting one. What are the tradeoffs between "self defrost" and "manual defrost" models?

– Self-defrosting models save you the time and hassle of manually defrosting your freezer. Generally speaking, frozen food items retain their "freshness" longer in manual defrost freezers. Self-defrosting models consume more energy, costing you more money to operate.

4. – Hello. I would like to ask you a question. Can I use my ice maker and water dispenser without the through-the-grill water filter installed?

– Yes, the filter is not mandatory to have in the product and you can remove it. The housing the filter goes into consists of a by-pass valve and all you need to do is to turn the filter counter clockwise to remove. You don't need the filter in the housing to use the water dispenser and icemaker, however, if the filter is removed, the water will not be filtered.

5. – That is Mary, a schoolgirl calling. It's my duty to clean the fridge. Every time I have problems with door handles. What can I clean my plastic door handles with?

– Oils from your hands can cause the handle to become dirty. If your hands are dirty or oily, you should wash them before touching the handles. This will keep the handle clean and free from dirt and oils from your hands. Do not use abrasive or harsh cleaners such as flammable fluids, concentrated detergents, bleaches or cleansers containing petroleum products on plastic parts and handles.

2 Find in the text equivalents for the following words and word combinations.

Мягкое моющее средство, соотношение выгод и потерь, повернуть против часовой стрелки, перепускной клапан, перерыв в электроснабжении, вытирать, отключить холодильник, модель с автоматическим размораживанием, потреблять скоропортящиеся продукты, модель с ручным типом размораживания, предотвратить появление запаха, морозильное отделение.

3 Make your own sentences using the following prompts.

1. handle / dirty / to use / abrasive cleaners / concentrated detergents / to contain petroleum products

2. self-defrosting models / advantage / to save time / however / to retain "freshness"

3. less energy / "manual defrost" models / to consume / so / to pay

4. to prevent odors / spills / removable parts / hand wash / interior surfaces

5. interior walls / remove odors / to wash / a mixture / baking soda.

4 Make up stories illustrating the causes of the following consequences.

1) You came to see your grandmother and saw a lot of canned food in her house, which is not typical of her.

2) In the morning you asked your little sister to clean the fridge. When you came back it didn't work and was covered with dirty oily spots.

3) You came home from classes and saw a filter on the table. Your roommate was not in. What might have happened?

4) You live in the dormitory and share a room with three boys / girls. Every day you see dirty spots on the fridge handle.

5 For the forthcoming Fool's day Fridgy, which is a company manufacturing refrigerators, has worked out a funny set of tips and enclosed it to every fridge box. It starts as follows: "If you want to get rid of your new fridge as soon as possible follow the advice we give you below".

Read the "recommendations" and turn bad pieces of advice into good ones.

A funny guide

1. Every time you take something out of the fridge hold the door open for at least 2 minutes.

2. There is no need in regular defrosting your manual defrost freezer. Do it when you are in the mood. While defrosting it always chip away the frost.

3. Keep your fridge either half empty or overfill it.

4. Don't keep your refrigerator upright during moving and storage. Keep it in level position.

5. Put the fridge right against the wall. Don't leave any air space behind your refrigerator and above it.

Unit 11 HOW AIR CONDITIONERS WORK

Air conditioners make hot weather bearable.

MY GLOSSARY

lithography – литография
paper stock - бумажное сырье
layered inking techniques - техника послойного нанесения краски
pop up - появляться
ambient - окружающий, внешний
exterior housing - внешний корпус
rely on - полагаться на
conversion – преобразование
to force – заставлять
fan - вентилятор
ducts – каналы
dehumidifier – осушитель
moisture-collecting pans - поддоны для сбора влаги

How did it start?

The first modern air conditioning system was developed in 1902 by a young electrical engineer named Willis Haviland Carrier. It was designed to solve a humidity problem at the Sackett-Wilhelms Lithographing and Publishing Company in Brooklyn, N.Y. Paper stock at the plant would sometimes absorb moisture from the warm summer air, making it difficult to apply the layered inking techniques of the time. Carrier treated the air inside the building by blowing it across chilled pipes. The air cooled as it passed across the cold pipes, and since cool air can't carry as much moisture as warm air, the process reduced the humidity in the plant and stabilized the moisture content of the paper. Reducing the humidity also had the side benefit of lowering the air temperature – and a new technology was born.

Carrier realized he had developed something with far-reaching potential, and it wasn't long before air-conditioning systems started popping up in theaters and stores, making the long, hot summer months much more comfortable.

The actual process air conditioners use to reduce the ambient air temperature in a room is based on a very simple scientific principle. The rest is achieved with the application of a few clever mechanical techniques. Actually, an air conditioner is

very similar to another appliance in your home – the refrigerator. Air conditioners don't have the exterior housing a refrigerator relies on to insulate its cold box. Instead, the walls in your home keep cold air in and hot air out.

1 Answer the following questions?

1. How was the process of air conditioning discovered?
2. What was the problem in the company?
3. What kind of techniques was it difficult to apply?
4. How could Carrier reduce the humidity in the plant?
5. Why Carrier's development had far-reaching potential?
6. What is the difference between an air conditioner and a refrigerator?

2 Find the words/ phrases in the text which follow the verbs below.

1 be designed	5 to pass	9 to carry
2 to reduce	6 to lower	10 to start
3 to make	7 to reduce	11 to base
4 to achieve	8 to be similar	12 to insulate

Air-conditioning Basics

Air conditioners use refrigeration to chill indoor air, taking advantage of a remarkable physical law: When a liquid converts to a gas (in a process called phase conversion), it absorbs heat. Air conditioners exploit this feature of phase conversion by forcing special chemical compounds to evaporate and condense over and over again in a closed system of coils.

The compounds involved are refrigerants that have properties enabling them to change at relatively low temperatures. Air conditioners also contain fans that move warm interior air over these cold, refrigerant-filled coils. In fact, central air conditioners have a whole system of ducts designed to funnel air to and from these serpentine, air-chilling coils.

When hot air flows over the cold, low-pressure evaporator coils, the refrigerant inside absorbs heat as it changes from a liquid to a gaseous state. To keep cooling efficiently, the air conditioner has to convert the refrigerant gas back to a liquid again. To do that, a compressor puts the gas under high pressure, a process that creates unwanted heat. All the extra heat created by compressing the gas is then evacuated to the outdoors with the help of a second set of coils called condenser coils, and a second fan. As the gas cools, it changes back to a liquid, and the process starts all over again. Think of it as an endless, elegant cycle: liquid refrigerant, phase conversion to a gas/heat absorption, compression and phase transition back to a liquid again.

It's easy to see that there are two distinct things going on in an air conditioner. Refrigerant is chilling the indoor air, and the resulting gas is being continually compressed and cooled for conversion back to a liquid again.

1 Find the words in the text which correspond to the following definitions.

A substance or matter in a state in which it will expand freely to fill the whole of a container, having no fixed shape and no fixed volume.

Make (someone) cold.

A machine used to supply air or other gas at increased pressure.

Take in or soak up (energy or a liquid or other substance) by chemical or physical action.

A set of things working together as parts of a mechanism or an interconnecting network; a complex whole.

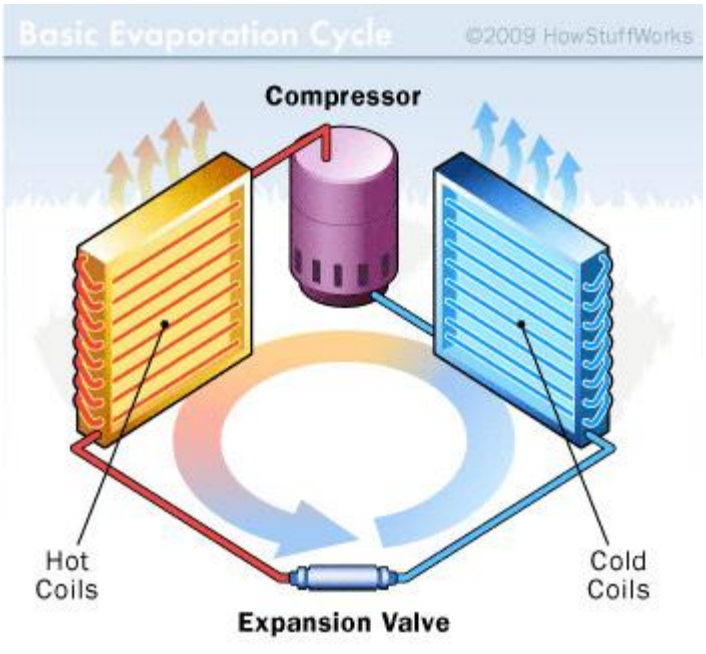
An apparatus with rotating blades that creates a current of air for cooling or ventilation.

A substance that flows freely but is of constant volume, having a consistency like that of water or oil.

2 Match left to the right to make a word/phrase combination taken from the text. Consult the text.

1. to chill	a) system
2. to take advantage	b) of a physical law
3. to absorb	c) coils
4. closed	d) indoor air
5. evaporator	e) heat
6. gaseous	d) high pressure
7. unwanted	e) refrigerant
8. to put under	f) state
9. liquid	g) heat

3 Ask six questions to your partner about the text.



The Parts of an Air Conditioner

The biggest job an air conditioner has to do is to cool the indoor air. That's not all it does, though. Air conditioners monitor and regulate the air temperature via a thermostat. They also have an onboard filter that

removes airborne particulates from the circulating air. Air conditioners function as dehumidifiers. Because temperature is a key component of relative humidity, reducing the temperature of a volume of humid air causes it to release a portion of its moisture. That's why there are drains and moisture-collecting pans near or attached to air conditioners, and why air conditioners discharge water when they operate on humid days.

Still, the major parts of an air conditioner manage refrigerant and move air in two directions: indoors and outside:

- **Evaporator -** receives the liquid refrigerant
- **Condenser -** facilitates heat transfer
- **Expansion valve -** regulates refrigerant flow into the evaporator
- **Compressor -** a pump that pressurizes refrigerant

The cold side of an air conditioner contains the evaporator and a fan that blows air over the chilled coils and into the room. The hot side contains the compressor, condenser and another fan to vent hot air coming off the compressed refrigerant to the outdoors. In between the two sets of coils, there's an **expansion valve**. It regulates the amount of compressed liquid refrigerant moving into the evaporator. Once in the evaporator, the refrigerant experiences a pressure drop, expands and changes back into a gas. The **compressor** is actually a large electric pump that pressurizes the refrigerant gas as part of the process of turning it back into a liquid. There are some additional sensors, timers and valves, but the evaporator, compressor, condenser and expansion valve are the main components of an air conditioner.

Although this is a conventional setup for an air conditioner, there are a couple of variations you should know about. Window air conditioners have all these components mounted into a relatively small metal box that installs into a window opening. The hot air vents from the back of the unit, while the condenser coils and a fan cool and re-circulate indoor air. Bigger air conditioners work a little differently: Central air conditioners share a control thermostat with a home's heating system, and the compressor and condenser, the hot side of the unit, isn't even in the house. It's in a separate all-weather housing outdoors. In very large buildings, like hotels and hospitals, the exterior condensing unit is often mounted somewhere on the roof.

1 Answer the following questions?

1. How do air conditioners monitor and regulate the air temperature?
2. What removes airborne particulates from the circulating air?
3. Why do air conditioners have moisture-collecting pans?
4. What does the evaporator do?
5. What device regulates refrigerant flow into the evaporator?
6. Where does hot air coming off the compressed refrigerant go?
7. What is a compressor?
8. What are the main components of an air conditioner?
9. How do bigger air conditioners work?

2 What are the synonyms from the text of the following words?

Fan watch carefully regulator share out-of-doors clinic building covering supplementary adjust

3 Match left to right to make a sentence complete.

1 Most people think that air conditioners	a) the same in a refrigerator as in an air conditioner.
2 What's really happening is the warm air from your house	b) and other allergens as well as smoke and everyday dirt found in the air.
3 The mechanics of the Freon evaporation cycle are	c) lower the temperature in their homes simply by pumping cool air in.
4 Most indoor units have filters that catch dust, pollen, mold spores	d) is being removed and cycled back in as cooler air.
5 Air conditioners take excess water from the air and use it	e) by routing the cooled water back into the system to be reused.
6 Other units use the condensed moisture to improve efficiency	f) the water that runs throughout the building.
7 The air handler blows air through the coil and routes	g) to help cool the unit before getting rid of the water through a hose to the outside.
8 The heat exchanger lets the cold Freon chill	h) the air throughout the building using a series of ducts.

4 Supply the correct preposition.

to change 1) ___ relatively low temperatures; to move warm interior air 2) ___ refrigerant-filled coils; temperature is a key component 3) _____ relative humidity; to attach 4) ____ air conditioners; regulates refrigerant flow 5) ____ the evaporator; they operate 6) ____ humid days; to know 7) ____ sth.; to share a control thermostat 8) ____ a home's heating system; to mount 9) ____ sth.

at over to of into on about with on

5 Translate into English.

1. Встроенный фильтр удаляет взвешенные частицы.
2. Основные части кондиционера управляют хладагентом и перемещают воздух в двух направлениях.
3. Компрессор это насос, который создает давление хладагента.

4. Расширительный клапан регулирует количество сжатого жидкого хладагента, поступающего в испаритель.
5. Компрессор создает давление газа хладагента в процессе превращения его обратно в жидкость.
6. В оконных кондиционерах все компоненты смонтированы в небольшой металлической коробке, которая устанавливается в оконный проем.
7. Центральные кондиционеры имеют общий термостат управления с домашней системой отопления.
8. В больших зданиях внешний конденсаторный блок часто монтируется где-то на крыше.

6 Read the conversation between a mechanic and a customer. Choose the correct answers.

Mechanic: (M) Thanks for calling Billings Refrigeration.
Customer (F): Hi, this is Karen at the Soup Stand restaurant. We really need your help.
Mechanic: What seems to be the problem?
Customer: Our busy lunch rush will start soon, and our air conditioning system has stopped working. I'm afraid the customers may walk out due to the heat.
Mechanic: Well, we certainly don't want that. Is this the first time it's happened?
Customer: No, it happened last month. A man from Jackson Mechanics said the air conditioner was leaking refrigerant. He said he took care of it, but whatever he did isn't working any more.
Mechanic: Is air blowing out of the vents?
Customer: No air is coming out.
Mechanic: Can you hear the motor running?
Customer: Not a peep. The system is dead.
Mechanic: You definitely have big problems. I'd have to see it to tell you more.
Customer: Can you come in soon?
Mechanic: Let me check the schedule. It looks like we can get someone out there in about an hour. Does that work?
Customer: That'll work. Thanks so much.

1 Why does the woman call the mechanic?
A Her walk-in cooler failed.
B Her ice machine isn't working.
C Her air conditioning system is not working.
D Her refrigerator is not keeping food cold.

2 What did the last mechanic claim was wrong?
A the vents were clogged
B the condenser had failed
C there was a refrigerant leak

D the heat exchanging pipe was broken

Speaking

7 With a partner, act out the roles below based on the above dialogue.

USE LANGUAGE SUCH AS Can you hear the ...? Can you come in soon? Does that work?	*Student A*: You are a mechanic. Talk to Student B about: • an air conditioning problem • making an appointment *Student B*: You are a restaurant owner. Talk to Student A about problems with your air conditioning system.

8. Some people prefer to work for a large company. Others prefer to work for a small company. Which would you prefer? Use specific reasons and examples to support your choice. You should write at least 250 words.

Model answer:

The issue whether working for a large company is better than working for a small company is a controversial one. From my everyday experience and observation I think that every option has its advantages and disadvantages. I base my opinion on the following points. From the one side working for a large company brings many benefits. First of all, one has better medical insurance, higher salary. Often employees of a large company have less responsibility. Moreover, they feel more secure because their company has more clients and this means better chance to survive on the modern market. However, one working for a large company has less chance to be promoted because one's manager does not want to lose his or her job unless she or he is promoted too. Also, from my observation, managers of a large company do not pay much attention to one's solutions and suggestions. From the other side working for a small company has many advantages too. Firstly, one has better chance to be promoted. Secondly, one can talk to the owner of the company about any improvements that can be done in order to get more profit. Another important aspect of working for a small company is the opportunities to find out more about how company works. As a result of this one can gain more experience and get better recommendations. However, this also has some disadvantages. For instance, one can get less salary, worse medical benefits, etc.

UNIT 12 HEALTH AND SAFETY AT WORK

MY GLOSSARY

ash - пепел
to assemble - собирать
building site - строительная площадка
carelessness - небрежность
to cope with - справляться
debris - обломки
employee - сотрудник
employer - работодатель
to enable - дать возможность
evacuation drill - учения по эвакуации
fire extinguisher - огнетушитель
fire fighter - пожарный
to flip up - перевернуть
hazard - опасность
injury - травма
lens - линза
long-sleeved - с длинными рукавами
overall - рабочий комбинезон
precautionary - предупредительный
safety - безопасность
sign - знак
spark - искра
supplier - поставщик
varnish - лак

1. Read the text about health and safety at work and answer the questions.

Attention must be paid to safety in order to ensure a safe working practice in factories. Workers must be aware of the dangers and risks that exist all around them: two out of every three industrial accidents are caused by individual **carelessness**. In order to avoid or reduce accidents, both protective and **precautionary** measures must be followed while working. Each country has specific regulations concerning health and safety at work. For example, The Health and Safety at Work Act 1974 is a UK Act of Parliament that establishes the fundamental rules to enforce workplace health, safety and welfare within the United Kingdom.

The objectives of the Act are:

- to secure the health, safety and welfare of people at work;
- to protect people in the work place against risks to health or safety in connection to their work activities;

- to control the keeping and use of dangerous substances;
- to control the emission of dangerous gases into the atmosphere.

The Act defines general duties of **employers, employees, suppliers** of goods and substances for use at work, and people who manage and maintain in work premises. In particular, every employer has to ensure the health, safety and welfare at work of all the employees, visitors, the general public and clients. Employers have to ensure the absence of risk to health in connection with the use, handling or storage of items and substances, as well as provide adequate facilities for a safe working environment. It is also very important to provide employees with proper instructions and training so that they will be able **to cope with** any problem that may occur at work. Employees, on their part, should always behave responsibly at work and take care of themselves and other people who may be affected by their actions. Moreover, they should cooperate with employers to enable them to perform their duties or requirements under the Act.

1. Why is it important to ensure a safe working environment?
2. Which law regulates workers' welfare in the United Kingdom?
3. What does the Act define?
4. What are the duties of employers?
5. Why is it important to provide employees with adequate training?
6. How can employees contribute to a safe working environment?

2. Read the text again and match the words with their definitions.

1. precautionary measure a □ a responsibility or task that you have to do as part of your job
2. carelessness b □ to deal effectively with a difficult situation
3. welfare c □ the buildings and land occupied by a business
4. duty d □ poor attention to an activity, which results in harm or errors
5. premises e □ action taken in order to prevent something dangerous from happening
6. to cope with f □ the health, comfort and well-being of a person or group

3. This is an example of safety rules established by the workers' safety committee in a factory in Adelaide, Australia. Read the text and complete it with the words in the box.

operate	tidy	fire	gloves	concentration	first aid	protection	brush

SAFETY RULES

MACHINERY

- Be sure to understand how to (1) _____ every machine you are going to use.
- Never use machinery when you are in a room alone.
- Use all the (2) _____ required in the place of work.
- Check that the safety devices are working. If they are not working, ask for them to be repaired immediately.
- Do not talk to anybody who is operating a machine. (3)_____ is important at all times .
- Turn off the electricity before cleaning a machine.

TOOLS

- Report any damage to the tools used at work.
- See that tools are correctly set.

DRESS

- Before starting work, wear protective clothing.
- Always wear safety glasses, (4) _____and boots when using a machine.

WORKSHOP

- Keep the workshop (5) _____, do not leave rubbish around and do not throw cigarette ends or ashes into the rubbish bin.
- The area around machines must be kept clear to avoid falling.
- Tools and protective clothing should be put away when not in use.
- Clean machines after use with a (6) _____ not with your hands.

ACCIDENT PROCEDURES

- Make sure you know where to assemble in the event of (7) _____ and where the emergency stop buttons are located.
- Do not shout or run as this can lead to panic, and inform the supervisor immediately if any accident occurs.
- Never administer (8) _____ unless you have been trained to do so.

4. Read the text again and decide if the following rules are true (T) or false (F), then correct the false ones.

1. Use machinery only when other people are in the workplace.
2. People mustn't talk in the workplace.
3. Turn off electricity after a machine has been cleaned.
4. Wear safety boots before arriving in a workplace.
5. Always wear sunglasses when using a machine.
6. Damaged tools can be dangerous.
7. Report to the supervisor about damaged equipment.
8. In case of fire ask the supervisor where the emergency stop buttons are located.

9. In case of fire shout to catch other people's attention.
10. Anyone can give first aid in case of an accident.

5. Read the text about safety signs and colours and complete the table with the correct sign category.

Safety **signs** and colours are useful tools to help protect the health and safety of employees and workplace visitors. Safety signs are used to draw attention to health and safety **hazards**, to point out hazards which may not be obvious and to remind employees where personal protective equipment must be worn. Colour attracts attention and can be used extensively for safety purposes. For example, colour can be used as an additional safety measure to identify the contents of pipes and the nature of the hazard. Different combinations of colours are used to indicate the various types of hazards. For example, the colour red is used to indicate a definite hazard, while a potential hazard is communicated by the colour yellow. When employees are aware of the hazards around them and take the necessary precautions, the possibility of an **injury**, illness or other loss is minimised.

As shown in the table below, there are three basic sign categories used in the workplace:

- warning, to indicate definite or potential hazards;
- regulatory, to indicate which actions are prohibited or mandatory;
- information, to provide general information and directions.

Each category is distinguished by its shape and can be divided into subcategories having different colours.

Category	Subcategory	Colour
 1 _____ A circle indicates that an order is in force.	- Prohibition: it forbids an action. - Mandatory: it requires an action.	Red and black on white White on black
 2 _____ A triangle indicates caution or danger.	- Caution: it indicates a potential hazard. - Danger: it indicates a definite hazard.	Black on yellow White on red

3 _____ A square indicates information.	- Emergency: it indicates first aid, health, fire protection and emergency equipment. - General information: it indicates permission or public information.	White on green White on blue

6. Match each sign with its meaning and write the correct subcategory for each of them.

a □ slippery when wet
b □ high voltage
c □ first aid station
d □ head protection must be worn
e □ cafeteria
f □ no smoking area

7 Read the texts about safety equipment and match the words in the box with the correct description.

hearing protection hard hats respirator safety glasses face shield **overall**

(1) _____are the most important piece of safety equipment. There are many styles of these, but all share the same features, that is to say impact resistant **lenses** and side screens to protect against dust.

(2) _____ should be worn when working with **loud** power tools and machinery, in order to protect you from long-term hearing loss.

(3) _____are predominantly used in workplace environments such as **building sites**. They protect the head from injury by falling objects, impact with other objects, **debris**, bad

When working with chemicals or machinery which makes dust, it is advisable to wear a face mask, to keep these fine particles away from the face. When spraying **varnish** or paint, a (4) _____is a better

weather and electric shock.	choice, to protect you from any **harmful** effects of using these **chemicals**.
(5) A _____ must be worn when using machinery which gives off **sparks** or little parts. It is comfortable, can be **flipped up** when not needed, and will keep most of the flying chips away from your face. 	When working, you should always wear proper clothing, like an (6) _____ Comfortable, **long-sleeved** shirts and long trousers combined with good safety boots will each provide a layer of protection. 

8. Read the text about fire safety procedures and put the actions in the correct order.

A fire safety plan is required in all public buildings, from schools, hospitals, supermarkets to workplaces. Generally, the owner of the building is responsible for the preparation of a fire safety plan. Once the plan has been approved by the Chief Fire Official, the owner is responsible for training all staff in their duties. **Evacuation drills** are a very important part of the staff training associated with emergency evacuation procedures. Drills should be carried out in all buildings at least once a year. The drill should be checked, recording the time required to complete the evacuation, and noting any problems and deficiencies. After each drill a meeting should be held to evaluate the success of the drill and to solve any problems that may have arisen. What to do in case of fire...

- If you see fire or smoke, do not panic. Remain calm and move quickly, but do not run.
- Alert the responsible staff and telephone the correct national emergency number. Have someone meet the **firefighters** to tell them where the fire is. They can lose valuable minutes if they have to find it themselves.
- Rescue any people in immediate danger only if it is safe to do so.
- If practicable, close all doors and windows to contain the fire.
- Try to extinguish the fire using appropriate firefighting equipment only if you are trained and it is safe to do so.
- Follow the instructions of your supervisor and prepare to evacuate if necessary.
- Save **records** if possible.

- Evacuate your area and check all rooms, especially changing rooms, toilets, storage areas, etc.
- Do a head count of all staff and report any people unaccounted for to the supervisor.

a □ Close all doors and windows.
b □ Do a head count of all staff and visitors.
c □ Evacuate your area and check all rooms.
d □ Meet the firefighters and give them details about the fire.
e □ Save records.
f □ Prepare to evacuate.
g □ Remain calm and move quickly.
h □ Report any people unaccounted for to the supervisor.
i □ Rescue any people in immediate danger.
j □ Telephone the correct national emergency number.
k □ Try to extinguish the fire using appropriate firefighting equipment.

Safety hazards

9 Where could you see a notice like this? Do you have any similar safety precautions where you work or study?

A precaution is something you do now to avoid hazards and danger, and to stop problems in the future.

Workshop safety precautions
1 Wear goggles and ear protectors
2 Do not leave things lying on the floor.
5 Wear short-sleeved shirts or roll up shirt sleeves.
4 Do not remove safety guards from machines.
5 Do not use electric tools when the work area is wet. Make sure plugs are earthed (grounded).

10 Match these hazards to the correct precaution in previous exercise.

a trips and falls	**b** electric shocks	**c** cuts	**d** eye injuries and hearing damage	**e** clothing getting caught up in machinery

11 Read the conversations. Match each one to a hazard in 10.

1 A Can you come closer to the machine?
B I'm worried about getting too close to the gears.
A You should roll up your sleeves.
B Yes, OK.

2 A You shouldn't leave these boxes here.
B I don't know where else to put them.
A They're in the way. Someone could trip over them and hurt themselves.
B All right, I'll move them.

12 Which hazards are these conversations about? Complete the sentences with *should, shouldn't,* or *could*. Then read them with a partner.

1 A The floor's wet.
B Did someone spill some water?
A Someone ….. slip. We ….. clean it up right away.
B Yes, and we ….. turn off all the machines. Someone ….. get a shock.

2 A You ….. use this machine without goggles. You ….. injure your eyes.
B I don't know where they are.

3 A Who took the guard off this machine? Someone ….. have a nasty accident.
B It takes longer to clean if it's on.
A But you ….. remove it. You ….. cut yourself, or even lose a finger.

13 Find these things in the picture and write the letters in the boxes.

ladder □
drawer □
sink □
drill □
shelf □
goggles □
hand cart □
glass □
flask □
fork-lift □
truck □
crumbs □
socket □
lead □
lead BrE
power cord AmE

14 Look at the picture again. Circle the safety hazards. How many can you find? Discuss them with another student.

Example

A The drill is on the floor.
B Yes, someone could trip over it.
A And the drill lend is worn.
B Yes, someone could get an electric shock.

15 Explain what these people in the picture should and shouldn't do.

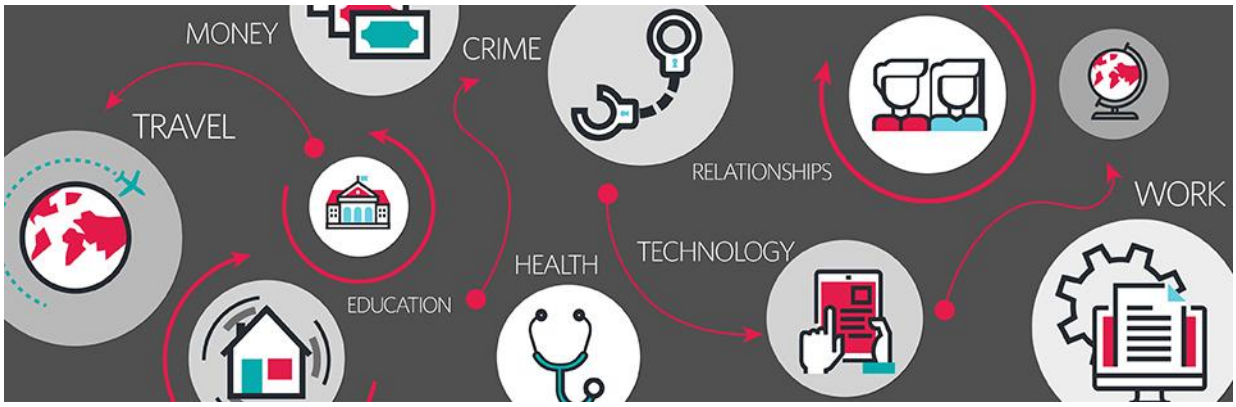
Example

They shouldn't leave things lying on the floor. They should make sure electrical equipment is in good condition.

16 Work in small groups. You are responsible for training some new apprentices on safety in your workplace.

1 Brainstorm different safety precautions people in your workplace should take. Write a list.
2 Prepare to explain your list to new apprentices. Explain what they should and shouldn't do, and what could happen if they didn't take precautions.
3 Present your safety precautions to the class and answer any questions they have.

БЛОК КОНТРОЛЯ ЗНАНИЙ



Test 1

1. Put the words from the frame into the right place in *the text.*

became power household discipline cost electricity telegraph made invention

ELECTRICAL ENGINEERING

Electrical engineering is a professional engineering (1)…….. that generally deals with the study and application of (2)…….., electronics, and electromagnetism. This field first (3)…….. an identifiable occupation in the later half of the 19th century after commercialization of the electric (4)…….., the telephone, and electric (5)…….. distribution and use. Subsequently, broadcasting and recording media (6)…….. electronics part of daily life. The (7)…….. of the transistor, and later the integrated circuit, brought down the (8)…….. of electronics to the point they can be used in almost any (9)…….. object.

2. Use the verbs to complete the sentences. Use the *Present simple* or the *Present continuous* tenses.

• operate • know • not use • not understand • taste • seem • see •

1. Greg …….. purposes, uses, maintenance, and care of all equipment, together with their safety implications.
2. We …….. freezer units in households at the moment.
3. This pasta …….. delicious!
4. I …….. this math's problem. Can you help me with it?
5. How …….. the refrigerator defrost mechanism ……..?
6. Mum …….. the dentist tomorrow morning.
7. That's our new neighbor, Mrs. Evans. She …….. very nice.

3. Underline the correct answer.

1. Water *boils / is boiling* at 100 *DC.*
2. You *always interrupt / are always interrupting* me when I'm on the phone!
3. Timothy *works / is working* safely with heat pumps.
4. Tonia never *gets up / is getting up* early.
5. The student *needs / is needing* to know and understand safety standards that apply to the Refrigeration industry.
6. Monica *has / is having* a party this week.
7. Football practice *begins / is beginning* at 4 o'clock.

4. Put the adverbs of frequency in brackets in the correct position in the sentences.

1. Anna is late for university. (never) …..
2. Brian goes to the cinema at the weekend. (sometimes)……
3. John prepare and maintain a safe and tidy work area. (always)….
4. Sergei provides training for the client operators. (rarely).....
5. Does Jamal watch TV in the evening? (usually)……
6. Michaela talks to her friends on the phone. (often) .....
7. Piatrus travels abroad on business. (seldom)…….

5. Fill in: has - have been in / to, has - have gone to.

1. Mum and Dad aren't here right now. They……. the plant.
2. My sister Jane has broken her leg. She……. hospital for a week now.
3. Tom ..... the head office to see his boss. He'll be back soon.
4. ..... you ..... .the WORLDSKILLS competition? It's fantastic!

6. Put the verbs in brackets into the present perfect or the past simple.

Kate: Thank you so much for the birthday present, Mum! I 1) …….. (get) it yesterday.

Mum: You're welcome! So, tell me your news. 2) ..... (you/find) a part-time job?

Kate: No, not yet but I 3) ..... (have) three job interviews last week. How's Dad? Can I speak to him?

Mum: Dad's fine, but he isn't here. He 4) …… (go) to Uncle Bill 's house for the weekend. Guess what? Aunt Lilly 5) …….. (win) £100 in a cooking competition!

Kate: That's great! How's Billy doing?

Mum: He 6) …… (join) the university football team. He really enjoys it. So, 7) ..... (you/take) any exams so far this term?

Kate: Yes, I 8) ..... (sit) for two exams last Monday. I think I 9) ……. (do) very well. Well, I must go now! Talk to you soon.

Mum: OK, take care dear. Bye!

7. Use the present simple, the present continuous and the present perfect to complete the email.

Hi Ilia!

How are you? I'm so sorry I 1) ..... (not/write) for so long but I 2) ..... (be) very busy with studies lately. 3) ..... (you/like) your new school? We 4) ..... (have) a new English teacher, Mrs Raptsvitch. She's very nice but sometimes she 5) ..... (give) us a lot of homework.

She's from Brest and she 6) ..... (only/be) in Minsk for a few months. She 7) ..... (love) it here. Next week, she 8) ..... (take) us on a trip to a historic castle. I can't wait!

So, what about you? 9) ..... (you/make) any new friends so far?

Well, that's all for now. Somebody 10) ..... (knock) on my door, so I have to go! Write back soon!

Love,

Olesia.

8. Choose the correct answer.

1. Tony ..... to understand standard units of measurement.
A is having **B** have **C** has

2. Jenny had her eighteenth birthday a week ..... .
A ago **B** before **C** last

3. ..... have you been in Pinsk?
A How long ago **B** When **C** How long

4. I ..... Jim at Sue's party yesterday.
A have seen **B** saw **C** see

5. Sasha ..... for design of an efficient refrigeration system these days.
A is looking **B** looks **C** has looked

6. Mary ..... her friends at the cinema tonight.
A meets **B** is meeting **C** has met

7. Brian ..... walks to work because he likes to keep fit.
A seldom **B** always **C** never

8. Have you finished selecting the required equipment and materials according to given criteria ..... ?
A yet **B** just **C** rarely

9. Our engineers ..... Grodno for the weekend.
A have been to **B** have gone to **C** have been in

10. Nick hasn't been to the cinema ..... a month.
A since **B** just **C** for

11. Anton ..... in the Ice Palace. He's a Refrigeration Control Engineer.

A works **B** has worked **C** is working

12. Water ..... at 0°C.
A is freezing **B** has frozen **C** freezes

13. David ..... to an Italian company last year.
A moved **B** has moved **C** is moving

9. Put the sentences into the correct order to get the story about the profession of Industrial engineer.

1. .a.. 2. …. 3. …. 4. …. 5. …. 6. …. 7. …. 8. ….

a) Industrial engineers design, analyze, and manage complex human-integrated systems such as manufacturing systems, supply chain networks, and service systems.

b) This increased demand recognizes the modern industrial engineer's versatility and responsiveness to the challenges of a rapidly changing society.

c) To achieve these objectives, an industrial engineer draws upon knowledge of mathematics, along with physical, engineering, management, and behavioral sciences to function as a problem-solver, innovator, designer, coordinator, and system integrator.

d) These systems typically consist of a combination of people, information, material, and equipment.

e) Industrial engineers are employed in and apply their skills in an extremely wide range of organizations, including manufacturing industries, service industries, and governmental agencies.

f) The complexity of these organizations and the emphasis on increased effectiveness, efficiency, and productivity have led to a growing need for industrial engineering analysis and design, resulting in an increased demand for industrial engineering graduates.

g) In such systems industrial engineers determine how to optimize the system for maximum efficiency, effectiveness, throughput, safety, or some other objective of interest to the stakeholders of the system.

h) Industrial engineering is one of the nation's largest and most rapidly growing engineering professions.

Test 2

1. Put the verbs in brackets into the *present* perfect or the *past simple.*

A: I 1) …….. **(go)** to the new Mexican restaurant yesterday.
B: I 2) …….. **(never/be)** there. Did you like it?
A: I 3) …….. **(not/see)** Ann for a very long time.
B: Really? I 4) …….. **(see)** her yesterday at the gym.
A: How long 5) …….. (**they/be)** married?
B: Only a year. They 6) …….. **(get)** married last June.
A: Shall I help you tidy up the kitchen?
B: No, you don't have to. I 7) …….. **(already/do)** it.

2. Put the words from the frame into the right place.

maintain engineer reliable responsibility interpersonal industrial skills products design specialist mistakes standard conditioning team accordance malfunctions detail

A refrigeration and air conditioning …….. works on commercial, residential, public and …….. projects, including transportation and storage. This branch of engineering covers a wide range of …….. and services. He or she will plan and …….., install, test, report, …….., fault find and repair systems to a high …….. Work organization and self-management, communication and …….. skills, problem solving, flexibility and a deep body of knowledge are the universal attributes of a good ……..

Whether the refrigeration and air …….. engineer is working alone or in a …….. the individual takes on a high level of personal …….. and autonomy. From ensuring a safe and …….. installation and maintenance service, in …….. with relevant standards, through to diagnosing …….., upgrading and commissioning, and fault finding and correction, the …….. of concentration, precision, accuracy and attention to …….. at every step in the process are crucial. …….. may be very expensive and damaging.

2. Fill in: *have - has* gone to, *have - has* been *in/to.*

A: May I speak to Mr Stephens, please?
B: Mr Stephens isn't here right now. He 1) …….. London.
A: 2) …….. you ever…….. Canada?
B: Yes, I went in 2001.
A: How's Phil? Is he still ill?
B: Yes. He 3) ...….hospital for a week.
A: Where are Jack and Diane?
B: They 4) .....Bristol for the weekend.

3. Underline the correct answer.

1) I have replaced three filters *so far* / *yet*.
2) You *always forget / are always forgetting* to lock the front door!
3) Ivan *flies / will be flying* to Madrid at this time tomorrow.
4) The conference *starts / is starting* at 10 o'clock.
5) She usually *has / is having* a big breakfast in the morning.
6) Craig is looking for a new flat *these days /on Fridays*.
7) They *were / have been* friends since 2012.
8) They perform / are performing general plumbing maintenance.
9) Timothy *called / has called* me just now.
10) They have traveled to customer sites to evaluate projects and provide expertise *since / for five* years.

4. Rewrite the words in the sentences in the correct order.

1. schedule / operating / often / to / ensures / Helen / equipment / is / according / given.
2. a / silver / large / square / refrigerator / he / bought.
3. municipal /this / as / interaction / with / outside / agencies / necessary / includes.
4. equipment / Engineer / for / condition / inspects / and / facilities / proper / operation / and / working /Operating.
5. low / for / thermoelectric / is / employed / cooling /refrigeration / loads.
6. refrigeration / the / chemical / employed / industry / the /dyes / is / in / synthesis / of / ammonia / in /and.
7. skilled / most / talented / and / refrigeration / complex / more / and / conditioning / engineers / will / the / air /work / on / larger / and / projects.

5. Fill in: *than,* of or *in* and the correct *comparative* or *superlative* form of adjectives.

Sarah Jones has one brother and one sister. She is 1) …….. (young) …….. the three. Sarah's brother, John, is three years 2) …….. (old) …….. her and he is also much 3) …….. (tall). He is 4) …….. (tall) person …….. the family. Sarah's sister, Julie, is only one year 5) …….. (old) than Sarah. Julie is nineteen, and she is 6) …….. (good) student …….. her group. Sarah thinks sport is much 7) …….. (interesting) pastime at University. She is 8) …….. (fast) runner …….. the University team.

6. Fill in the gaps with too or *enough.*

1. A: Did you go sailing yesterday?
   B: Yes, it was …….. (windy)
2. A: How did you find the Maths test?

B: It was …….. (long). I didn't have enough time to finish it.
3. A: Alex, did you understand the lesson?
B: Yes, it was …….. (easy) to understand.
4. A: It's …….. (cold) in here.
B: Sorry. I'll turn on the heating.
5. A: Is your little brother going to watch the film with us?
B: No. I'm afraid he's …….. (young).
6. A: Can Tara win the race?
B: Yes. She is …….. (fast).

7. Fill in: *will / won't, shall* or be *going to.*

1) I'm sad. My parents …….. let me go to the concert.
2) My aunt …….. has a baby in April.
3) I heard Sue's in hospital. I …….. send her some flowers.
4) …….. I carry this bag for you?
5) I'm tired. I think I …….. go home.
6) This is my new pink dress. I …….. wear it tonight.
7) I haven't studied hard. I don't think I …….. pass the exam.
8) Watch out! you …….. crash into the tree!
9) Tidy your room or you …….. go out.
10) …….. you open the door for me, please?

8. Choose the correct answer.
1. Jake is. …….. person I know.
A the funnier **B** funny **C** the funniest

2. Donna …….. dinner at the moment.
A has **B** has had **C** is having

3. Doctors …….. hard every day.
A is working **B** work **C** have worked

4. I haven't spoken to him …….. last week.
A for **B** since **C** after

5. Let me know immediately when he …….. .
A arrives **B** is going to arrive **C** will arrive

6. In a few weeks, I …….. on a sandy beach in Italy.
A will be lying **B** will lie **C** am lying

7. I can't see Elisha. There are too …….. people in front of me.

A much **B** many **C** enough

8. It's …….. colder today than it was yesterday.
A very **B** much **C** more

9. Water ..... at 100°C.
A is boiling **B** has boiled **C** boils

10. **.....** you …….. to Kim later? I've got a message for her.
A Do - speak **B** Are – speaking **C** Will - be speaking

11. I need …….. information, please.
A further **B** farther **C** far

12. Klaus is …….. Max.
A so tall as **B** as tall as **C** as tall than

13. Look at those dark clouds! It …….. .
A is going to rain **B** will rain **C** will be raining

9. Read essential duties and responsibilities of a Refrigeration Control Engineer and find three wrong ones.

1. Designs refrigeration, humidity and fluid systems based upon customer requirements.
2. Evaluates and selects appropriate components to meet functional requirement while minimizing overall cost.
3. Has a good understanding of thermodynamics, heat transfer and fluid flow.
4. Provides guidance to manufacturing personnel to ensure assemblies/systems are being fabricated correctly.
5. Serves and collects food trays, performs tray monitor.
6. Develops applications of refrigeration/fluid components, devices and systems for new commercial, domestic and industrial uses.
7. Directs activities to ensure that manufacturing, construction, installation and operational testing conform to functional specifications and customer requirements.
8. Assists service and customers to solve problems with units in the field. Cleans utility rooms, storage areas, and resident rooms/closets.
9. Uses computer assisted engineering and design software to perform engineering tasks such as AutoCAD.
10. May be involved in training other employees or customers about refrigeration.
11. Transports residents, using wheelchair or wheeled cart.
12. Revise/edit manuals with appropriate text for standard custom units.

Test 3

1. Put the verbs in brackets into the correct tense.

My father is a news photographer and he 1) …….. **(often/travel)** around the world. He 2) …….. **(visit)** many places like Singapore, China and Russia. This time next week, he 3) …….. **(fly)** to Rome. He has promised to take us somewhere very special when he 4) …….. **(get)** back. I'm sure we 5) …….. **(have)** a great time wherever we go!

2. Complete the calculations using the words in the box. Sometimes there is more than one possible answer.

divided	minus	plus	square root	subtract	times
less	multiplied	square	squared	sum	

1. 14 + 18 = 32	Fourteen ……. eighteen equals thirty-two.
2. 200 x 15 = 3,000	Two hundred ……. fifteen is three thousand.
3. 8 x 12 = 96	Eight ……. by twelve equals eighty-six.
4. 500 ÷ 25 = 20	Five hundred ……. by twenty five equals twenty.
5. 65 + 2 = 67	The ……. of sixty-five and two is sixty-seven.
6. 8^2 = 64	The ……. of eight is sixty-four.
7. 60 - 40 = 20	If you ……. forty from sixty, it equals twenty.
8. √196 =14	The ……. of one hundred and eighty six is fourteen.
9. 11^2 = 121	Eleven ……. is a hundred and twenty-one.
10. 78 - 12 = 36	Seventy-eight ……. twelve equals sixty-six.

3. Fill in the gaps with the correct form of the verbs in brackets. Use be going to, were going to, the present simple or will.

Mrs Sellers: Watch out! You 1) …….. **(fall)** off your bike Billy! 2) …….. **(not/want)** you to get hurt.

Billy: Don't worry, Mum. I promise I 3) …….. **(be)** more careful.

Jennifer: Do you have any plans for the summer?

Paolo: Well, we 4) …….. **(visit)** Spain but my father has to work. So my mum and I 5) …….. **(spend)** time with my grandparents in the countryside.

Jennifer: I'm sure you 6) …….. **(have)** lots of fun.

4. Write figures instead of words.

1. Three point zero four plus two point zero two makes five point zero six.
2. There is a zero percent chance of rain.
3. The temperature is twenty degrees below zero.

4. There are twenty-five people in the room.
5. You can reach me at zero one seven one, three nine zero, one zero six two.
6. I live at forty-six o four Smith Street.
7. He became king in fourteen o nine.
8. I waited until four o five.
9. The score was four nil.
10. Six hundred thousand people were left homeless after the earthquake.

5. Underline the correct item.

1. Mei is the sweetest **of / in** all the girls in my class.
2. The blue dress is as expensive **so** / **as** the green one.
3. The harder you study, the **good** / **better** you will do at school.
4. Michael is the tallest boy **in** / **of** the family.
5. Layla is not **very** / **so** short as Jamal.
6. The motorbike is less expensive **from** / **than** the car.
7. It's **much** / **more** warmer today than it was yesterday.
8. These shoes are as comfortable **so** / **as** my trainers.
9. Debbie is **the** / **a** nicest girl I've ever met.
10. Rock climbing is **much** / **more** dangerous than skydiving.

6. Put the verbs in brackets into the *Present perfect* or the *Present perfect continuous*.

1. Please, hurry up! You …….. **(talk)** on the phone for over an hour.
2. I'm tired! I …….. **(work)** hard all day.
3. …….. **(you/post)** the letter yet?
4. Nikos and Manos …….. **(take)** karate lessons since April.
5. …….. **(you/see)** my glasses? I can't find them anywhere.
6. I …….. **(not/go)** to the gym for over a month.
7. Who …….. **(use)** my laptop without asking me?
8. He …….. **(not/catch)** any fish yet.
9. How long …….. **(the kids/watch)** TV?

7. Put the verbs in brackets into the *Past simple* or the *Past continuous.*

It was a dark and stormy night. I 1) …….. (stay) with my grandparents all week because my parents were away on a business trip. Grandma and Grandpa 2) …….. (be) both fast asleep but I was still awake.

I 3) …….. (decide) to get a glass of milk from the kitchen. As I 4) …….. (go) down the stairs, I 5) …….. (hear) the sound of glass breaking. It was loud enough to wake even my grandparents. We all 6) …….. (run) into the living room. To our

surprise, there was a huge tree branch on the sofa and a lot of rain 7) …….. (come) in through the broken window.

8. Fill in: *used* to or *didn't* use to.

When I was young, I 1) …….. go out in the evenings. I 2) …….. stay at home. My mum 3) …….. invite my friend Sally and her mum over, so Sally and I could play. Now that I'm older, my parents let me go out. I 4) …….. have many friends but now I do.

9. Underline the correct item.

1) Grandma **didn't use to** / **used to** have a mobile phone but she does now.
2) At 9:00 am next Monday, I **will fly / will be flying** to Amsterdam.
3) Sophia **did** / **was going to do** her essay but she changed her mind.
4) They **used to** / **are used to** hot weather.
5) Johan **has painted** / **has been painting** the garage for two hours.
6) Lilly's eyes are red. She **was crying** / **has been crying**.
7) I was reading a book while Beth **did** / **was doing** her homework.
8) I'll tell Jim about the party. I'll **be seeing** /**am seeing** him at work.

10. Choose the correct item.

1. The rock band plans to make …….. appearances in Europe.
A further **B** farther **C** farthest

2. Alicia …….. dinner when her husband came home.
A made **B** has made **C** was making

3. I …….. the Andersons since 2015.
A have known **B** knew **C** know

4. What time …….. tomorrow?
A we meet **B** are we meeting **C** have we met

5. Don't eat too …….. chocolate. It's bad for your teeth.
A much **B** many **C** enough

6. The phone is ringing. I …….. it.
A will answer **B** answer **C** am answering

7. Be quiet! Grandpa ……..
A sleeps **B** has slept **C** is sleeping

8. Ali is the …….. player on the team .
A best **B** better **C** good

9. I will ask her when I …….. her.
A will see **B** am seeing **C** see

10. Cars are much …….. than bicycles.
A fast **B** faster **C** fastest

11. Jamie …….. Baranovichy once.
A has been in **B** has gone to **C** has been to

12 …….. a lot of homework every day?
A Do you have **B** Are you having **C** Were you having

13. Cynthia isn't …….. to go to school.
A too old **B** old **C** old enough

14. Akim …….. to working in the evenings but now he enjoys it.
A wasn't used **B** isn't used **C** will get used

11. Marina has just started a new course at college and her tutor has asked her to write him a letter telling him something about herself. She has made ten mistakes in verb tenses in her letter. Find and correct them.

Dear Tutor,

I am coming to Brighton College from Singapore, where I was a student for ten years. I did already take examinations in Singapore in English, Biology, Computer and Maths. My highest score is for Computer: I got grade A.

When I was a student in Singapore, I also have a part-time job in a shop. My uncle owns a supermarket and so I helped him in the evenings. I used to worked there four nights a week and I think this was very good experience for me.

At the weekends, I usually played volleyball with friends or, if the weather is bad, we have been to the theatre, which is very popular in Singapore. Because of my part-time job, I also did spend a lot of time studying at the weekend.

Test 4

1. Put the words in the correct order to make sentences.

1) to / was / the / the / he / fourteenth / person / award / win.
2) refrigeration / projects / the / talented / engineers / work / on / most / will / complex.
3) common / of / problems / the / air / conditioning / is / improper / one / operation / most.
4) components / extensively / refrigeration / has / natural / used / to / remove / condensable / from / gas / been.
5) What / hardware / the / types support of Internet?

2. Put the words from the frame into the right place.

height multiply four width object cubic volume cylinder measure diameter rectangular sphere where result diameter divide

Regularly Shaped Objects

To find the volume of a rectangular**……** , measure the length, **……** and height. Multiply the length times the width and **……** the result by the height. The result is the volume. Give the result in **……** units, such as cubic centimeters. Calculate a cube as you would any other **……** object.

To find the **……** of a cylinder, measure the diameter across the round end at its widest point. **……** the height. Approximate pi as 3.14. Multiply 3.14 times the diameter. Multiply the result by the **……** again. Multiply this result by the**……**. Divide the total by**……**. The result is the volume of the**……**.

Find the volume of a sphere. Lay the **……** down on paper or on the ground. Note **……** the widest point is across the sphere. Take away the sphere and measure this line, which is the**……**. Multiply the diameter cubed by 3.14. **……** the total by six. The **……** is the volume of the sphere.

3. Choose the correct item.

1. He spoke …….. loudly.
A very **B** much **C** enough
2. I don't know when she …….. back.
A come **B** has come **C** will come
3. What was Ron …….. at nine o'clock?
A do **B** doing **C** does
4. When Nathan was younger he …….. work in New York.
A got used **B** used to **C** used

5. The lights went off while Isabel …….. TV.
A was watching **B** watch **C** watched
6. …. shopping every Monday?
A Do you go **B** Are you going **C** Have you gone
7. He has …….. money to buy a computer.
A much **B** many **C** enough
8. Jill didn't …….. travel a lot.
A used to **B** use to **C** use
9. He bought the …….. ring in the shop.
A expensive **B** more expensive **C** most expensive
10. Lucy …….. the chemist's. She'll be back soon.
A has gone in **B** has gone to **C** has been to
11. How long …….. Italian?
A you have studied **B** do you study **C** have you been studying
12. It's …… noisy in here. I can't work.
A too **B** enough **C** as
13. Mei …… to the theatre.
A goes rarely **B** is rarely going **C** rarely goes
14. There's too …….. traffic today.
A much **B** many **C** enough

4. Fill in the appropriate reflexive or emphatic pronouns.

1. The children really enjoyed …….. at the park yesterday.
2. I can't believe you made that dress all by ……..!
3. Jessica taught …….. to play the piano.
4. Hans drew this picture ……..

5. Fill in the correct *pronouns* or *possessive adjectives.*

My grandfather is 85 years old and often talks to 1) …….. One day a young man came to repair 2) …….. fridge. My grandfather was cooking at the time and he burnt 3) …….. on the cooker. "You fool!" he cried. "Are you talking to 4) ……..?" the young man asked 5) …….. "In that case, you can repair the fridge 6) ……..!"

6. Fill in: *any, no, nothing,* some*, somebody, somewhere* or *anyone.*

1. There's …….. at the door. Can you open it?
2. There's …….. milk left. I'll go and buy some.
3. Don't tell …….. about the party we're planning for Celine.
4. Could I have …….. tea, please?
5. Is there …….. chicken soup left?
6. I'm bored; I've got …….. to do.

7. I want to take Lynn …….. nice for her birthday.

7. Fill in the gaps with *both, all, neither* or none.

1. A: Did you and Olga go to the concert last night?
   B: Yes. We ……. had a fantastic time.
2. A: Was the language lesson difficult?
   B: Yes . …….. of us understood a word of what she was saying.
3. A: Have you talked to Pedro and Juan lately?
   B: No, …….. of them has phoned me since Tuesday.
4. A: So, what happened?
   B: Well, Tim was showing …….. of us his new MP3 player when Miss Adams walked in and took it away.
5. A: Why didn't you and Oleg come to the game yesterday?
   B: Because ..... of us was feeling well.
6. A: Have you listened to the two CDs I gave you?
   B: Yes. They're …….. great.
7. A: That shop sells lots of nice shoes.
   B: Yes, but …….. of them are very expensive.

8. Put the verbs in brackets into the past simple, the past continuous or the past perfect.

1. Nadia …….. **(finish)** all her homework by the time her parents came home from work.
2. Alik …….. **(buy)** a new computer two days ago.
3. Harry …….. (**talk)** to a friend when the teacher walked into the classroom.
4. First, Tina had a bath and then she …….. **(go)** to bed.
5. The plane …….. **(already/take off)** by the time we got to the airport.
6. It …….. **(rain)** heavily while we were waiting for the train.

9. Put the verbs in brackets into the correct tense.

1. He …….. (save) some money before he bought a car.
2. The workers are dirty. They …….. (mend) the pump in the garden.
3. He is very happy. He …….. (win) the race.
4. He was angry because his car …….. (break down).
5. She is exhausted. She …….. (type) for hours .
6. Steve …….. (watch) TV when his girlfriend came home.

Test 5

1. Read the text and decide whether the following statements are true or false according to the text.

SOLAR IS TOP SOURCE OF NEW CAPACITY ON THE US GRID

The US electric grid continued to transform in 2016. No new coal plants were added, and solar became the top new source of generating capacity. Combined with wind, a small bit of hydro, and the first nuclear plant added to the grid in decades, sources that generate power without carbon emissions accounted for two-thirds of the new capacity added in 2016.

These numbers come from the US Energy Information Administration, which asked utilities about what sources they expected to have online at the end of the year. These numbers typically show a burst of activity in December, as projects are raced to completion to take advantage of the tax benefits of reaching operational status in the current year.

Overall, the EIA recorded 26 GW of new capacity added to the grid in 2016. This includes a small amount (0.3GW) of new hydropower and a smattering of projects collected under "other" that produce a similar magnitude. Notably absent from the list is coal. Also absent is distributed solar, meaning panels installed on homes and other small-scale projects. Distributed solar accounted for about 2GW of new capacity in 2015, and the EIA notes that the incentives for these projects haven't changed considerably in 2016.

Even without that 2GW, solar comes out on top, with 9.5GW of new additions this year. At 8GW, natural gas comes in second place on the EIA's list, followed by wind at 6.8GW. Thanks to the opening of a new reactor at Watts Bar in Tennessee, nuclear also joins the list for the first time in years, adding 1.1GW of capacity. Combined, wind, nuclear, hydro, and solar account for 68 percent of the new additions, making 2016 a low-carbon year for the US grid. Assuming distributed solar this year is similar to its 2015 levels, the percentage of new non-fossil generation goes up above 70.

It's important to note that no energy source runs at full capacity. Utilization typically ranges from the low 30 percents for solar up to about 90 percent for nuclear; for gas, utilization typically depends on how often the local grid needs a rapid response to demand. So, predicting precisely what these installations will mean for future generation is difficult, other than the fact that all of these sources produce less carbon per unit of electricity than coal.

The focus of new solar installations is shifting a bit from the Southwest as well. While California installed more than the next four states combined, the top-five include states like North Carolina, Texas, and Georgia. This may indicate that the continued drop in the cost of utility-scale solar is making it competitive across a broader geographic region.

1. A new coal plants was built in 2016.
2. A new nuclear plant was built some time ago.
3. Nuclear, hydro, solar and wind energy are sources that generate power without carbon emissions accounted.
4. The projects took advantage of the tax benefits.
5. It was produced a small amount of new hydropower in 2016.
6. National grid gets solar energy from panels installed on homes and other small-scale projects.
7. The magnitude of distributed solar was approximately a similar in 2016 as in 2015.
8. Natural gas has the first place of new additions that year.
9. The year 2016 is a low-carbon year for the US grid because combined, wind, nuclear, hydro, and solar account for 68 percent of the new additions.
10. It's important to note that some energy sources run at full capacity.
11. All of other sources produce less carbon per unit of electricity than coal.
12. California has more solar installations than other states.

2. Rewrite the sentences in the correct order.

1. grid / the / supply / of / electricity / is / the / amount / an / of / energy / it / needs / to / to / users / capacity.
2. rises / evening / demand / power / for / a / maximum / in / the / to.
3. during / it / to / its / night / lowest / falls / levels / the.
4. inefficient / lines / are / wasting / relatively / power / by / energy.
5. amount / stations / input / the / of / energy / put / is / into / the / power / grid / by.
6. produced / when / surplus / power / electricity / is / by / the / solar / panels / it / faster / than / is / needed / in / being / the / home / is.

3. Put the adjectives in brackets into the *comparative* or *superlative* form, adding any necessary words.

1. This building is ..... (modern) that one.
2. Harry is ..... (good) football player on the team.
3. It's ..... (cool) today ..... it was yesterday.
4. I believe that dogs are ……. (intelligent) cats.
5. Which is ..... (large) country in the world?
6. For ..... (far) information, please speak to Professor Adams.
7. This is ..... (delicious) meal I've ever tasted.
8. ..... (hard) you study, the better you 'll do in your exams.
9. My sister Rania is ..... (young) in my family.

4. Answer the questions using *too* or *enough.*

1. "Can he reach the book?"
   'No, ..." (tall)
2. "Can she drive a car?"
   "Yes, ... " (old)
3. "Does the jacket fit Greg?"
   "No, ... " (big)

5. Put the verbs in brackets into the correct tense.

Dear Julia,

Hello! How are you? I 1) ..... (not/hear) from you for weeks! I hope everything 2) ..... (be) alright!

So, how is your new job? You're so lucky you get to travel. 3) ..... (you/still think) of buying a new car because of all those trips? I still haven't found a job yet although I 4) ..... (look) for months. I hope I 5) ..... (find) one soon!

Guess what? I saw Aunt Betty yesterday as I 6) ..... (walk) home from the supermarket. She won two tickets to Hawaii and asked me to go! Of course I said yes! Just think, in two weeks' time, I 7) ..... (lie) on a beach in Hawaii!

Well, that's all for now! Write back and tell me all your news!

Love,

Tonia

6. Fill in: *both (of), neither (of),* none *(of)* or *all (of).*

I come from a big family. I have got three sisters and two brothers. 1) ..... my sisters are married but 2) ..... them have children. 3) ..... my brothers are at university and 4) ..... them is married. My parents are doctors and they 5) ..... work in a hospital. They love their jobs but 6) ..... them likes to work at night. We usually get together on Sundays. Last weekend, we had a barbecue. 7) ..... us had a great time!

7. Fill in: *don't have to, may, can't, should, shall* or *must.*

1. You…….see a dentist.
2. You…….be quiet in the library.
3. I don't believe it. It…….be true.
4. They……..wear a uniform at school.
5. …...I do the washing-up?
6. …...I leave the room, please?

8. Complete the dialogue.

B: Hello, Tim.
T: Hello, Ben. That's my house over there.
B: 1)……..?
T: My house is the one with the white fence.
B: 2) .....?
T: The man outside my house is my granddad.
B: 3)…….?
T: We bought the house two years ago.
B: 4)…….?
T: Those boys over there are my cousins.
B: 5) ……?
T: No, they don't live with us.
B: 6)……..?
T: No, my granddad doesn't live with us either.

9. Add question tags and short answers.

1. You know Jane, ... ? Yes,……
2. Phil used to be a singer, ... ? Yes,……
3. She had a party yesterday, ...? Yes,……
4. There's nothing to eat, …… ? No, ...
5. He works in a bank, **……** ? Yes**, ……**
6. Your father is a teacher,……? No, …….
7. I'm late again,……? Yes, ……
8. Don't turn up the music, …….. …? No, ...

10. Complete the correct item.

1. Can you look after the baby ..... I go shopping?
A until **B** while **C** before

2. We're going to the cinema. Do you want to join.....?
A we **B** our **C** us

3. She wasn't used ..... in the city.
A to live **B** to living **C** live

4. We haven't seen ..... for a long time.
A each other **B** another **C** other

5. "We enjoyed the film last night." " ..... did we. It was fantastic."
A Neither **B** Nor **C** So

6. There are ..... letters on the table. They're for you.
A some **B** any **C** no

7. ..... do you go out with your friends?
A How much **B** How many **C** How often

8 . You haven't seen Akim today, ... ?
A haven't you **B** have you **C** did you

9. ..... you help me with the cooking, please?
A Should **B** Shall **C** Will

Test 6

1. Put the words from the frame into the text.

metal times cars space questions single survive clothes

MATERIALS AND THEIR PROPERTIES

Why do plastic rulers shatter when you flex them while **…….** ones simply bend? How come you can twist a paperclip two or three **…….** without it breaking but not twenty or thirty times? Why do some **…….** go rusty faster than others? How do astronauts survive in **…….** without getting boiled by the Sun... or frozen by the lack of it?

These are the kinds of **…….** that orbit the minds of materials scientists—arguably some of the most important people on Earth. Why are they important? Because from the moment you get up (woken by an alarm clock built around a tiny crystal of ceramic quartz) to the time you go to bed (snoozing soundly on cotton or synthetic-fiber sheets), every **…….** thing you do involves materials of one kind or another. Could we **…….** without materials? No! When you remember that materials provide everything from the **…….** we wear and the food we eat to the energy we use for cooking and keeping warm, it's obvious that civilized human life is impossible without them.

2. Answer the questions using too or *enough*.

1. "Can he play basketball?"
"Yes, ... " (tall)
2. "Can they hear each other?"
"No, ... " (noisy)
3. "Can she walk?"

"No, ... " (old)

3. Put the verbs in brackets into the correct tense.

My 16th birthday is next week. I 1) ..... **(already/ask)** my friend Jenny to help me plan my party. She is really good at planning parties. Last month she 2)….. ..... **(have)** a huge fancy dress party at her house. She 3) ..... **(hire)** a great DJ . and everyone 4) ..... **(really/enjoy)** themselves.

So far, Jenny and 15) ..... **(buy)** the decorations and 6) ..... **(chose)** the music we want to play. I think my party 7) ..... (**be)** so much fun!

4. Choose the correct item.

1. He's got a bucket of water. He ..... clean the floor.
A is going to **B** will **C** shall
2. When the boys won the tennis match, they
were very pleased with .....
A their **B** them **C** themselves
3. Judy left without ..... goodbye.
A saying **B** say **C** to say
4. I can't afford a holiday, so I'm not going
A nowhere **B** anywhere **C** somewhere
5. She's a very clever girl, ...?
A is she **B** isn't she **C** didn't she
6. Mr Harper has ..... Portugal. He'll be back next week.
A gone to **B** been to **C** been in

5. Fill in: shall, mustn't, should, can't, needn't or may.

1. You..... be more careful.
2. You..... feed the animals.
3. ..... I open the door?
4. Pedro..... be home. There aren't any lights on.
5. I say..... something, please?
6. You..... shout. I can hear you.

6. Complete the dialogue.

T: Hi, Steve! 1.....?
S: I'm fine, thanks.
T: 2) .....?
S: I'm going to the cinema. 3) .....?
T: Thanks, but I've got a lot of homework to do. 4) .....?

S: I'm going to see a comedy.
T: 5) .....?
S: It starts in twenty minutes.
T: 6) ..... ?
S: The one that's in the city centre.

7. Fill in the question tags in the dialogue.

A: Do you remember Jane from the party?
B: You mean Tom's sister, 1) .....?
A: Yes. She gave me two tickets to Duffy's next concert.
B: Wow! Lucky you! You're going to take Beth, 2) ..... ?
A: Actually, she's busy that weekend. You don't have anything planned, 3)… .....?
B: Sorry, but I'm going camping. What about Gina? She'll still in town, 4) .....?
A: Yes. She's leaving for Madrid in two weeks. I guess I'll give her a call.

8. Put the verbs in brackets into the correct *infinitive* or *-ing* form.

I really enjoy 1) ..... (meet) new people so last year I started writing to two teens living abroad. One lives in Germany and the other in Australia. So far, I've already been to Australia to meet Julia. She's great! At the moment, I'm busy 2) ..... (plan) a trip to Germany. Hans lives there. Both of my parents have agreed 3) ..... (come). We expect 4) ..... (travel) there this winter. I want 5) ..... (go) skiing with Hans and I'm looking forward to 6) ..... (practise) my German with him, too.

9. Turn from *active* into *passive.*

1) An old lady found a box of old coins last week. 2) The previous owner of the house had hidden the box. 3) She took it to the museum. 4) Experts have examined the coins. 5) Someone is interviewing the old lady on TV now. 6) She will give half of the money to charity.

……
……
……
……

Test 7

1. Decide whether the following statements are true or false according to the text.

Is it "materials science" or "materials technology"?

Before we go any further, it'll help to be clear what we mean by "materials science."

Science is all about making observations and doing experiments to form and test theories of how our world works; technology means using science in a practical way to solve everyday problems. Materials are technological almost by definition: who needs materials that have no obvious use? Yet there's almost no such thing as a "useless material"—and even some of the strangest materials invented in laboratories, which seemed pretty useless to begin with, have often turned out to have amazing applications later on. (Super-strong Corning® Gorilla® Glass, used in touchscreens, ever-sticky adhesive that lines the backs of Post-it® Notes, and nonstick Teflon® are three good examples of materials that found uses no-one imagined them having.)

What, then, do we mean by materials science? From stone and bronze to steel and concrete, materials are useful for a particular purpose because they behave in a certain way under certain conditions: they have particular qualities, which we call their properties. Understanding these properties is what materials science is all about. Where our modern age differs from earlier periods of history is in having tools that allow us to turn materials inside out: unlike people who lived hundreds or thousands of years ago, we can explain the useful properties of different materials by peering inside them with microscopes, X rays, and all kinds of other neat techniques to inspect their atomic, molecular, or (in the case of once-living things) cellular structure. Just as science provides the foundations for technology, so materials science (understanding the inner structure of materials) helps us to advance materials technology (developing materials that are useful in different situations).

1. Science is all about making observations and doing experiments to form and test theories of how our words work.
2. Technology means using science in a practical way to solve everyday problems.
3. Some seemed at first pretty useless materials often have amazing applications later on.
4. Materials are useful for a particular purpose because they behave in a certain way under certain conditions
5. Properties of materials are their particular qualities.
6. Materials science tries to understand properties of materials.
7. When we develop materials that are useful in different situations we advance materials technology.

2. Fill in the gaps using the appropriate tense.

On Sundays my parents and I usually 1) ..... **(go)** for a walk in the park. Last Sunday, however, 2) ..... **(be)** different. As we 3) ..... **(walk)** along the road, we heard a strange noise coming from our neighbor's garden. A few seconds later, we 4) ..... **(see)** a squirrel. By the time we walked to the fence, the squirrel 5) ..... **(run)** away with an apricot in its mouth. Of course, our neighbor's dog Flippy 6) ..... **(love)** chasing squirrels, so he started barking very loudly. Then our neighbour came outside to see why Flippy 7) ..... **(make)** so much noise. Suddenly, Flippy 8) ..... **(knock down)** a ladder that had a bucket of green paint on top of it! It fell all over our neighbour! I 9) ..... **(never/forget)** that Sunday and I don't think our neighbour will either!

3. Choose the correct item.

1. You ..... stop eating junk food and exercise more.
A will **B** ought **C** should
2. Would you like ..... to my party?
A to come **B** come **C** coming
3. ..... his parents come from Ireland.
A Neither **B** All **C** Both
4. He fell over and hurt ..... quite badly.
A him **B** his **C** himself
5. He started working here five years .....
A ago **B** for **C** since
6. I'm right, ...?
A are I **B** aren't I **C** am I
7 . Greg ..... of visiting Portugal.
A thinks **B** thinking **C** is thinking
8. She ..... flowers all morning.
A has been planting **B** is planting **C** plants
9. The building ..... since 1993.
A wasn't painted **B** hasn't been painted **C** hasn't painted
10. At 6 o'clock next Friday, I ..... to Berlin.
A will be flying **B** will fly **C** going to fly

3. Put the verbs in brackets into the *infinitive* or the *-ing* form.

1. I am really looking forward to .....Spain. **(visit)**
2. Please, let me ..... with your new video game. **(play)**
3. I don't know where ..... on holiday. **(go)**
4. Jim is used to ..... early. **(get up)**
5. They're thinking of ..... to America. **(move)**

6. I am so happy ..... you again. **(see)**
7. Dad's busy ..... the dishes. **(wash)**

4. Put the verbs in brackets into the correct tense.

1. If you ..... **(not/study)** hard, you won't pass the exams.
2. I ..... **(invite)** Bill to dinner if I had seen him.
3. If I ..... **(be)** you, I wouldn't eat so much chocolate.
4. If I ..... **(have)** free time, I would join a gym.
5. If you see May, ... **.(tell)** her to call me.
6. Unless it ..... (**rain),** we'll go to the park.

5. Use the boy's thoughts to write conditionals.

1. I was late for school. I was in a hurry.
2. I rode my bike too fast. I had an accident.
3. I wasn't careful. I hit the tree.
4. My friends don't visit me very often. I'm bored.
5. I have no one to talk to. I'm lonely.
6. I'll call the nurse. She'll bring me some magazines.

1)……
2)……
3)……
4)…….
5)……..
6)……..

6. Complete the people's wishes.

1. I wish I.....
She has a lot of homework.
2. I wish I.....
He can't go to the Bahamas.
3. I wish I.....
She can't afford a new computer.
4. I wish my sister.....
His sister is on the phone all the time.
5. I wish I.....
He didn't drive carefully.
6. I wish I.....
Billy is short. He wants to be taller.

7. Rewrite the following sentences in the passive.

1. Sometimes we use one material instead of another.
2. He looks round the room and quickly lists the materials he can see.
3. You can probably see metals, woods of various kinds, glass windows, and colorful plastics.
4. We have to clean soft furnishings in rugs, cushions.
5. My friends gave me a puppy for my birthday.
6. As they were carrying the puppy into my house, it jumped out of its box.
7. They bought composites and laminates to decorate the building.

Test 8

1. Put the words from the frame into the text.

waterproof	well-suited	materials	swap	wool	flexible

THE RIGHT MATERIAL

What do you notice about the ..... around you? For everything we need to do, we've found materials that are very ..... to the job (and often very ill-suited to other jobs). So in buildings, we choose materials that are hard, strong, durable, ..., and good at retaining heat; when it comes to furnishings, we prefer quite different materials that are soft, ... , colorful, and reasonably hard-wearing. Although some materials have many uses, and it's often possible to swap one material for another, it's hard to imagine a house built out of ....., or clothes made from glass!

2. Choose the correct item.

1. She ..... be forty years old! She looks much younger.
A needn't **B** can't **C** mustn't
2. She has two daughters. ..... of them do very well at school.
A Both **B** All **C** None
3. It's no use ..... to Janet; she won't listen to you.
A talk **B** talking **C** to talk
4. They kept smiling at .....
A each other **B** other **C** another
5. If I were rich, I ..... a big house for my family.
A would buy **B** bought **C** will buy
6. This beautiful poem ..... in 1821.
A written **B** wrote **C** was written

7. I wish it ..... yesterday.
A hadn't rained **B** wouldn't rain **C** couldn't rain
8. He painted the kitchen .....
A him **B** his **C** himself

3. Underline the correct item.

1. You can't / needn't walk to school. I'll give you a lift.
2. You mustn't / couldn't chew gum in class.
3. May / Must I use your computer?
4. Will / Shall I open the door for you?
5. You should / may have been more careful.
6. She might / ought to still be at work.
7. I could / can ride a bike when I was four years old.
8. You shall / should study harder for the exam.

4. Turn from *active* into *passive.*

1) An earthquake destroyed a small village in Spain last night. 2) Falling buildings have injured many people. 3) When it happened, the villagers were organising an annual fiesta. 4) The government will send further help today.

……
……
……

5. Use the boy's thoughts to write conditionals.
1. I played football in the rain. I got ill.
2. I have to stay in bed. I have a high temperature.
3. My head hurts. I can't sleep.
4. My mum will call the doctor. He will give me some medicine.
1……..
2……..
3……..
4…….

6. Complete the people's wishes.
1. I wish I…….
He can't go home yet.
2. I wish we……..
We don't have enough money to buy this car.
3. I wish I……..
He didn't pass the test.
4. I wish I…….

Billy ate too much chocolate. Now he has stomach ache.
5. I wish I……..
Carrie broke her arm while skiing.
6. I wish the dog……..
The neighbour's dog barks all day.

7. Fill in: *who, whose, why, where, when* or *which.*

Dear Carla and Bruno,
Hi, how are you? The reason 1) ..... we haven't written sooner is that we've both been busy settling into our new home. The village 2) ..... we live is very quiet and Tom goes fishing every Saturday in the river 3) ..... is just behind of our house! The people here are very friendly. The day 4) ..... we arrived at the village, the couple 5) ..... lives next door had invited us for lunch and the woman 6) ..... house we're renting had put flowers in every room. I think we're going to like it here.
Write back soon.
Love,
Jill and Sam

8. Write what the people said using reported speech.

Grandma: Put your hat on, Ben!
Ben: What time is it?
Dad: I'm going for a swim.
Mum: Have you bought a newspaper today?
Uncle Tom: Does anyone want an ice cream?
Eddie: I've built a sandcastle.
Aunt Sarah: Don't stay in the sun too long, Lisa.
Lisa: I'll put some suntan lotion on, Aunt Sarah.

1. Grandma told Ben……..
2. Ben asked Grandma…… ……
3. Dad said ....
4. Mum asked Dad…….
5. Uncle Tom asked……
6. Eddie said …….
7. Aunt Sarah told Lisa ……
8. Lisa said .....

9. Match the names of some common ferrous metals to their descriptions.

Steel	They incorporate elements such as chromium, nickel and titanium to impart greater strength and durability without increasing

	weight. Stainless steel is an important alloy steel made using chromium. They are used in construction, machine tools, and electrical components.
Carbon Steel	This is an alloy made from iron, carbon, and silicon. It is brittle and hard and resistant to wear. It's used in water pipes, machine tools, automobile engines and stoves.
Alloy Steel	It is an alloy with so little carbon content it's almost pure iron. During the manufacturing process, some slag is added which gives it excellent resistance to corrosion and oxidation, however, it is low in hardness and fatigue strength. It is used for fencing and railings, agricultural implements, nails, barbed wire, chains, and various ornaments.
Wrought Iron	It is made by adding iron to carbon which hardens the iron. Alloys of it becomes even tougher as other elements like chromium and nickel are introduced. It is made by heating and melting iron ore in furnaces. It is widely used in the construction and manufacturing industries.
Cast Iron	It has a higher carbon content in comparison to other types of steel making it exceptionally hard. It is commonly used in the manufacturing of machine tools, drills, blades, taps, and springs. It can keep a sharp cutting edge.

Test 9

1. Put the words from the frame into the text.

THE BEST COMPROMISE

Mechanical properties are also important in the materials we use for transportation: airplanes, space rockets, trucks and cars have to be made from strong materials both to withstand the forces they experience during acceleration and deceleration and to protect the occupants in case of an accident. But transportation materials illustrate another really important principle of how we choose and use materials: almost always we have to compromise. You could make an airplane out of super-strong steel, but then it might be too heavy to take off, or it might use too much fuel to be economical. That's why aerospace designers are just as likely to use strong but lightweight alloys made from aluminum or titanium, as well as composite materials. Although cars have traditionally been made from metals, some are made from composites such as fiberglass, which offer a compromise between strength, weight, and cost, and from lighter aluminum and titanium alloys.

The same goes for every other use of materials: there's always an element of compromise. Gasoline is a brilliant way to power a car because, per unit of its weight, it holds more energy than almost any other widely available substance—but it makes air pollution and it's relatively expensive, so it's another case of "materials compromise." We could make everlasting shoes out of steel, but they'd be incredibly heavy and uncomfortable. Or we could make them out of amazingly comfortable cotton and wool, but then they wouldn't last very long. Instead, we use durable, flexible, and relatively comfortable materials such as leather and plastics—usually a good compromise between comfort, cost, and durability.

1) Mechanical properties are also unimportant in the materials we use for transportation
2) We never have to compromise when we choose or use materials.
3) It might be too heavy to take off if an airplane out will be made of super-strong steel.
4) Cars have been always made from metals.
5) Gasoline not makes air pollution and it is a good way to power a car.

2. Choose the correct item.

1. London ..... by millions of tourists every year.
A is visited **B** is visiting **C** was visited
2. I'll wait here ..... you get back.
A before **B** hile **C** until
3. Costas has two sisters. ..... of them are older than him.
A None **B** All **C** Both
4. I answered the door but there was ..... there.
A anyone **B** no one **C** someone
5. I went to the doctor's ..... I felt ill.
A so **B** so that **C** because
6. Kurt had missed his flight by the time he..... at the airport.
A had arrived **B** arrived **C** was arriving
7. That's the boy ..... mother is a pilot.
A who **B** which **C** whose
8. I don't think he's Russian. He ..... be Swedish.
A can't **B** should **C** must

3. Put the verbs in brackets into the correct tense.

1. A: Did you get to the stadium on time?
B: No, the match .....**(just/finish)** when we arrived.
2. A: Where are you going Sam?
B: I ..... **(take)** the dog out for a walk

3. A: How long ..... **(you/sing)?**
   B: Since I was 8 years old.
4. A: Bob, where are the boys?
   B: They ..... (**go)** to the park.

3. Put the verbs in brackets into the correct *infinitive* or *-ing* form.

1. A: I don't mind..... **(help)** you tidy up.
   B: Thank you. You're so kind.
2. A: I'm looking forward to..... **(go)** skiing in the Alps.
   B: Lucky you. Can I come?
3. A: Mandy, where are your brothers?
   B: They've gone ..... **(fish).**
4. A: Why are you so late? You promised..... **(be)** on time.
   B: I'm really sorry but I got stuck in traffic.

4. Rewrite the following passage in the passive.

1) Some common ferrous metals include alloy steel, carbon steel and cast iron wrought iron. 2) We use these metals for their tensile strength and durability. 3) Our factory produces shipping containers. 4) Workers are building a new library in Riverdale. 5) They will finish it in a few weeks. 6) The mayor will open the new library. 7) The town expects everyone to come.

……
……
……

5. Underline the correct item.

1) If they **took / had taken** a map with them, they wouldn't have got lost.
2) If you **mix / will mix** black and white, you get grey.
3) Unless you **finish / don't finish** your homework, you can't watch TV.
4) If I were you, I **will pay / would pay** attention in class.
5) If Tamara had left earlier, she **wouldn't have missed / wouldn't miss** her plane.
6) If I **have / had** free time, I would take up a sport.

6. Write what Mariah wishes.

1. I lost my ticket.
2. I can't go to the concert.
3. I want to see my favourite band.
4. I can't get an autograph.
5. I have to wait for their next concert.

6. I feel sad.
1…….
2…….
3…….
4…….
5……
6……

7. Choose a reporting verb and turn the following into reported speech .

• refused • suggested • advised • offered

1. "Shall I help you?" Bob said to Mr Jones.
Bob……..
2. "No, I won't lend you my bike," Lily said to Ann.
Lily…….
3. "Let's go skiing," James said.
James……..
4. "You should see a doctor," the nurse said to me.
The nurse…….

8. Fill in: *a, an* or *the* where necessary.

Last February my family and I went to 1) ..... Quebec City for their famous Winter Carnival. We stayed at 2) ..... beautiful Chateau Frontenac and spent one night at 3) ..... Ice Hotel which was full of amazing 4) ..... ice sculptures! While we were there, we went 5) .....skiing beside 6) ..... St Lawrence River and had fun going down 7) ..... icy hill. We also saw 8) ..... exciting canoe race and 9) ..... night parade. Quebec City is definitely 10) ..... great place to visit, especially in winter!

9. Fill in: *in front of, at,* next *to, in, opposite* or *on.*

This is Toby's room. He is sitting 1) ..... his desk playing computer games. All his toys are nicely placed 2) ..... the toy box 3) ..... his bed. His cat is lying 4) ..... the floor 5) ..... he bed. 6) ..... the window there
is a chest of drawers where Toby keeps his clothes. His room is very tidy!

10. Fill in: *at, in* or *on.*

1..... the moment 3 ..... the nineteenth century 5 ..... summer
2 ..... June 2nd 4 ..... midnight 6 ..... a cold day

11. Match the names of metals to their definitions.

Aluminum	It is a medium to low strength metal with a very low melting point. It can be machined easily, but heating may be required to avoid cleavage of crystals. It is most widely used in galvanizing, the process of applying a protective it coating to iron or steel to prevent rust.
Zinc	It is a soft, heavy, malleable metal with a low melting point and low tensile strength. It can withstand corrosion from moisture and many acids. It is widely used in electrical power cables, batteries, building construction and soldering.
Tin	It is lightweight, soft and low strength. It is easily cast, forged, machined and welded. It's not suitable for high-temperature environments. Because it is lightweight, it is a good choice for the manufacturing of aircraft and food cans. It is also used in castings, pistons, railways, cars, and kitchen utensils
Copper	It is very soft and malleable, ductile with low tensile strength. It's often used to coat steel to prevent corrosion. Tinplate steel is used to make tin cans to hold food. In the late 19th century, tin foil was commonly used to wrap food products, but has since largely been replaced by aluminum foil. It is can also be alloyed with copper to produce tin brass and bronze.
Lead	It is red in color, highly ductile, malleable and has high conductivity for electricity and heat. It is principally used in the electrical industry in the form of wire and other conductors. It's also used in sheet roofing, cartridge cases, statutes, and bearings. It is also used to make brass, an alloy of copper and zinc

Test 10

1. Put the words from the frame into the text.

wood jet diversity bamboo neutral material common plants available

THE LOCAL SOLUTION

In our modern age of 1) ..... planes and container ships, it's easy to transport materials anywhere in the world in a matter of days or weeks. In theory, that means we can use any 2) ..... we want to use anywhere we might like to use it. Historically, that wasn't always the case. Although some materials (such as wood, iron, and coal)

are 3) ..... throughout the world, others (such as the oil that still powers much of the planet, the lithium we use in rechargeable batteries, and the uranium used to fuel nuclear energy plants) are 4) ..... only in certain places. The huge 5) ..... of building styles and architecture around the world is the best illustration of how people have used local materials to solve their problems. In Scandinavia, where 6) ..... is cheap and readily available, there are many timber-framed buildings. In Asian countries such as Vietnam, 7) ..... is widely used to make everything from bridges and houses to furniture and water pipes. Making things from plastics is the opposite approach to using local materials; we can make synthetic plastics in chemical 8) ..... anywhere on the planet. That's why modern plastic objects feel culturally and geographically 9) ..... they don't occur naturally anywhere on Earth and they have no obvious links to any particular country or region.

2. Choose the correct option to make write use of verbs of sense.

1. I was tasting / tasted the cake when my mother got in and asked me if it was tasted / tasting good.
2. I 'm not feeling / can't feel very well, and I'm so cold that I can't feel / 'm not feeling my toes.
3. Sorry, there's a lot of noise and I can't hear / 'm not hearing you very well. Are you hearing / can you hear me?
4. 'Why is the dog smelling / does the dog smell the sofa like this?' 'I don't know, but don't you think the living room smells / is smelling strange?'
5. 'Where is James? I can't see / 'm not seeing him, and I need to tell him something.' 'He has just left, but I 'm seeing / can see him tomorrow at 7. Do you want me give him a message?
6. It smells of / as if cheese in here.
7. He sounded as though / if he was not very fond of the idea.
8. It seems / looks / sees that we've got lost. Can you help us?
9. She seems/looks/sees to have a natural gift for music.
10. I 'm looking/look at her as I am speaking to you and she looks/is looking fantastic.

3. Put the words in the correct order to make sentences.

1. have/civilization/been/of/since/Non-ferrous/used/beginning/the/metals.
2. traditionally/been/metals/made/Cars/from/have.
3. difference/metal/between/the/and/ferrous/non-ferrous/What's?
4. Cast/silicon/is/alloy/iron,/made/carbon,/an/iron/from/and.
5. is/temperatures/process/Refrigeration/of/producing/the/low.
6. refrigeration/Applications/separate/units/the/provide/process/for.
7. Refrigeration/food/many/preserving/uses/besides/has.

4. Underline the correct linking word.

1. Nancy turned on the TV **because / so** she wanted to watch a film.
2. Billy has black hair **but / and** blue eyes.
3. I'll call you **as soon as / since** I get there.
4. First, Carla had a shower. **Then / finally**, she went to bed.
5. Ann always has breakfast **while / before** she goes to school.
6. Aya is the girl **who / who**se party I went to last night.
7. Tina brought her MP3 player **so that / until** she could listen to music on the bus.
8. Henry is both kind **and / also** friendly.
9. I won't give you any dessert **or / unless** you eat all your vegetables.
10. The baby smiled **when / while** May held her.

5. Choose a reporting verb and turn the following into *reported speech* .

• refuse • advise • explain • offer • ask • warn • order
• beg • suggest •promise

1. "Could you take the dog for a walk?" Mum said to me.
……
2. "Let's go to the cinema tonight," Tom said to me.
……
3. "I can't come to the party because I have a test tomorrow," Ethan said.
……
4. "Would you like me to carry those bags for you?" he said to me.
……
5. "Don't go near the pool!" he told us.
……
6. "I'll call you when I get there," she said to me.
……
7. "Please, please don't go!" she said to me.
……
8. "You should speak to Mrs. Andrews," she said to me.
……
9. "Go to your room!" he said to her.
……
10. "No, I won't help him," she said to me.
……..

6. Fill in the gaps with *say* or *tell* in the correct form.

1. Fatima …. . .that she had a great time in Spain.

2. Can you please . …….me the time?
3. Ann ..... Ted to stop making so much noise.
4. Elisha, I want .. .. you a secret.
5. Dan ..... that he had tidied his room.
6. My dad used to ..... me a story before bedtime.

7. Put the verbs in brackets into the correct tense.

1. A: I wish the sun ……(**come out).**
   B: Me too! I want to go swimming.
2. A: You look very tired.
   B: I was studying all night. I wish …… (**study)** earlier in the week.
3. A: Did you enjoy your stay in Italy?
   B: It was great. I wish I ……(**be)** still on holiday.
4. A: It's a shame you can't come to the party tonight.
   B: I know. I wish I .....**(not/be)** ill.
5. A: Do you like your new job?
   B: Yes, but I wish I ……**(not/have)** to get up so early.
6. A: Is Janet going to Portugal with you?
   B: No, I wish she .....(**come),** but she's made other plans .
7. A: If only I ..... **(not/forget)**to pay the electricity bill.
   B: Never mind. You can still do it tomorrow.
8. A: I wish our neighbours ……**(stop)** making so much noise!
   B: I know. I can't get any sleep.

8. Read the text and write down six questions. In pares ask your questions and answer the questions of the other student. Find the translations of the word partnerships given below in text.

What are polymers?

Polymers are everywhere. Just look around. Your plastic water bottle. The silicone rubber tips on your phone's earbuds. The nylon and polyester in your jacket or sneakers. The rubber in the tires on the family car. Now take a look in the mirror. Many proteins in your body are polymers, too. Consider keratin (KAIR-uh-tin), the stuff your hair and nails are made from. Even the DNA in your cells is a polymer.

By definition, polymers are large molecules made by bonding (chemically linking) a series of building blocks. The word polymer comes from the Greek words for "many parts." Each of those parts is scientists call a monomer (which in Greek means "one part"). Think of a polymer as a chain, with each of its links a monomer. Those monomers can be simple — just an atom or two or three — or they might be complicated ring-shaped structures containing a dozen or more atoms.

In an artificial polymer, each of the chain's links will often be identical to its neighbors. But in proteins, DNA and other natural polymers, links in the chain often differ from their neighbors.

In some cases, polymers form branching networks rather than single chains. Regardless of their shape, the molecules are very big. They are so big, in fact, that scientists classify them as macromolecules. Polymer chains can include hundreds of thousands of atoms — even millions. The longer a polymer chain, the heavier it will be higher. And, in general, longer polymers will give te materials made from them a higher melting and boiling temperature. Also, the longer a polymer chain, the higher its viscosity (or resistance to flow as a liquid). The reason: They have a greater surface area, which makes them want to stick to neighboring molecules.

Wool, cotton and silk are natural polymer-based materials that have been used since ancient times. Cellulose, the main component of wood and paper, also is a natural polymer. Others include the starch molecules made by plants. Here's an interesting fact: Both cellulose and starch are made from the same monomer, the sugar glucose. Yet they have very different properties. Starch will dissolve in water and can be digested. But cellulose doesn't dissolve and can't be digested by humans. The only difference between these two polymers is how the glucose monomers have been linked together.

Living things build proteins — a particular type of polymer — from monomers called amino acids. Although scientists have discovered some 500 different amino acids, animals and plants use only 20 of them to construct their proteins. In the lab, chemists have many options as they design and construct polymers. Chemists may build artificial polymers from natural ingredients. Or they can use amino acids to build artificial proteins unlike any made by Mother Nature. More often, chemists create polymers from compounds made in the lab.

1) Содержат крахмальные молекулы
2) Структуры кольцеобразной формы
3) Очень разные свойства
4) Формируют разветвляющиеся сети
5) Крахмал может растворяться в воде
6) Особый вид полимера
7) Огромные молекулы, сформированные путем склеивания
8) Из соединений, сделанных в лаборатории

9) Сопротивление к течению в виде жидкости
10) Резина в шинах

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1) Can’t be digested by humans
2) The silicone rubber tips
3) Artificial polymers from natural ingredients
4) Links in the chain
5) Both cellulose and starch
6) The stuff your hair and nails
7) Want to stick to neighboring molecules
8) To construct their proteins
9) Natural polymer-based materials
10) They have a greater surface area

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ПРИЛОЖЕНИЕ 1

WORLDSKILLS STANDARD SPECIFICATION

Skill 38

REFRIGERATION AND AIR CONDITIONING SYSTEMS

THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS) GENERAL NOTES ON THE WSSS The WSSS specifies the knowledge, understanding and specific skills that underpin international best practice in technical and vocational performance. It should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSSS). The skill competition is intended to reflect international best practice as described by the WSSS, and to the extent that it is able to. The Standards Specification is therefore a guide to the required training and preparation for the skill competition. In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will not be separate tests of knowledge and understanding. The Standards Specification is divided into distinct sections with headings and reference numbers added. Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards Specification. The sum of all the percentage marks is 100. The Marking Scheme and Test Project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition. The Marking Scheme and Test Project will follow the allocation of marks within the Standards Specification to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Standards Specification.

WORK ORGANIZATION AND MANAGEMENT

The individual needs to know and understand: • The health and safety standards that apply to the RAC industry • How to recognize and respond to hazardous situations while working in the RAC industry • The safe personal protection measures while working in the RAC industry • How to apply manual handling techniques • How to respond to accidents that occur while working in the RAC industry • The procedures for electrical safety when working in the RAC industry • How to apply basic electrical safety measures in the RAC industry • The methods of working safely with heat producing equipment (heat pumps) in the RAC industry • How to safely work with refrigerant hot gas heating equipment • The methods of safely using access equipment • The methods of working safely in excavations and confined spaces • The purposes, uses, maintenance, and care of all equipment, together with their safety

implications • The purposes, uses, care, and potential risks associated with materials and chemicals • The first aid requirements and actions required when both minor and major injury • The use of new technologies as a work aid • The working time associated with each activity • The parameters within which work needs to be scheduled • Principles and their application to good housekeeping within the work environment • How to apply environmental protection measures within the RAC industry • The applications of energy sources used in the RAC industry • The importance of energy conservation when commissioning RAC systems • The methods of reducing waste, and safe disposal of materials in the RAC industry.

The individual shall be able to: • Produce risk assessments and method statements • Apply the respective health and safety legislation for the RAC industry • Take responsibility for those working in the RAC industry • Identify hazards and dangers to the workforce and members of public where RAC work is carried out • Identify and implement methods to control common hazardous substances and prevent accidents or dangerous situations occurring in the RAC industry • Plan and perform safe manual handling of heavy and bulky items including mechanical lifting aids • Prepare and maintain a safe and tidy work area at all times • Select and use appropriate personal protective equipment in all RAC activities • Select and use appropriate hand tools to complete RAC tasks safely and efficiently • Apply first aid procedures for dealing with minor and major injuries in the RAC industry record near misses and accidents at work • Safely use access equipment such as step ladders, extension ladders, and mobile towers • Identify common electrical hazards encountered during RAC activities • Demonstrate safe working practice for working with electrically powered tools • Identify how bottled gases and equipment should be transported in the RAC industry • Identify types of energy sources and uses in RAC • Identify and apply basic operating principles • Plan work within time limits to maximize work efficiency and minimize disruption • Restore the work area to an appropriate condition.

COMMUNICATION AND INTERPERSONAL SKILLS

The individual needs to know and understand: • The identities and roles of the members of the construction team and the building services industry • How to apply information sources • How to communicate the technical language associated with the skill with others in the building services industry • The dynamics of working in a team and collaboration with other related skill groups and teams to achieve task completion • The working requirements of other trades either operating in the immediate area or affected by the installation works • The range and purposes of documentation, including text, graphical, paper based, and electronic • The standards required for routine and exceptional reporting in oral, handwritten and electronic form • The nature of the reports provided by measuring equipment, together with

their interpretation • The required standards for health, safety, and environment, customer service and care.

The individual shall be able to: • Read, interpret and extract technical data and instructions from manuals and other documentation • Communicate in the workshop by oral, written, and electronic means using standard formats with clarity, effectiveness, and efficiency • Use a standard range of communications technology • Respond to legislative requirements, customers' needs face to face and indirectly • Use search methods to obtain specific and non-specific information, specifications, and guidance.

DESIGN REFRIGERATION AND AIR CONDITIONING SYSTEMS

The individual needs to know and understand: • The standard units of measurement used in the RAC industry • The detailed properties of used materials and fluids in the RAC industry • Relevant Directives applicable to RAC industry • The relationship and interactions of energy, heat, and power • Principles of force and pressure and their application to RAC industry • Principles of electricity and control circuits as related to RAC industry • The detailed properties of fluids used in RAC industry • The refrigeration and heat pump cycle • Condensate drainage and secondary refrigerant circuits • The information requirements for the design of a refrigeration or air conditioning system • The principles and conventions used in specifications and drawings • The range of specifications and drawings in use, and their purposes • The uses and limitations of the generally available drawing tools • The types and use of electrical cables and devices for different applications.

The individual shall be able to: • Appraise the purposes of the required systems • Appraise the feasibility of locating the system within designated areas • Calculate relative density of refrigerants to air and water • Apply specialist knowledge of the principal applications and detailed properties of solid materials • Apply the principal applications and basic properties of fluids used in the RAC industry • Use the terminology associated with latent, sensible heat and fluid change of state • Carry out simple heat energy and power, force, and pressure calculations • Carry out simple electrical calculations i.e. ohms law, power consumption, voltage, current, and resistance circuits • Design an efficient refrigeration system that includes a range of heat exchangers and refrigerant types; HFC, HC and those with low or zero ODP and GWP • Choose components and joining methods that ensure leak-tight installation • Design an air conditioning system that would serve a comfort cooling application and also a full building application • Produce simple drawings and specifications, using standard conventions and symbols • Estimate the cost/budget requirement for equipment and materials • Select the required equipment and materials according to given criteria, including price and environmental considerations • Check the price and

either order the equipment and materials or amend the design of the system to maintain the budget.

INSTALLATION AND MAINTENANCE OF REFRIGERATION AND AIR CONDITIONING

The individual needs to know and understand: • Specific health and safety requirements that apply to fitting and fixing, servicing, maintaining, and decommissioning RAC systems • The working principles and layouts of RAC and heat pump systems • The procedure for fitting, fixing and testing materials, equipment, and components in RAC systems • The service and maintenance procedures for RAC systems, equipment, and components.

The individual shall be able to: • Interpret diagrams, plans, and specifications for piping and electricity routes • Work safely with hot gas heating equipment in the RAC industry • Prepare and, if need be, improve the area and surfaces which the installation depends upon • Itemize the required tools, components, and materials required for installation • Take and transfer measurements and angles from given drawings to surfaces and piping materials • Identify, check, and use various types of gases and equipment used for joining materials in the RAC industry • Safely drain oil and recover refrigerant • Join similar and dissimilar materials commonly found in refrigeration and air conditioning systems using a range of permanent and accessible jointing methods (brazing) • Fabricate and install mechanical materials and components according to drawings and specifications • Install electrical materials components and control devices according to drawings and specifications • Install ancillary components and systems found in refrigeration and air conditioning systems such as condensate drainage, and leak detection systems • Use tools and equipment to apply pressure to test the strength of a refrigeration system or any part of it • Use tools and equipment to apply pressure to test the tightness of a refrigeration system or any part of it • Use tools and equipment to evacuate moisture and non-condensable gases from inside a refrigeration system, and ensuring that the system is dry and free of leakage

COMMISSION REFRIGERATION AND AIR CONDITIONING SYSTEMS

The individual needs to know and understand: • How to interpret the design parameters of the given systems • Safety standards relating to the handling and application of refrigerants • Safe procedures for applying electrical supply to RAC systems • How to set up safety controls and devices to satisfy design requirements • How to ensure the integrity of RAC systems • How to ensure efficient operation of a system.

The individual shall be able to: • Charge the system with the correct type and quantity of refrigerant for efficient operation without leaking refrigerant to the

environment • Examine the system for leakage after commissioning, using direct or indirect measuring methods • Assess the refrigeration system for correct operation • Assess the air conditioning system for correct operation • Assess any secondary refrigerant or cooling system for correct operation • Assess the refrigeration or air conditioning system electrical installation for correct operation • Adjust refrigerant controls and flow devices for optimal system performance • Adjust electrical and electronic controls for optimal system performance • Balance the air distribution systems • Measure and record the RAC system operating parameters • Ensure the availability of essential client documentation • Provide training for the client operators • Demonstrate the safe functioning and care of the system to the client • Hand over the system to the client, while responding to all relevant queries.

FAULT FINDING REFRIGERATION AND AIR CONDITIONING SYSTEMS

The individual needs to know and understand: • The electrical standards that apply to the RAC industry • The inspection and testing requirements of electrically operated RAC services and components • The procedures for safely diagnosing and rectifying faults in electrically operated RAC services and components • The layout and features of electrical circuits in RAC systems • The procedure for safe isolation of the specific systems • The procedure for carrying out a risk assessment prior to investigating RAC systems • The importance of the original design and operational parameters • The impact of system isolation on client operations.

The individual shall be able to: • Inspect and test electrically operated RAC system components • Safely diagnose and rectify faults in electrically operated RAC services and components • Prepare and safeguard the area of work and its surroundings • Carry out safe isolation of electrical systems • Assess the refrigerant system for integrity and correct operation • Replace faulty refrigerant system components • Evaluate and test electrical wiring integrity prior to energizing • Assess the electrical installation for correct operation • Examine the whole system for leakage using direct and indirect methods, knowing the parts most likely to leak • Reclaim HFC and HFO refrigerant from systems without leakage to the environment • Safely purge natural refrigerants, like Ammonia or Carbon Dioxide • Drain and refill compressor lubricant • Restore the work area and its surroundings to its prior state • Explain, advise, and report on findings, actions, and matters requiring further attention

ПРИЛОЖЕНИЕ 2

ADDITIONAL TEXTS

Minsk Refrigerators Plant

The Minsk refrigerators plant founded in 1959 became one of the leading manufacturers of household refrigeration equipment within a relatively short period of time. Constant quality, reliability, practical design, diverse models and versions of fridges and freezers define firm steadfast stance of the enterprise in the market of household appliances.

Having fabricated its first refrigerator in 1962, the enterprise manifested itself as a developer of manufacturable and economical refrigerators. According to Minsk documentation, refrigerators were commercialized in many cities of the former Soviet Union: Alitus, Baku, Dushanbe, Kishineu and Samarkand. Afterwards, a two-compartment refrigerator and a freezer were developed and fabricated and foamed polyurethane heat insulation was applied for the first time in the Soviet Union. Supplying a batch of refrigerators to Greece in 1973 initiated successful activities of the enterprise in the world market.

In the 70ies and 80ies the Minsk Refrigerators Plant expanded its manufacturing, increases export of products, supplying them to such countries as France, England, Italy, Belgium, Austria, etc. The Plant became the parent enterprise of ATLANT Manufacturing Group founded in 1977.

At the beginning of the 90ies, when former economic ties were broken by political transformations and ATLANT Group actually disintegrated, they continued the activities on improving the output products at the Minsk Refrigerators Plant. This made a qualitative spurt possible. To add, organization works on establishing a new ATLANT Group, i.e. Closed Joint-Stock Company, were carried out. Development of a new generation of refrigerators started, based on ozone-friendly coolant, with "soft line" design, more low-energy, high-speed compressor, non-separable refrigerating unit and foamed condenser. Due to application of up-to-date equipment, refrigerator computer-added design and fabrication of precise machining attachments, application of latest materials and technologies, a new Minsk series 700 of refrigerators and freezers was developed, which possess all opportunities and advantages of up-to-date household consumer equipment.

Today thy Minsk Refrigerators Plant produces household refrigerators and freezers ATLANT, differing in volume (from 30 to 400 l), functional capabilities (single- and two-compartment ones, with top and bottom location of the freezer, with one and two compressors, with electronic control and display unit). Distinctive features of the fridge models newly developed and put into large-scale production include provision of two compressors, application of the door and cabinet zone-safe filling system, new exterior and interior design, parts fabrication of metal-base laminate and transparent polystyrene. When developing new models of household refrigerators and freezers ATLANT, article structures are perfected and their energy efficiency is improved.

Each refrigerator and freezer leaving the Plant line pass functional tests in accordance with the European quality, reliability and safety regulations. Therefore, Belarusian refrigerators and freezers are in constant demand both in the CIS and far abroad. The Minsk Refrigerators Plant supplies its products to Australia, Germany, Yemen, Latvia, Lithuania, Mongolia, Slovakia, France, Sweden, Estonia, etc. — altogether to 34 countries of the world. The buyers give notice of high quality, reliability and modern design of ATLANT refrigerators , which do not yield to the best world counterparts by their engineering parameters and are certified in prestigious European certified centers.

Increasing the output of household refrigeration equipment each, the enterprise expands manufacturing of ATLANT commercial refrigeration equipment . Refrigerated cabinets with the volume of 245 to 445 l, which include the models with advertising block, combined with a freezer, are in no less demand than household refrigerators and freezers.

Reliability of ATLANT refrigeration equipment is determined in many respects by the fact that quality management system in relation to the development, manufacture and maintenance of refrigerators, freezers and refrigerated cabinets, confirmed by the certificate of conformity to the International standard ISO 9001-2000 is used at the enterprise. The Plant also possesses ecological certificate of conformance to the requirements of ISO 14001-2000.

Lately the Minsk Refrigerators Plant has become known as the manufacturer of industrial equipment. The Plant has successful experience in creating automated and mechanized transport, storing and assembly systems, which can be used for any manufacturing line. Within the sort terms according to the customer's requirements, the enterprise produces air ducts and completing components for ventilation systems of high quality. Applying advanced technologies in designing and fabricating special manufacturing equipment also allows Minsk Refrigerators Plant fulfilling successfully the orders of other enterprises. Instrument production of the Plant offers designing at up-to-date engineering level of transfer molds, vacuum forms, die blocks, attachments; fabrication and introduction of machining attachments; training of rigging maintenance personnel. Besides, ATLANT Inc. produces technologically finished systems for plastic products manufacturing at the Baranovichi Machine-Tool Plant: different equipment for plastics processing, including thermoplastic automatic machines.

Long-term experience of creating qualitative and reliable products, development of own engineering base and application of latest innovations altogether determine the success and achievements of the Minsk Refrigerators Plant.

ENTERPRISE TODAY

Products of ATLANT Inc., one of the leading company manufacturing consumer equipment in CIS, is of high quality and has gained recognition of the consumers.

ATLANT is known as a manufacturer of popular refrigerators and freezers. For more than 40 years they have been leaving the production line, having gained prestige of efficient and reliable equipment meeting high consumer demands. Not for nothing, refrigeration equipment from Minsk is known not only in our country and other post-Soviet republics, but also in many European states and even in distant Australia.

At present, ATLANT Group commercializes the manufacture of other products. Many people have come to like automatic washing machines, and entrepreneurs and trade organizations have highly evaluated the advantages of refrigerated cabinets of this brand. Recently the enterprise has produced its new developments to the market: a built-in electric range burner panel and an electric kettle.

Development of refrigerators, which correspond to consumer equipment of the highest level, has become possible due to the production of highly efficient compressors, organized at ATLANT Inc. Their application allows greatly decreasing power consumption by refrigerators and freezers; therefore the majority of compressors by ATLANT Inc. are exported. Lately, the enterprise has developed compressor models for refrigerators, based on isobutane coolant widely used in the world.

ATLANT Inc. also manufactures plastics processing equipment (thermoplastic automatic machines, drying units, feeders and batching units), conveyor equipment (creepers and roller conveyors, lifters for transport, storing and assembling systems), as well as equipment for enterprises for chinaware production.

Success of ATLANT Inc. is closely connected to high level of industrial engineering. The factories of ATLANT Inc. have introduced 3D computer designing of the products, use microprocessor technology, when testing new specimen products and apply rapid simulation technologies. All these have allowed increasing the quality of the developments, greatly reducing the time for production development and preparation, augmenting consumer properties of the products and introducing new trends in the manufacture of domestic electric appliances.

ATLANT Inc. itself fabricates different types of rigging for refrigerator and freezer manufacturing — die blocks, casting molds, molds patterns for products of foamed polystyrene and polyurethane, vacuum forms. Production facilities and many-year experience enable to fabricate high-quality rigging for any industry.

To increase the efficiency of manufacturing and to improve it, the enterprise has developed transport and storing systems, automated warehouses and storerooms.

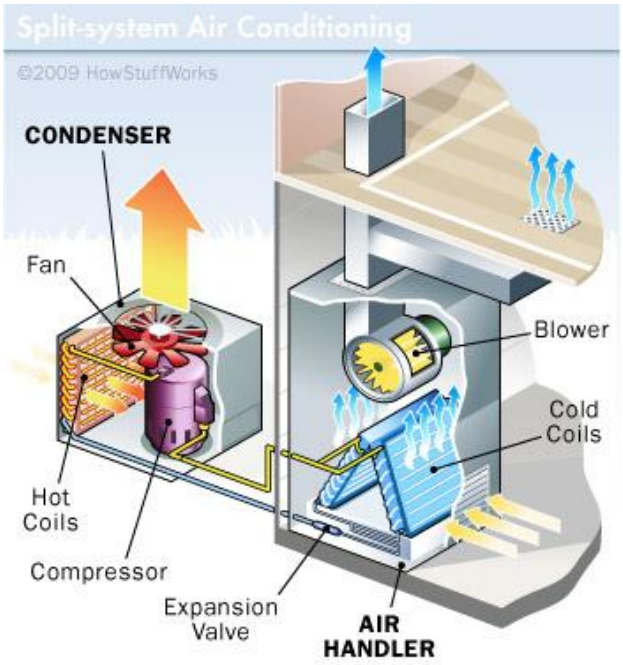
Engineering capabilities of ATLANT Inc. allows quickly and qualitatively manufacturing air ducts and completing components for ventilation systems both its own factories and other enterprises.

Strategic objective of ATLANT Inc. is to develop own base in specialized equipment manufacturing and facilities to increase refrigerator output amounting to 1 2000 000 pieces, to expand the range of output products due to manufacture of washing machines, electric ranges and other consumer equipment.

To achieve the stated goals, ATLANT Inc. plans to continue updating the equipment, performing the works on engineering process automation, taking stock of the output products, as well as expending their range. Long-term experience of developing qualitative and reliable products, development of own engineering base and application of latest developments determine the success and achievements of ATLANT Inc.

ATLANT Closed Joint-Stock Company is a high-tech and dynamically developing enterprise. It keeps up to date and aims at manufacturing the products meeting at the most the demands of the contemporary consumer. Experience multiplied by the drive to be the first is the guarantee of success of ATLANT.

Window and Split-system AC Units



A window air conditioner unit implements a complete air conditioner in a small space. The units are made small enough to fit into a standard window frame. You close the window down on the unit, plug it in and turn it on to get cool air. If you take the cover off of an unplugged window unit, you'll find that it contains:

- A compressor
- An expansion valve
- A hot coil (on the outside)
- A chilled coil (on the inside)
- Two fans
- A control unit

The fans blow air over the coils to improve their ability to dissipate heat (to the outside air) and cold (to the room being cooled).

When you get into larger air-conditioning applications, its time to start looking at split-system units. A split-system air conditioner splits the hot side from the cold side of the system, as in the diagram below.

The cold side, consisting of the expansion valve and the cold coil, is generally placed into a furnace or some other air handler. The air handler blows air through the coil and routes the air throughout the building using a series of ducts. The hot side, known as the condensing unit, lives outside the building.

The unit consists of a long, spiral coil shaped like a cylinder. Inside the coil is a fan, to blow air through the coil, along with a weather-resistant compressor and some control logic. This approach has evolved over the years because it's low-cost, and also because it normally results in reduced noise inside the house (at the expense of increased noise outside the house). Other than the fact that the hot and cold sides are

split apart and the capacity is higher (making the coils and compressor larger), there's no difference between a split-system and a window air conditioner.

In warehouses, large business offices, malls, big department stores and other sizeable buildings, the condensing unit normally lives on the roof and can be quite massive. Alternatively, there may be many smaller units on the roof, each attached inside to a small air handler that cools a specific zone in the building.

In larger buildings and particularly in multi-story buildings, the split-system approach begins to run into problems. Either running the pipe between the condenser and the air handler exceeds distance limitations (runs that are too long start to cause lubrication difficulties in the compressor), or the amount of duct work and the length of ducts becomes unmanageable. At this point, it's time to think about a chilled-water system.