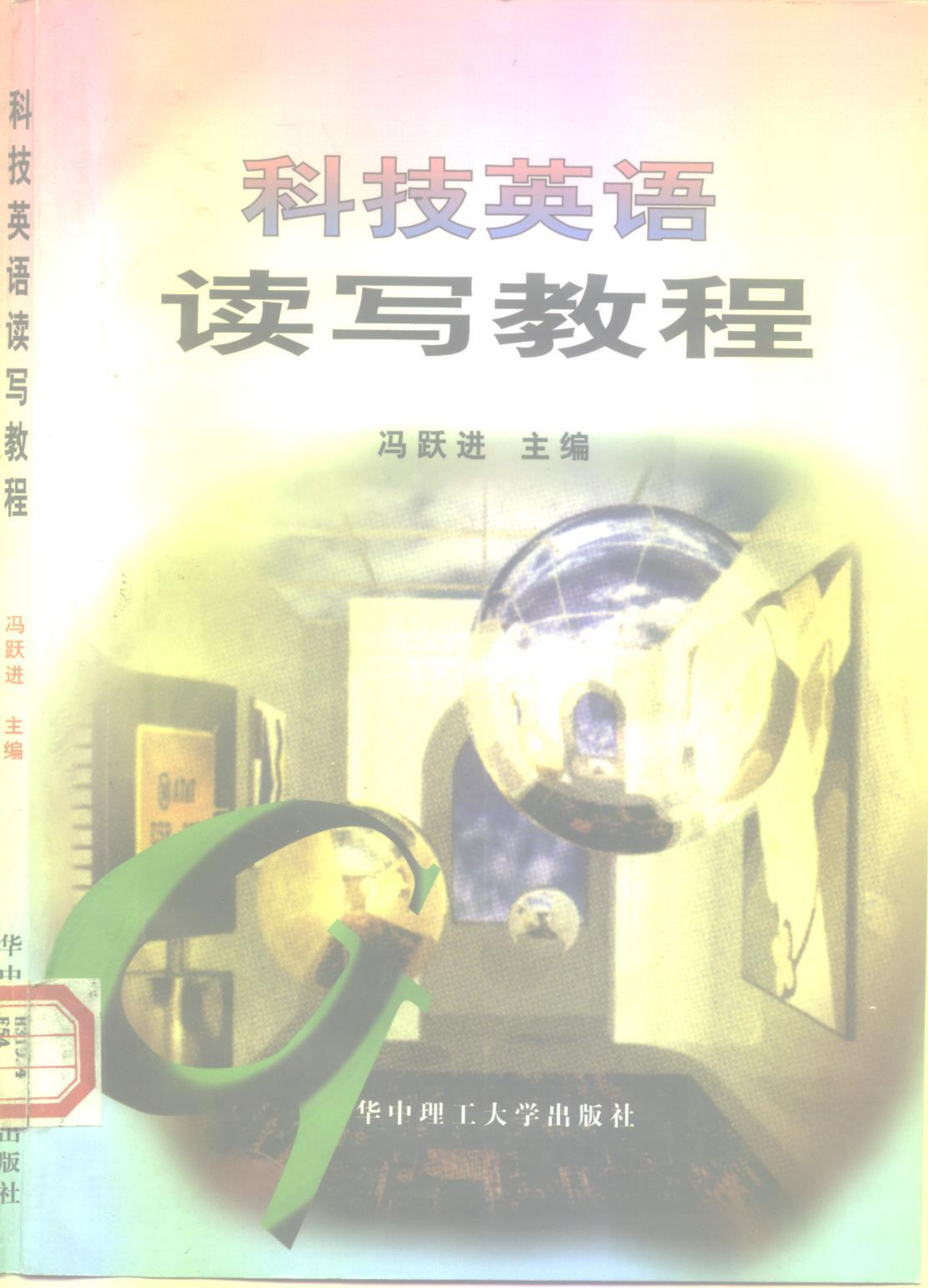
科技英语读写教程

冯跃进 主编



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前　言

本教程以科技英语中常见的九个主题类型为主线，具体阐明了构成这些类型的基本要素。编写本教程的目的是希望英语学习者在阅读科技英语文章时，能抓住每个类型的基本要素，按基本要素去获取有用的科技信息。

全书共分十四个单元，每个单元分四个部分。Part A 是一篇主课文及其练习，Part B 为一至两篇辅助课文及其练习。Part C 则侧重陈述各主题类型的基本要素及表达这些要素所常用的英语句型，并论述了科技英语的一些主要功能意念及其相应的英语表达形式。Part D 中的练习旨在加深英语学习者对主题类型基本要素的理解，并提高他们使用这些基本要素进行科技英语写作的能力。

书后附有超过新近颁布的大学英语四级词汇的词汇表。

本教程选材新颖，除可作科技英语阅读教材外，对英语教师和科技工作者都会有很大的帮助和启发。

在本书的编辑过程中，秦傲松教授就选材、练习设计等提出了许多宝贵意见，并对全书进行了仔细的审核；陈华同志曾参加前期的选材工作，在此一并表示感谢。由于编者水平有限，本教程中定有不少不足之处，恳请读者和专家学者批评指正。

编　者

1998 年 7 月

内容提要

本教程参照全国大学英语专业阅读阶段教学基本要求，依据主题类型(Topic Type)理论编写而成。本教程包含了以下九个主要的科技英语主题类型：物质、结构、机理、过程、特征、指令、原理、书评和序论，讲述了如何有效地阅读科技英语和通过阅读进行类型写作的方法。本教程所选材料虽偏重于机械专业英语，但所应用的主题类型理论对其它所有专业均适用。

Content

Unit 1

Part A

Text

Diamonds

Some of the earliest diamonds known came from India. In the eighteenth century they were found in Brazil, and in 1866, huge deposits were found near Kimberley in South Africa. Though evidence of extensive diamond deposits has recently been found in Siberia, the continent of Africa still produces nearly all the world's supply of these stones.

The most valuable diamonds are large, individual crystals of pure crystalline carbon. Less perfect forms known as 'boart' and 'carbonado' are clusters of tiny crystals. Until diamonds are cut and polished, they do not sparkle like those you see on a ring——they just look like small, blue-grey stones.

In a rather crude form, the cutting and polishing of precious stones was an art known to the Ancient Egyptians, and in the Middle Ages it became widespread in north-west Europe. However, a revolutionary change in the methods of cutting and polishing was made in 1476 when Lukwig Van Berquen of Bruges in Belgium invented the use of a swiftly revolving wheel with its edge faced with fine diamond powder. The name 'boart' is given to this fine powder as well as the natural crystalline material already mentioned. It is also given to badly flawed or broken diamond crystals, useless as jewels, that are broken into powder for grinding purposes, the so-called 'industrial' diamonds.

Diamond itself is the only material hard enough to cut and polish diamonds——though recently, high-intensity light beams called lasers have been developed which can bore holes in them. It may be necessary to split or cleave the large stones before they are cut and polished. Every diamond has a natural line of cleavage, along which it may be split by a sharp blow with a cutting edge.

A fully cut 'brilliant' diamond has 58 facets, or faces, regularly arranged. For cutting or faceting, the stones are fixed into copper holders and held against a wheel, edged with a mixture of oil and fine dust, which is revolved at about 2 500 revolutions a minute.

Amsterdam and Antwerp, in Holland and Belgium respectively, have been the centre of the diamond cutting, polishing industry for over seven centuries.

The jewel value of brilliant diamonds depends greatly on their colour, or 'water' as it is called. The usual colours of diamonds are white, yellow, brown, green, or blue-white; the blue-white brilliants are the stones of the 'fine water' and so command the highest prices. During their formation, some diamonds absorb metallic oxides from the surrounding rocks and take on their colour. Thus black, red and even bright pink diamonds have occasionally been found.

The trade in diamonds is not only in the valuable gem stones but also in the industrial diamonds mentioned above. Zaire produces 70% of such stones. They are fixed into the rock drills used in mining and civil engineering, also for edging band saws for cutting stone. Diamond-faced tools are used for cutting, drilling glass and fine porcelain, and for dentists' drills. They are used as bearings in watches and other finely balanced instruments. Perhaps you own some diamonds without knowing it——in your wristwatch!

Exercises

I. Read the passage once and do the following exercises.

1. In the second paragraph, what properties of the most valuable diamonds are mentioned?
   A. They sparkle.
   B. They are blue-grey stones.
   C. They are large and individual crystals.
   D. They are clusters of tiny crystals.
   E. They are crystalline carbon.
   F. They are pure.
   G. They are cut and polished.
2. What kind of device did Ludwig Van Berquen invent? Describe it simply.
3. The word 'boart' appears in both Paragraph 2 and Paragraph 3. What does it refer to respectively?
4. What are 'industrial' diamonds as mentioned near the end of the third paragraph? Why are they called as such?
5. Decide whether the following statements are True (T) or False (F) according to the fourth paragraph.
   ( ) You could not find any other material harder in the world than diamond.
   ( ) There are two ways to cut and polish diamonds.
   ( ) The reason why laser can bore holes in diamonds is that it has intensive power.
   ( ) We have to draw a cutting edge along a diamond's natural line of cleavage before splitting it.
6. According to the fifth paragraph, during faceting, diamonds are held in copper holders

_____.

A. to facilitate accurate cutting

B. to make them shine

C. so that they can revolve more easily

D. because copper is soft and metal materials might damage the diamond

7. What have been the two centres of the diamond polishing for over 700 years? What kind of method was used to cut and polish diamonds?

8. How may a brilliant diamond get its 'fine water'?

9. Since the jewel value of brilliant diamonds depends greatly on their colour or 'water' as it is called, the value order of 'water' in diamonds _____.

A. ranges from blue-white upwards

B. ranges from blue-white downwards

C. has never been reliably established

D. ranges from those occasionally found colours upwards like black, red and bright pink

10. According to the seventh paragraph, Zaire produces _____.

A. 70% of all diamonds sold

B. 70% of industrial diamonds sold

C. 70% of all precious stone sold

D. 70% of the world's blue-white diamonds

Ⅱ. Read the passage again and complete the following tables.

1. Complete the following table, using the information from the first paragraph:

What Comes Out	Location	Time
	India	long before
diamonds		the 18th century
huge deposits of diamonds	Kimberley	
	Siberia	
nearly all the world's supply of diamonds		today

2. Several applications of industrial diamonds are mentioned in the seventh paragraph. Please complete the following table.

Main Applications of Industrial Diamonds	
diamond fixed into drills	used in _____
	for cutting stone
diamond-faced tools	
	as bearings

3. This passage describes 'diamonds', presents certain types of information and arranges the information in a certain order. Complete the following table to summarise the passage and sort out the information provided in the passage.

Description of Diamonds		
Order	**Information Type**	**Summary of the Information**
1	occurrence	
5	instruments	
2	forms	
4	properties	
7	applications	
6	reactions	
3	structure	

Part B

Text 1

Metals

Why does man use metals still so much today when there are other materials, especially plastics, which are available? A material is generally used because it offers the required strength, and other properties, at minimum cost. Appearance is also an important factor. The main advantage of metals is their strength and toughness. Concrete may be cheaper and is often used in building, but even concrete depends on its core of steel for strength.

Plastics are lighter and more corrosion-resistant, but they are not usually as strong. Another problem with plastics is what to do with them after use. Metal objects can often be broken down and the metals recycled; plastics can only be dumped or burned.

Not all metals are strong, however. Copper and aluminium, for example, are both fairly weak—but if they are mixed together, the result is an alloy called aluminium bronze, which is much stronger than either pure copper or pure aluminium. Alloying is an important method of obtaining whatever special properties are required: strength, toughness, resistance to wear, magnetic properties, high electrical resistance or corrosion-resistance.

The properties of a metal can be further improved by use of heat treatment. Heat treatment is the term given to a number of different procedures in which the properties of metals and alloys are changed. It usually consists of heating the metal or alloy to a selected temperature below its melting point and then cooling it at certain rate to obtain those properties which are required. For example, hardening is used to make metals harder. Tempering makes them softer and less brittle. Annealing is carried out to make a metal soft

so that it can be machined more easily. In this way, metallic materials can be produced to meet every kind of engineering specification and requirement.

When Concorde was built, a material was needed which could withstand extreme aerodynamic conditions and would have a life of at least 45 000 flying hours. To achieve this, a special aluminium alloy was developed which is tough and lightweight and is used in over 70% of Concorde's structure. Another 16% is made of high-strength steel, and titanium alloys are used in the engine surrounds to withstand temperatures of 4 000 degrees centigrade.

Methods of extracting, producing and treating metals are being developed all the time to meet engineering requirements. This means that there is an enormous variety of metals and metallic materials available from which to choose.

Exercises

I. Read the passage once and do the following exercises.

1. In the first paragraph, a proposition is put forward, suggesting something general. Point it out and explain it.
2. What is the main advantage of the metal as mentioned in the first paragraph? Does concrete get the same advantage? Why or why not?
3. Decide whether the following statements are True (T) or False (F) according to the information in the third paragraph.
   ( ) If we mix copper and aluminium together, we get an alloy.
   ( ) Alloys are stronger than any kind of pure metals.
   ( ) Aluminium bronze is an alloy stronger than copper but weaker than aluminium.
   ( ) Alloying is such an important method only because a mixture of metals will provide any special properties you want.
4. What is the general idea of the fifth paragraph? Does it have any relationship with the third paragraph? Why or why not?
5. The last paragraph lists three main methods of processing metals: extracting, producing and treating. Which method do you think has been introduced in this passage? Give a simple description of the method.
6. Decide whether the following statements are True (T) or False (F).
   ( ) Concrete is a cheap building material.
   ( ) Plastics are more easily recycled than metals.
   ( ) Aluminium bronze is an example of the alloy.
   ( ) Tempering is a kind of heat treatment.
   ( ) It is sometimes an advantage for a metal to be soft.
   ( ) Concorde is built mainly of steel.

Ⅱ. Read the passage again and do the following exercises.

1. Paragraph 2 explains why man still use metals so much today when plastics possess many advantages. Complete the following table to show the comparison between plastics and metals.

Properties	Plastics	Metals
density		
corrosion-resistance		
what to do with them after use		
strength		

2. The fourth paragraph introduces the method of heat-treatment for the improvement of metal properties. Define the term 'heat treatment' and describe the main procedure of this method according to the paragraph.
3. Complete the following table to illustrate the relationship between the different types of heat treatments and the relevant functions.

Making Metallic Materials Meet Every Kind of Requirements	
Types of Heat Treatment	**Functions**
hardening	
	makes metals softer and less brittle
annealing	

4. The fifth paragraph provides two examples of some special alloys. Complete the following table.

Alloys	Engineering Specification or Requirement	Properties	Weight Percentage in Concorde
high-strength steel and titanium alloys	might withstand extreme aerodynamic conditions and would have a life of at least 45 000 flying hours		over 70%

Text 2

Gravity

A force of attraction exists between every body in the universe. It has been investigated

by many scientists including Galileo and Newton. This gravitational force depends on the mass of the bodies involved. Normally it is very small but when one of the bodies is a planet, like the earth, the force is considerable. Everything on or near the surface of the earth is attracted by the mass of the earth. The greater the mass, the greater is the earth's force of attraction on it. We call this force of attraction gravity.

Because of gravity, bodies have weight. We can perceive weight only when a body resists gravity. For example, when we pick up a stone there are two forces involved. One is the lifting force we exert and the other is the force of gravity which attracts the stone downwards and thus gives it weight. When a body escapes from the influence of the earth's gravitational pull, it can become 'weightless'. For example, the centrifugal force of spacecraft spinning in orbit round the earth cancels the effect of gravity. The crew therefore experience weightlessness. One of the minor disadvantages of weightlessness is that normal pens will not write because the ink is not attracted by gravity to flow out of the pen.

If the space crew land on the surface of the moon, they experience the much weaker force of gravity exerted by the moon. On the moon they weigh less than on the earth. Special training is necessary to help them to walk on the moon's surface.

To simplify engineering calculations, it is assumed that gravity is the same everywhere on the earth's surface and that for every kilogram of mass the earth exerts a force of 9.81 newtons on a body. In fact gravity differs slightly from place to place because of the shape of the earth. It is greatest at the poles where the earth is flattest and is least at the Equator.

Exercises

I. Read the passage once and do the following exercises.

1. According to the first paragraph, what kind of force is gravity?
2. Where is it likely to find gravity according to the first paragraph (you may have more than one choice)?
   A. Between every body in the universe.
   B. Between the mass of bodies involved.
   C. Between the mass and a planet.
   D. On or near the surface of the earth.
3. What is the difference between a gravitational force and gravity?
4. What is the most important application of gravity according to the second paragraph?
5. Decide whether the following statements are True(T)or False (F).
   ( )The earth's gravitational pull is the reason of weight.
   ( )The spinning spacecraft round the earth is not under the effect of gravity.
   ( )Weight may be felt only if we escape from the influence of gravity.
   ( )Any body has weight.
   ( )You may not use a pen to write if you are in a spinning spacecraft.

6. How can we perceive weight? Answer the question by completing the following table.

When we Pick up a Stone		
force involved		
source of force		
function		
direction		

7. Why do the space crew weight less on the moon than on the earth?
8. Fill in the blanks according to the last paragraph.

As we know, the earth in not as _____ as a ball, the diameter from the core to the poles is the _____, while the diameter from the cove to the Equator is the _____. Therefore, gravity differs slightly from place to place. It is _____ at the poles, and is _____ at the Equator. But it is troublesome to consider any differences in engineering calculations, so gravity is supposed to be the _____ everywhere on the earth surface, i. e. the earth exerts a force of _____ on a body for every kilogram of _____. This explains what kind of error we make in assuming that gravity always exerts a force of 9. 81N on a body for every kilogram of its mass.

Part C

Substance Description

Description is a function which is frequently found in scientific English. Description may be focused on a physical structure, a system, a function or a process. The present unit mainly illustrates the description of the physical structure and the function of a *substance*. As the present unit exemplifies, the description of a substance will usually provide information on certain aspects of the substance, and the provided information may be sorted into such categories as concerning the *forms*, *occurrence*, *structure*, *properties*, reactions, applications *of the substance* involved.

Theoretically speaking, all the passages describing substances of one kind or another share a similar information structure. In this way, an infinite number of English passages may be classified into a definite number of *topic types*, like the topic type of *substance*. Each topic type usually presents roughly the same types of information.

Read the following passage, which may be helpful for you to understand the topic type of *a substance*:

Quartz

Quartz is a crystalline form of silica SiO_2, one of the most abundant minerals of the earth crust (12% by volume). Quartz occurs in many different kinds of rock, inclining sandstone and granite. It ranks 7 on the Moh's scale of the hardness and is resistant to

chemical or mechanical breakdown. Quartzes vary according to the size and purity of their crystals. Crystals of pure quartz are coarse, colourless, and transparent, and this form is usually called rock crystal. Impure, coloured varieties, often used as gemstones, include agate, citrine quartz and amethyst. Quartz is used in ornamental work and industry, where its reaction to electricity makes it valuable in electronic instruments. Quartz can also be made synthetically. Natural crystals that would take million of years to form can now be 'grown' in pressure vessels to a standard that allow them to be used in optical and scientific instruments and in electronics, such as quartz wristwatches.

Exercises

1. The passage is very typical of the description of a substance. What information categories or constituents are presented in this passage?
2. In the passage, each sentence may be sorted into an information constituent. Complete the following table.

Topic Type: Substance			
Information Constituents	**Information**		
Structure	a crystalline form of silica SiO_2		
Amount			
Occurrence	in many kinds of rock, including sandstone and granite		
Properties of quartz			
Forms		rock crystals	agate, citrine quartz, amethyst
Applications of quartz			
Reaction			

3. Make a comparison with Exercise No. 3 of Part A. What is the similarity between the description of the substance 'Diamonds' and the description of the substance 'Quartz'?

In fact it is not difficult to sort information into certain categories. It is so because the information itself has already revealed itself, and certain types of information may always have their own language patterns. The following list illustrates some of the ways of describing such information constituents as *forms*, *occurrence*, *structure*, *properties*, *reactions*, *applications*.

Forms

● *The most valuable forms of* diamonds *are* large, individual crystals of pure crystalline