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英汉对照科普读物

KEPU DUWU

浙江大学《新技术译丛》编译组

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前 言

本书主要取材于《Modern Physical Science》各章后面的 Summary, 内容涉及原子结构、环境污染、冶金、燃料, 和热、电、光、声、磁等方面。全书共30篇, 各篇内容相对独立, 读者可根据需要任意选读。每篇包括三个部分: 原文, 注释和参考译文。书后附有词汇表。注释部分对于某些词组和语法现象提供了较详细的说明和例句, 以使读者加深理解。

本书可供大、中学校学生及自学英语的同志使用。凡学过英语基础语法的读者, 都可以用这本读物自修, 接触科技基础词汇, 巩固语法, 以培养阅读英语科技书刊的能力。

由于编者水平有限, 错误之处在所难免, 希望广大读者批评指正。

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1. Measurement of Matter

Science^① concerns itself with^② all material things in nature, their properties, and their behavior under differing conditions. It is primarily a process by which new knowledge and understanding of the universe is acquired^③. Physical science includes the following divisions of science: chemistry, physics, astronomy, physical geology, meteorology, physical oceanography, and astrophysics, as well as other branches of science.

The following terms describe some of the properties of matter. Volume is the amount of space occupied by an object. We can determine the volume of many small irregular objects by displacement of water using a graduated cylinder. Weight is the force of attraction between the earth and an object. This force decreases as^⑤ the distance between the object and the earth increases. Rest mass is a measure of the quantity of matter. When an object is traveling at moderate speeds, its mass is practically constant. The weight of an object differs in various locations of the universe while^⑥ the rest mass of the same object does not change.

注 释

① science[狭义] = natural science(自然科学) ② concern itself with 含有“关于, 涉及, 论述, 研究”等意义。[例] Physical science concerns itself with those areas of science which

deal primarily with non-living things. 物理科学所涉及的是主要论述非生物的那些学科。③process 这里作“方法, 手段”解。[比较] Science is a process for acquiring new knowledge. Science is not a “book of answers,” but essentially a method of learning! by which 引导定语从句, 修饰 a process. 详见第17篇注释②。④介词短语by....和分词短语using....都说明谓语动词 determine, 作状语。⑤ as 这里引导时间状语从句, 主句中的动作随之进行, 译成“随着”。[例] Experiments indicate that the mass of an object increases as its velocity increases. 实验表明, 物体的质量随着速度增加而增加。⑥while 这里引导状语从句, 表示同时存在的两种事物的对比, 而且含有“让步”的意味。

1. 物质的量度

自然科学是研究自然界的一切物质、它们的性质以及在不同条件下的变化规律。从根本上说, 自然科学是人类不断认识和了解宇宙万物的手段。物理科学包括下列学科: 化学, 物理学, 天文学, 地质物理学, 气象学, 海洋物理学, 天文物理学以及其它有关学科。

下列术语阐明了物质的某些特性: 体积是物体所占据的空间。我们可以根据量杯的排水量测定各种不规则小物体的体积。重量是地球与物体之间的引力, 该引力随着物体与地球之间距离的增大而减小。静质量是物质的一种量度。当物体以中等速度运动时, 其质量实际上是恒定的。同一物体的重量因其在宇宙中所处位置的不同而异, 但一物体的静质量总是保持不变。

2. Matter—Its Properties and Changes

There are two kinds of change in the natural world, physical and chemical. A physical change is one that does not produce a new substance. A chemical change does^②, however, produce a new substance. Certain substances may be changed into simpler substances by heating or by electrolysis.

The fundamentally simple substances are called elements. A compound is defined as the chemical union of two or more different elements^③. According to scientific law every compound always contains the same proportions by mass of the elements that compose it^④.

In describing chemical reactions a designated symbol represents one atom of an element. A formula represents one molecule of a compound.

Chemists express chemical reactions by using chemical equations, which tell what materials are used, in what proportions, and what is obtained in the reactions^⑤.

A solution consists of^⑥ a solute dissolved in a solvent. Gases are more soluble in cold liquids than in hot ones. Most solids are more soluble in hot solvents. Water is our most common solvent. Other solvents are used for dissolving substances insoluble

in water.

A scientific law is an experimentally proven statement concerning the behavior of matter. The law of conservation of matter states that matter cannot be created or destroyed by ordinary chemical means.

注 释

① physical 和 chemical 这两个形容词连用作定语, 修饰 two kinds of change. ② does 这里用来加强动词 produce 的语气。[例] In some cases air and other gases do conduct electricity. 在某些情况下空气和其它气体确实导电。③ is defined 后面的 as...elements 作主语补足语, 前面一句 are called 之后的 elements 亦为主语补足语。④ scientific law 是指 the law of constant proportions (定比定律)。by mass (按质量计算) 说明 proportions; of the elements 说明 proportions by mass; that compose it 是修饰 elements 的定语从句; it 指 compound。[例] Water is about 8/9 oxygen and 1/9 hydrogen by weight. 按重量计, 水约由 8/9 氧和 1/9 氢组成。⑤ 连接代词 what 分别引导三个名词性从句, 作 tell 的宾语。其中第二个从句 in what proportions 后面省略了 they are。⑥ consist of 由...组成, 由...构成。[例] The motor consists of the stator and the rotor. 电动机由定子和转子构成。

2. 物质的性质和变化

自然界有两种变化, 即物理变化和化学变化。物理变化是一种不生成新物质的变化, 而化学变化则生成新的物质。某些物质经加热或电解可变成更简单的物质。

最基本的简单物质称为元素。所谓化合物就是由两种或两种以上不同元素化合而成的物质。根据科学定律, 每一化合物

的各个组成元素的质量比总是恒定的。

为了阐明化学反应，用特定的符号代表某种元素的一个原子，用分子式代表某种化合物的一个分子。

化学工作者用化学方程式表示化学反应，化学方程式表明哪些物质参加反应、其比例如何、以及反应生成物是什么。

溶质溶解于溶剂便成为溶液。气体在冷的液体中比在热的液体中易于溶解。大多数固体在热的溶剂中较易溶解。水是最普通的溶剂，其它溶剂则用来溶解不溶于水的物质。

科学定律是已为实验所验证的关于物质变化规律的概述。物质守恒定律指出，用普通的化学方法物质既不能创造也不能消灭。

3. Atomic and Molecular Structure

The atomic theory explains how atoms react to form new substances. Atoms, being the smallest units of elements^①, are composed basically of protons, electrons, and neutrons. Electrons move about the heavy nucleus of an atom in definite regions called electron clouds or energy levels.

The atomic number of an element represents the number of protons in the nucleus. This is also equal to the total number of electrons in shells outside the nucleus. There can be a maximum of two electrons in the K shell, eight in the L shell, and eighteen in the M shell. The mass number of an element is its atomic mass (atomic weight), rounded off^② to the nearest

whole number. It is also equal to the sum of the protons and neutrons the atom contains③.

The valence number of an element expresses the combining power of an element with other elements. Atoms join with other atoms by transferring electrons from one atom to another (ionic bonding), or by sharing electrons with each other (covalent bonding). By knowing the valence numbers of elements, we can predict what compounds are possible, and can write their formulas. In any compound, the total positive valence number must equal the total negative valence number. In summary, the term valence number represents the number of electrons an atom can transfer, receive, or share during a chemical reaction.

The kinetic theory of matter states that the molecules of all matter are in constant motion. Diffusion is the rapid, random motion of molecules to fill a space. When a substance is heated, its molecules speed up④, increasing their average energy of motion, or kinetic energy⑤. The amount of kinetic energy a substance possesses, determines its phase of matter.

注 释

① 分词短语 being...elements 作状语, 插在主语和谓语之间。

② round off 原意为“完成, 使圆满, 弄齐全”, 引伸到数学上, 作“四舍五入成整数”解。③ the atom contains 是省略了关系代词 that 或 which 的定语从句, 修饰 the protons and neutrons。因关系代词在定语从句中作宾语, 故可省。本文第三段最后一句中的定

语从句 *an atom can transfer, ...* 和文末的 *a substance possesses* 也都省略了关系代词。④ *speed up* 加快, 加速。文中 *speed up* 作不及物动词用, 它也可用作及物动词。[例] *We must speed up the development of steel industry.* 我们必须加速钢铁工业的发展。⑤ *increasing ... kinetic energy* 这一分词短语作状语, 带有“结果”的意味。[例] *Iron reacts with most acids, displacing hydrogen.* 铁与大多数酸起反应, 置换出氢。表示结果的分词短语一般放在句子后部, 有时在分词前还带有 *thus, thereby* 一类的副词。[例] *We increase the length of the wire, thus increasing its resistance.* 我们增加导线的长度, 从而增加了导线电阻。

3. 原子和分子的结构

原子学说是解释原子怎样互相作用而形成新的物质。原子是元素的最小单元, 它主要由质子、电子和中子组成。电子在重得多的原子核周围的电子云或能级的一定区域内运动。

元素的原子序数表示原子核中的质子数, 它也等于在原子核外边各个壳层上电子的总数。K层的最大电子数为2, L层为8, M层为18。元素的质量数就是最接近该原子质量(原子量)的整数, 它也等于原子所含的质子数与中子数之和。

元素的化合价表示该元素与其它元素结合的能力。原子与原子之间的结合是通过电子从某个原子转移到另一原子(离子键)或者两个原子彼此共有若干电子(共价键)来达到的。如果知道某两种元素的化合价, 我们就能预测将会生成何种化合物, 并写出分子式。在任何化合物中, 总正价数必定等于总负价数。总之, 化合价这一术语表示原子在化学反应中所能转移、接收或共有的电子数。

分子运动学说认为，所有物质的分子都在不断地运动。扩散是分子充满某一空间的一种迅速而不规则的运动。当物质受热时，分子运动速度加快，分子的平均运动能量（即动能）也因而增大。物质所具动能的大小决定该物质的物相。

4. The Nature of Some Common Gases

Oxygen is the most abundant element on earth. It is found as free element in the air and as a part of many compounds such as water and rocks①. Rapid oxidation accompanied by noticeable heat and light is called combustion. Slow oxidation, on the other hand, is a process in which no noticeable heat or light is given off. Rusting and decay are examples of slow oxidation. After a sufficient amount of heat from slow oxidation has accumulated, spontaneous combustion may occur. Oxygen can be prepared in the laboratory by heating potassium chlorate in the presence of a catalyst such as manganese dioxide. It can also be prepared by the decomposition of mercury oxide or hydrogen peroxide. For industrial uses, it is prepared from water or air.

Nitrogen is a colorless gas that does not form compounds readily. Nitrogen makes up about 78% of the air by volume. Another gas, carbon dioxide, is

taken up^③ by plants. The oxygen-carbon dioxide cycle accounts for^④ the almost constant amount of carbon dioxide in the air. Carbon dioxide is prepared in the laboratory by the action of an acid on any carbonate. Carbon dioxide is heavier than air gas^⑤ that neither burns nor supports combustion.

Hydrogen is the lightest of all elements. It is used to change oils to solid fats and in the production of gasoline, as well as for producing very high temperatures. Hydrogen is usually prepared in the laboratory by the reaction of an active metal such as zinc with an acid such as sulfuric or hydrochloric. Since free hydrogen occurs in nature only in minute quantities, it must be extracted from its compounds.

注 释

① as a free element.... 和 as a part of.... 作主语补足语, such as 用于举例的场合, 作“例如..., 象...那样的, 如...之类的”解。②make up 这里指构成部分“组成, 构成, 合成”。[例] Iron ore, coke, and limestone make up the charge for the blast furnace. 高炉的炉料是由铁矿石、焦炭和石灰石组成的。make up作“组成, 构成”解时常用被动式。[例] Rubber is made up of giant molecules called polymers. 橡胶是由聚合物的大分子构成的。③take up 这里作“吸入(气体)”解。④account for 解释, 说明...的原因; 意为“serve as an explanation of, explain the cause of”。[例] Resonance accounts for sympathetic vibrations. 和应振动的现象可以用共振来解释。⑤heavier than air 整个地作前置定语用, 修饰 gas。把它提前是因为 gas 后面还有定语从句。

4. 几种常见气体的特性

氧是地球上最丰富的元素。氧在空气中是以游离元素存在的，而在水和岩石之类的许多化合物内则为化合物的一部分。伴有明显的光和热的急剧氧化称为燃烧。缓慢氧化是一种不发出明显的光或热的过程，例如生锈和腐烂均属缓慢氧化。缓慢氧化积聚了相当多的热量之后，亦可能引起自 发 燃 烧。在实验室可以加热氯酸钾并用二氧化锰作催化剂来制备氧，还可以电解氧化汞或过氧化氢来制氧。工业用氧是从水或空气中制取的。

氮是一种不易于形成化合物的无色气体，按体积计约占空气的78%。另一种气体二氧化碳是植物所需要的。空气中的二氧化碳含量之所以能保持恒定就是因为氧-二氧化碳的循环。在实验室可以通过酸和任何一种碳酸盐的反应来制备二氧化碳。二氧化碳是一种比空气重、既不可燃也不助燃的气体。

氢是所有元素中最轻的，它可用来使油类硬化为固体脂肪、提炼汽油以及产生极高温度等。在实验室氢通常是由活泼金属锌与硫酸或盐酸起反应而制得。由于游离氢在自然界中含量极少，故必须从其化合物中提取。

5. Acids, Bases and Salts

Acids, bases, and salts are electrolytes, compounds that will, when dissolved or melted, conduct an electric current①. Acids are compounds that have a sharp, sour taste, such as those in lemon juice, vine-

gar, and sour milk. They dissociate in water to form hydrogen (hydronium) ions, which turn blue litmus red, neutralize bases, and corrode active metals. Sulfuric, our most common acid, is a dense liquid that ionizes readily in water. Concentrated sulfuric acid is a good dehydrating agent. Hydrochloric and nitric are two other strong acids of industrial importance.

Bases dissociate to form hydroxide ions in a water solution. Strong bases, such as sodium and potassium hydroxides have a bitter taste, turn red litmus blue, neutralize acids, and have a caustic action on skin. Sodium hydroxide, prepared by electrolysis of salt solution, is used in the manufacture of rayon and cellophane, in refining petroleum, and in mercerizing cotton. Ammonia-water is an important weak base.

A salt is the substance other than water that is produced by a reaction between an acid and a base^②. Neutralization may be described as the process in which hydrogen ions of the acid and hydroxide ions of the base react to form water. Certain salts, when dissolved in water, act like acids or bases because of a process called hydrolysis.

Crystals have a regular shape with flat surfaces and straight edges. They form cubes and other geometrical forms that are characteristic of the compounds they are made of.