

# Unit 1-1

## Language Focus: Classifying

### Topic Focus: The Composition of Matter

科学的な研究をするときには私たちのまわりにあるさまざまな物質を収集し、観察して分類することが大切です。その分類の仕方を学びましょう。

#### Introduction



音声を聞いて( )を埋めてから下の問いに日本語で答えなさい。

The early stages of scientific research involve making observations and gathering information. (1), merely collecting facts is not enough. The scientist needs to arrange and classify the facts and to find (2) among them.

The word *classification* comes from the word *class* — meaning a group of things that all have one important element in (3). Scientists group related information into an array. Chemists, for example, cannot study every (4), but can make generalizations by arranging all the elements into groups with related (5). (6), if iodine is identified as belonging to the same group as chlorine and bromine, its properties can be predicted. Similarly, since there are several million kinds of plants and animals on earth, it is clearly (7) to study each one. However, by classifying an animal as a member of a particular group, or species, a biologist can (8) its characteristics. Classification is thus very basic to scientific (9) and (10).

1. classification の語源は何ですか。
2. なぜ分類することが科学にとって大切なのですか。
3. 分類することによって、例えば生物学者は何をすることができると言っていますか。

□ パートナーと答えを話し合いなさい。

#### Sentence Patterns

分類を表現するには次の要素が必要です。

1. a general class (一般的な部類：上位区分)
2. a specific item or items (具体的な項目：下位区分)
3. a basis for classification (分類の根拠)

【例】 All matter may be classified as either solid, liquid, or gas.

general class = matter

specific items = solid, liquid, gas

上記の例では、「物質」が上位区分にあたる一般的な部類、「固体」「液体」「気体」がその下位区分にあたります。次の表で英語の表現をまとめてみましょう。

### Classifying from General to Specific

Matter	is/are	classified	into	divisions.
	may be	grouped		groups.
	can be	divided		types.
	could be	arranged		classes.
		categorized		categories.
		classified		classifications.
		categorized	as	solid, liquid,
		classed		or gas.
		grouped		
There are three	types			
	kinds			
	classes			
	categories			
				of matter.

### Classifying from Specific to General

Oxygen	may be	classified	as a gas.
	can be		
	could be	classed	
	is/are	categorized	
Oxygen is			
		an example of a	
		a type of	
		a kind of	
		a form of	
		a	gas.

🌟 **Identifying General and Specific Ideas:** general class には下線を, specific item(s) には波線を引きなさい。

【例】 Copper, lead, mercury, and silver are nonferrous substances.

1. Steel is an alloy.
2. Five important classes of compounds are acids, bases, salts, metallic oxides, and nonmetallic oxides.
3. A deer is a mammal.
4. Carbon exists in three forms: graphite, diamond, and amorphous.
5. Rocks are grouped into three categories: igneous, metamorphic, and sedimentary.

🌟 **Changing Active Voice to Passive Voice:** 科学的な文章を書くときや分類するときには, 受動態がしばしば用いられます。なぜなら科学では重点が通常動きにあって, それを行う人にはありません。また現在形の単文が科学的な文章を書くときには最もよく用いられます。例にならって, 能動態を受動態に書き換えなさい。

【例】 We extract sulfur from volcanic rock.

→ Sulfur is extracted from volcanic rock.

1. Luigi Galvani invented the electric battery in 1786.

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2. The authorities temporarily suspended the American space shuttle program after the accident in 1986.

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3. Workers completed the Panama Canal in 1914.

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4. The 1986 earthquake in Mexico City killed many people.

5. Chemists can extract nitrogen from the air by liquefaction.

### Short Reading

空欄にあてはまる語を下から選び入れなさい。

#### The Nature of Matter

Everything around us consists of matter: this book, your body, the air you breathe, and the water you (<sup>1</sup> ). Matter is anything that has weight or mass and takes up space.

All matter may be classified as either (<sup>2</sup> ), liquid, or gas. Solids are firm and have a definite form. Rubber, wood, glass, iron, cotton, and sand are all classified as solids. A considerable force would be needed to change the shape or volume of an iron bar, for example, because the atoms or molecules of a solid are densely packed and have very little (<sup>3</sup> ) of movement.

Solids may be further divided into two (<sup>4</sup> ): crystalline and amorphous. Ice, diamonds, sodium chloride, and quartz are crystalline solids. Crystalline solids are made up of atoms arranged in a definite pattern. When these solids are heated, the change to a liquid, known as melting, is sharp and clear. Amorphous substances include rubber, glass, and plastic. In these substances, the pattern of the atoms is not orderly, and when heated, they gradually soften.

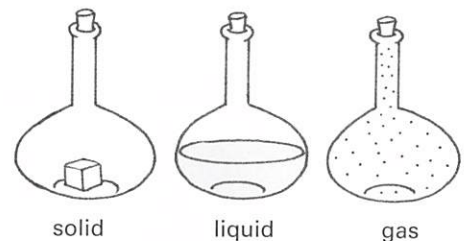
Liquids, on the other (<sup>5</sup> ), are not rigid. If water, milk, or oil is poured on a table, it will flow all over the surface. The atoms or molecules of liquids attract each other and thereby enable liquids to flow. But these atoms are loosely structured and do not keep their shape. Therefore a liquid will take the shape of any (<sup>6</sup> ) in which it is poured. However, liquids have a definite volume; a quart of milk cannot fit in a pint container.

Gases, such as air, oxygen, and carbon (<sup>7</sup> ), have no fixed shape or volume of their own. They diffuse or spread out to fill any container. If water is put into a tire, it will run to the bottom; if air is put into a (<sup>8</sup> ), it fills the whole space inside the tire. The atoms or molecules of gases are widely spaced and move very rapidly. They either compress or expand to adapt to any area.

Everything we know is made of matter in solid, liquid or gaseous form.

dioxide	drink	freedom	container
classes	hand	solid	tire

空欄に入る語句をテープを聞いて確認した後、文章をもう一度読み、受動態に下線を引きなさい。また、分類を表している文をできるだけたくさん見つけなさい。



# Unit 1-2

## Main Reading: The Infinitesimal Atom

### Vocabulary Building

平均的な人の語彙はだいたい20代半ばでとまってしまいます。従ってそれ以後も語彙を増やすためには意図的に努力する必要があります。英語の語源を、語根 (word root), 接頭辞 (prefix), 接尾辞 (suffix) に分解して覚えることもひとつの方法ですし、また同意語 (synonym) や反意語 (antonym) を知ることも大切です。次の例を見てください。

subdivision < sub = 「下」 + divide 「分ける」 + ion 名詞語尾  
indestructible < in- = not + destruct 「破壊する」 + able = 「できる」形容詞を作る。  
positive electric charge = 「陽電荷」 positive の反対が negative  
reaction = re 「再び」 + action 「反応, 反動」

化学記号は英語とラテン語, ギリシア語からできています。

Hg: mercury 「水銀」 <ラテン語の *hydrargyrum*

Cl: chlorine 「塩素」 <ギリシア語の *khloros* = pale green その色から英国の科学者が命名。

この教科書では、長文を読む前に Vocabulary Building セクションを設けて上記のような例を系統立てて紹介し、科学的な文章に頻繁に使用される語を中心に語彙力の増強をはかります。さらに、知らない単語の意味を文脈から推測する練習問題も用意されていますので、すぐに辞書に頼るのではなく、自分が持っている知識を活用して、文脈から意味を推測することを日頃から心がけましょう。

### Vocabulary in Context

長文を読む前に単語の意味を文脈から推測する練習をしてみましょう。斜字体の単語の意味に近いほうを○で囲みなさい。

- Atoms are *infinitesimal* in size.  
(a) tiny (b) huge
- The whale suddenly *emerged* from the water.  
(a) arose (b) disappeared
- All matter is either liquid, solid, or gas, and solids may be *subdivided* into crystalline and amorphous.  
(a) built up (b) broken down
- Plastic products are hard to dispose of because they are almost *indestructible*.  
(a) unable to be destroyed (b) unable to be constructed
- At one time the atom was thought to be *indivisible*.  
(a) unable to be divided (b) unable to be seen
- Einstein's ideas are too *abstract* for many people to understand.  
(a) practical (b) theoretical
- The airplane had to rely on radar in the *dense* fog.  
(a) thick (b) thin
- The moon *revolves* around the earth.  
(a) stretches (b) circles



electrons whirling around keeps the electrons in their paths.

What is it that makes iron hard, oxygen a gas, and mercury a liquid? The properties of an element are determined by the number of electrons in an atom, which is called the atomic number. All atoms of the same element are alike. If you've seen one atom of oxygen, you've seen them all. Hydrogen, the lightest element, has one electron and one proton. In fact, the hydrogen atom, the most common atom in the universe, is the basis on which our entire universe was formed. Oxygen has eight protons and eight electrons. Uranium, one of the heaviest elements, has 92 protons and 92 electrons.

All the world is made of atoms: Everything we see and know of is made of the billions and billions of these infinitesimal specks of matter. All life exists because atoms are continually moving, combining, separating, colliding, giving off energy, and absorbing energy.

### Understanding the Reading

次の各文は本文の内容と異なります。例にならって、本文の内容と一致するように文を書き直しなさい。

【例】 *Molecules are even smaller than atoms.*

→ *Atoms are even smaller than molecules.*

1. The concept of the atom did not exist before 1804.  
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2. In ancient Greece, a lot of people believed Democritus' theory that matter is composed of four elements.  
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3. During the Middle Ages, the atomic theory was widely accepted.  
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4. John Dalton theorized that atoms are composed of electrons, protons, and neutrons.  
\_\_\_\_\_
5. The size of a nucleus inside an atom is equal to the size of an ant.  
\_\_\_\_\_
6. Atoms are densely packed with protons, neutrons, and electrons.  
\_\_\_\_\_

### Comprehension Check



テープを聞いて、その質問の答えとして最もふさわしいものを選びなさい。

1. (a) Democritus      (b) Aristotle      (c) John Dalton      (d) Niels Bohr
2. (a) element      (b) proton      (c) nucleus      (d) neutron
3. (a) 1      (b) 8      (c) 11      (d) 9