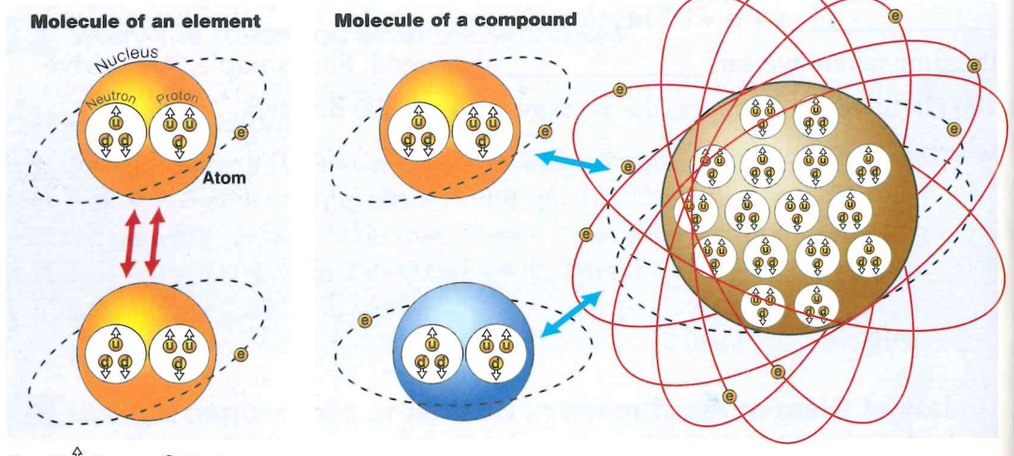
UNIT 8

Elements and compounds

CD 1-38

Section 1 *Vocabulary*



A. Read the text and look at the diagrams.

Chemistry is the study of **matter**. **Quarks** are the smallest known particles of matter. There are five different types of quarks They have unusual names like *up* and *down, charm* and *strange*.

Quarks can make **protons** and **neutrons**. Protons have two *up* quarks and one *down* quark. Neutrons have one *up* quark and two *down* quarks.

Protons and neutrons combine to make the **nucleus** of an **atom**. Every atom also has one or more **electrons**. There are the same number of electrons as protons in each atom. Protons have a **positive charge** and electrons have a **negative charge**.

Atoms of the same type make up matter that is called an **element**. For example **hydrogen, oxygen, iron** and **copper** are elements. There are 92 elements that occur in nature and scientists have made at least 10 more. Each element has a one or two-letter symbol.

This is usually the first one or two-letters in English; for example, **H** for hydrogen and **O** for oxygen. However, sometimes the symbol does not come from the English word; for example, **Fe** for iron and **Cu** for copper.

When atoms combine they make **molecules**. Atoms of the same element can combine to make molecules. When atoms of different elements combine, the matter is called a **compound**. For example, hydrogen atoms combine with oxygen atoms to make water, whilst carbon atoms combine with oxygen atoms to make **carbon dioxide**.

Atoms of different elements can combine in chemical reactions to make compounds. Compounds can be broken down into their constituent elements. This is called **decomposition**.

B. Complete the table. Write the symbol for each element.

Element	Symbol	Element	Symbol
calcium		mercury	
carbon		nitrogen	
chlorine		oxygen	
copper		potassium	
hydrogen		sodium	
iron		sulfur	

C. Here are some chemical reactions. Match each reaction to its description.

Reaction

1. $2H_2 + O_2 \rightarrow 2H_2O$
2. $2HgO \rightarrow 2Hg + O_2$
3. $Fe + S \rightarrow FeS$
4. $2Na + Cl_2 \rightarrow 2NaCl$
5. $H_2SO_4 + CuO \rightarrow CuSO_4 + H_2O$
6. $2FeO + C \rightarrow 2Fe + CO_2$
7. $2NO_2 \rightleftharpoons 2NO + O_2$
8. $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$

Description

A. Copper plus nitric acid makes copper nitrate plus nitrogen dioxide plus water.
B. Hydrogen plus oxygen makes water.
C. Iron oxide plus carbon makes iron and carbon dioxide.
D. Iron plus sulfur makes iron sulfide.

E. Mercury oxide decomposes to mercury and oxygen.

F. Nitrogen dioxide can decompose to nitrogen monoxide and oxygen, which can combine again to make nitrogen dioxide.

G. Sodium plus chlorine makes common salt (sodium chloride).

H. Sulfuric acid (hydrogen sulfate) plus copper oxide makes copper sulfate plus water.

CD 1-39

Section 2 Reading

Period \ Group	1	2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																		2 He
2	3 Li	4 Be												5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg												13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca		21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr		39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	*	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	**	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo

*Lanthanides 57–70 **Actinides 89–102

Periodic table of elements

In 1869, a Russian chemist, Dmitri Mendeleyev, arranged the known elements in a table according to their properties – their appearance and behavior in chemical reactions. He didn't invent the idea. However, Mendeleyev's classification was better than previous attempts because he left spaces for elements still to be discovered. For example, he left a space between the known elements *calcium* and *titanium*. Ten years later, the Swedish chemist Lars Nilson discovered scandium. It fitted between calcium and titanium and proved the strength of Mendeleyev's arrangement.

Elements are arranged in seven horizontal *periods*. The elements are ordered by atomic number. This is the number of protons in the nucleus. The first element in each period has only one electron in the outer part of the atom. The last element in each period has no space for more electrons in the outer part so the element does not combine with other elements to form compounds. It is inert. Gases like helium (He), neon (Ne) and argon (Ar) are inert.

Elements are also arranged in 18 vertical *groups*. All the elements in a group look and behave in a similar way. For example, the elements in Group 1 (except hydrogen) are metals while those in Group 17 (except astatine) are nonmetals.

A. Choose the best answer in each case.

1. The term *properties* in this text refers to:
   a. houses or buildings
   b. the appearance of an element
   c. the behavior of an element
   d. the appearance and behavior of an element

2. Which sentence is correct?
   a. There were no periodic tables before Mendeleyev's.
   b. Mendeleyev's table contained all the elements in the world.
   c. Mendeleyev's table predicted the existence of unknown elements.
   d. Mendeleyev's table contained the new element scandium.

3. The first element in Period 3 is:
   a. sodium
   b. hydrogen
   c. nitric acid
   d. nitrate

4. Some elements are inert because:
   a. the outer part of the atom has no electrons
   b. the outer part of the atom has no space for more electrons
   c. they are gases
   d. they are like helium

5. The first element in Group 14 is:
   a. carbon
   b. calcium
   c. chlorine
   d. copper

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B. Study the following example sentences.

Using the passive

Elements **are arranged** in seven horizontal periods.
Elements **are ordered** by atomic number.

C. Circle the correct form of the verbs.

1. Mendeleyev (*left* / *is left*) spaces for elements still to be discovered.
2. The discovery of scandium (*proved* / *is proved*) the strength of Mendeleyev's arrangement.
3. In the periodic table, elements (*arranged* / *are arranged*) in periods and groups.
4. The elements (*ordered* / *are ordered*) by atomic number.
5. Inert elements (*are not combined* / *do not combine*) by contact with other elements to form compounds.

CD 1-40

Section 3 *Listening*

A. Listen and complete the summary of the reading text in Section 2. Write one word in each space.

In 1869 a Russian chemist, Dmitri Mendeleyev, arranged the known _____ in a table, according to their properties. In this table, elements are arranged in seven horizontal _____. The elements are ordered by atomic _____. They are also arranged in 18 vertical _____. All the elements in a group look and _____ in a similar way.

CD 1-41,42

B. Listen to the lecture. Which element makes up nearly two-thirds of the human body?

_____

CD 1-43,42

C. Listen again and complete the summary table. Write one word or number in each space.

Some constituents of the human body

C	18%
H	
	65%
Ca	
	3%
Cu	trace
Na	
S