

ELEMENTS AND COMPOUNDS: SYMBOLS AND FORMULAE

Elements are single pure substances that cannot be split into anything simpler by chemical means. There are just over 100 different elements of which about 30 are fairly common.

Scientists throughout the world use the same symbols for the same elements.

Most substances we come across are compounds. A compound is formed when two or more elements join together. The new substances formed are often very different from the elements from which they are made.

Compounds have the following characteristics:

- they have properties of their own and not the properties of the elements from which they are made;
- they contain fixed amounts of the elements in them;
- they are formed by a chemical reaction;
- they are difficult to split up and cannot easily be made back into the elements from which they were formed.

The formula of a compound is made using the symbols of the elements in the compound. It tells you which elements the compound is made from and how much of each element there is. Some simple rules are used when deciding how to name a compound. The most important ones are these:

- if a compound contains a metal, the name of the metal comes first, e.g. iron sulphide;
- the name of a simple compound containing two elements ends in the letters *-ide*, e.g. aluminium iodide;
- a compound of two elements and oxygen often ends in the letters *-ate*, and oxygen does not appear in the name, e.g. copper sulphate.

(from: Stone-Andrews-Williams,
Examining GCSE-Science, Stanley Thornes Ltd.)

Chemistry teacher: Now, Ronald, tell me, what's the substance whose formula is H_2SO_4 ?
Ronald: Er...hem... I've got it here on the tip of my tongue...
Chemistry teacher: You'd better spit it, then, because it's sulphuric acid!



1 Match these words with the definitions below: *compound, element, formula, reaction, symbol*. Tip: copy the definitions in your indexed book.

- A substance that consists of only one type of atom is called
- The letter(s) representing a chemical substance is/are called
- A substance consisting of two or more elements chemically combined is called
- The set of letters and numbers showing the elements that a substance is made of is called
- The chemical change caused in a substance when it combines with another is called

2 Match words a-h, as they are used in the passage Elements and compounds: symbols and formulae, with their synonyms 1-8. Tip: copy the pairs in your indexed book.

- | | | |
|--------------------|--------------------------|---------------|
| a. single | <input type="checkbox"/> | 1. canons |
| b. means | <input type="checkbox"/> | 2. distinct |
| c. over | <input type="checkbox"/> | 3. features |
| d. fairly | <input type="checkbox"/> | 4. methods |
| e. most | <input type="checkbox"/> | 5. more than |
| f. characteristics | <input type="checkbox"/> | 6. nearly all |
| g. as | <input type="checkbox"/> | 7. quite |
| h. rules | <input type="checkbox"/> | 8. while |

3 Match verbs a-e, as they are used in the passage Elements and compounds: symbols and formulae, with their synonyms 1-5. Tip: copy the pairs in your indexed book.

- | | | |
|----------------|--------------------------|--------------|
| a. split (up) | <input type="checkbox"/> | 1. call |
| b. come across | <input type="checkbox"/> | 2. encounter |
| c. join | <input type="checkbox"/> | 3. finish |
| d. name | <input type="checkbox"/> | 4. separate |
| e. end | <input type="checkbox"/> | 5. unite |

4 Decide which nouns the words underlined in the passage Elements and compounds: symbols and formulae refer to.

- "that" (cannot...) refers to
- (of) "which" refers to
- (from) "which" refers to
- "they" (are made) refers to
- (of) "their" (own) refers to
- (in) "them" refers to
- (as) "they" refers to
- (the most important) "ones" refers to

5 Which is the correct verb form in the sentences below?

- Elements *form* / *are formed from* compounds.
- Chemists *gave* / *were given* symbols to elements.
- Chemists all over the world *use* / *are used* the same chemical symbols.
- Fixed amounts of elements *contain* / *are contained in* compounds.
- Compounds *do not easily make back* / *are not easily made back into* their constituent elements.
- Sodium *forms* / *is formed by* common salt.

6 Read Compounds and molecules and replace the underlined words/expressions choosing among these:

Nouns: characteristic, forms, manners, proportion, types

Adjectives: attracted, entire, huge, non-alcoholic, normal, remarkable,

Verbs: carrying, deals with, keeps,

Adverbs/conjunctions/prepositions: around, as well, except, in contrast, tightly, too,

The clothes you wear and the food you eat consist of many (1) kinds of chemical compounds. Cotton and wool fibres are composed of (2) giant molecules, as are the substances in polyester and nylon. All are composed of carbon, hydrogen, oxygen, and other elements, organized in particular (3) ways Aspartame, a substitute for sugar in diet (4) soft drinks, is a simple compound, also built of carbon, hydrogen, and oxygen, but nitrogen is an essential ingredient (5) as well (6) Common table salt is a compound composed of sodium and chlorine, and many rocks and minerals are giant molecules of silicon, oxygen, and various metals such as sodium, aluminium, beryllium, and iron. Limestone contains calcium, carbon, and oxygen.

Chemistry (7) is about the compounds you find all (8) about you: about their composition and their chemical and physical properties. But it is also about making new compounds with properties that no one has seen before. Chemists often became chemists because they were (9) fascinated by the colours of compounds and the (10) shapes of molecules and by what determines these properties.

John Dalton said that compounds form by the combination of atoms in the (11) ratio of small (12) whole numbers. Now we know that the smallest unit of a compound that (13) retains the chemical characteristics of the compound is a molecule. The composition of a molecule can be represented by a molecular formula, which expresses the number of atoms of each type within one molecule of the compound.

When compounds are formed directly from the elements or from other compounds, one (14) striking (15) feature is that the characteristics of the constituent elements are lost. The subscript to the right of the element's symbol indicates the number of atoms of that element in the molecule. If the subscript is omitted, it is understood to be one, for example, in the water molecule, H₂O, there is one atom of oxygen and two atoms of hydrogen. Molecular formulas are sometimes written with the elements listed in alphabetical order.

All (16) but the heaviest of the elements have been isolated in large amounts in pure form. Most elements are metals and most of these are solids. In the solid state, metals consist of atoms packed together as (17) closely as possible. (18) On the other hand, non-metals are often gases, liquids, or solids consisting of (19) discrete atoms or even molecules

Atoms of almost all the elements can gain or lose electrons in ordinary chemical reactions to form ions, an atom or group of atoms (20) bearing a net electrical charge. Indeed, a characteristic of metals is that metal atoms lose electrons to form ions with a positive electrical charge, ions commonly called cations.

In contrast with metals, non-metals frequently gain electrons to give ions with a negative electrical charge. Such ions are called anions.

(from: Kotz & Purcel, *Chemistry and Chemical Reactivity*, Hartcourt Brace Jovanovich College Publishers.)