

# Teaching innovatively (with focus on ICT) and its impact on the quality of education"

## LESSON PLAN

## CHEMISTRY

Teacher: Fazilet TURNA Level: 9th Grade Unit: Substance and Its Features Topic: Naming Compounds Time: 40 Minutes

Materials: Publications, software, slide

Lesson Objectives

- 1. To be able to write the name of the ionic compound the formula of which is given.
- 2. To be able to write formula of the ionic compound the name of which is given.
- 3. To be able to write the name of the covalent compound the formula of which is given.
- 4. To be able to write the formula of the covanlent compound the name of which is given.
- 5. To use ICT as a successful tool when learning.

Procedures:

- 1. Teacher teach the subject trough someslides
- 2. Students name the compounds on the prepared software

Evaluation: Solving the problems of naming compounds on the software

Click on to play the game.

## <u>ANNEX</u> Chemical formulae Symbols

Chemists use a kind of shorthand to describe elements and compounts. All elements have characteristic *symbols*. These symbols sometimes consist of the first letter(s) of the name of the element; for example, hydrogen is given the symbol H, whereas the chemical symbol for bromine is Br. Some symbols, however, are not derived from the modern or English name of the element: gold has the chemical symbol Au (from the Latin *Aurum*), whereas tungsten is denoted by W (from *Wolfram*, a German word). Note that *the first letter only of a chemical symbol is written as a capital letter*. Box 2.4 gives the symbols of some elements.

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Extensive and intensive properties Classify the following properties as extensive or intensive: (i) length (ii) colour (iii) mass (iv) density.

#### Physical and chemical properties

Classify the following as physical or chemical properties: (i) the hardness of diamond (ii) the low density of aluminium (iii) wood burns in air (iv) arsenic is poisonous (v) milk goes sour.

### Using symbols and formulae

1. Use Information Box 2.4 to name the following elements:

(i) Ba (ii) Si (iii) Ar (iv) F (v) Li (vi) Hg (vii) Sn (viii) Ag (ix) B (x) Ti.

2. Name the elements in the following compounds and state how many atoms of each element are present:

(i) CsBr (ii) CuCl2 (iii) Fe3O4 (iv) CH4 (v) PbSO4 (vi) K2Cr2O7 (vii) Na3PO4 (viii) MnO2.

#### CHEMICAL FORMULAE

#### Formulae

The formulae for elements and compounds are constructed using these symbols. The symbol for the element oxygen is written as O. Since oxygen is normally found as oxygen gas, in which the smallest particles are diatomic molecules, the chemical formula for oxygen gas, or dioxygen, is written as O2. Compounds are written using a collection of different symbols. For example, water is H2O (indicating that two hydrogen atoms have joined with one oxygen atom to form a molecule of water), whereas sodium chloride is written as NaCl (this compound is formed when sodium reacts with chlorine in a ratio of 1 atom to 1 atom). Chemical formulae therefore give us two important pieces of information:

1. the elements that are present in a substance;

2. the relative number of atoms that make up that substance.

Note that '2H2O' refers to two separate molecules of water.

#### Writing chemical formulae

Although it is necessary for a chemist to learn the symbols of the common elements, it is possible to work out the chemical formulae of common substances 21

BOX 2.4

Mercury Hg

DOA 2.4
Some symbols for elements (you are strongly advised to learn
these!)
Element Symbol
Aluminium Al
Argon Ar
Arsenic As
Barium Ba
Boron B
Bromine Br
Caesium Cs
Calcium Ca
Carbon C
Chlorine Cl
Chromium Cr
Element Symbol
Cobalt Co
Copper Cu
Fluorine F
Gold Au
Helium He
Hydrogen H
Iodine I
Iron Fe
Lead Pb
Lithium Li
Magnesium Mg
Element Symbol
Manganese Mn

Neon Ne Nitrogen N Oxygen O Phosphorus P Platinum Pt Potassium K Radon Rn Silicon Si Silver Ag Element Symbol Sodium Na Sulfur S Tin Sn Titanium Ti Tungsten W Uranium U Vanadium V Xenon Xe Zinc Zn

#### Main elements in the human body Can you identify the main elements in the human body from Fig. 2.4?

Fig. 2.4 Main elements in the human body (diagram from F. C. Hess, *Chemistry Made Simple*, W. H. Allen).

#### Symbols of elements

1. Using library books at your disposal, find out from what names the symbols of the following

elements were derived:

(i) sodium (Na) (ii) iron (Fe) (iii) lead (Pb) (iv) tin (Sn) (v) potassium (K) (vi) silver (Ag).

2. Some of the latest elements discovered derive their names from famous scientists. See if you can find out the main contributions to our knowledge made by the following scientists: (i) meitnerium (Mt) named after Lise Meitner;

(ii) seaborgium (Sg) named after Glenn Seaborg;

(iii) bohrium (Bh) named after Niels Bohr;

(iv) rutherfordium (Rf) named after Ernest Rutherford.

C. HOPKINS CaFe A good place to eat....

## *take it with a grain of:* NaCl

#### 2 · ELEMENTS, COMPOUNDS AND REACTIONS

without having to learn them parrot fashion. Different elements have atoms with different combining powers. The combining power of an atom is known as its valency, and these valencies can be used to find out how many atoms of one element will combine with another. A table of the valencies of common elements and groups is shown on page 464. Again, these need to be *learned*. To obtain a clearer picture of how a chemical formula is constructed, imagine that the valencies of atoms are 'arms', which link up with the arms of other elements' atoms. Some elements have more than one valency, but the name of the compound should help you work out the formula. For example, in the compound iron(III) chloride, the iron atoms have a valency of three and its formula is FeC13, whereas in iron(II) chloride, the iron combines with a valency of two and the formula is FeC12.

BOX 2.5

#### Naming compounds

1. When a compound consists of a metal and a non-metal, the metal is written and named first. The Periodic Table will help you to distinguish whether an element is a metal or non-metal. Metals are shown to the left of the table, whereas non-metals are found to the right. The border between the two is shown as a zig-zag line. The non-metal part is named by putting 'ide' at the end, thus chlorine becomes chloride and oxygen becomes oxide. Examples: MgO magnesium oxide Na2O sodium oxide AlCl3 aluminium chloride CaS calcium sulfide 2. If a compound is composed of two nonmetals, the non-metal that is the closest to being a metal (closer to the metal-nonmetal border in the table) is written first. If more than one compound of the same two non-metals exist then the prefixes mono(1). di(2), tri(3), tetra(4), penta(5), hexa(6) and so on are put in front of the non-metal to indicate the number of its atoms present in the compound. Some examples: CO carbon monoxide CO<sub>2</sub> carbon dioxide

N2O3 dinitrogen trioxide N2O dinitrogen monoxide P4O6 tetraphosphorus hexaoxide\* P4O10 tetraphosphorus decaoxide\* \* Often written hexoxide and decoxide (for ease of pronunciation).

## Construct the formula of magnesium oxide (a compound of magnesium and oxygen).

#### \_Answer

The symbol for magnesium is Mg and it has a valency of two. Imagine it as: Mg

Similarly, oxygen could be thought of as:

0

When magnesium combines with oxygen, the arms link up with one another and *there are no free arms left over*. Therefore, one atom of magnesium combines with one atom of oxygen to form magnesium oxide:

Mg O

The formula is written as MgO. (Leave out the arms, they are only used to help you to construct the formula!)

## **CHEMICAL FORMULAE 23**

## What is the formula of aluminium chloride?

\_Answer

Aluminium chloride is a compound of aluminium and chlorine. The symbols and valencies for atoms of both these elements are

Al and Cl

When they combine together,

Al

Cl

aluminium has two 'arms' left over, so another two chlorine atoms, with one 'arm' each, must be added:

Cl

Al Cl

Cl

The formula of aluminium chloride is therefore AlCl3. The subscript after Cl shows that *three* chlorine atoms combine with one atom of aluminium. There is *no subscript* after Al, meaning that only *one* atom of aluminium is involved in the combination.

### More simple formulae

Write formulae for the following compounds (in (i)–(x), the valencies of the metals atoms are shown in brackets after the name of the metal; you should be able to work out the formulae of (xi)–(xx) just by looking at their names!):

(i) copper(I) oxide (ii) copper(II) oxide (iii) lead(IV) oxide (iv) chromium(III) sulfide (v) manganese(IV) oxide (vi) chromium(VI) fluoride (vii) cobalt(III) sulfide (viii) chromium(III) oxide (ix) vanadium(V) oxide (x) titanium(III) fluoride (xi) nitrogen monoxide (xii) arsenic trichloride (xiii) sulfur hexafluoride (xiv) dinitrogen (xv) disulfur dichloride (xvi) dinitrogen pentoxide (xvii) dioxygen difluoride (xviii) tellurium trioxide (xix) dichlorine hexaoxide (hexoxide) (xx) silicon tetrachloride.

#### Simple formulae

Write formulae for the following compounds, using the valency table on page 464.

(i) calcium oxide (v) aluminium fluoride (viii) lithium bromide

(ii) hydrogen sulfide (vi) aluminium oxide (ix) magnesium sulfide

(iii) magnesium fluoride (vii) hydrogen chloride (x) magnesium nitride.

(iv) magnesium chloride

#### 2 · ELEMENTS, COMPOUNDS AND REACTIONS

#### **Groups of atoms**

For the purposes of writing formulae, sometimes groups of atoms act as if they have a valency of their own. Their valencies are also shown on page 464. 24

## Write the formula of ammonium sulfate

## \_Answer

The ammonium group is a combination of one nitrogen atom and four hydrogen atoms, but together they act as if the group has a valency of one: NH4 Similarly, sulfate has a valency of two: NH4 Two ammonium groups therefore combine with one sulfate group: NH4 NH4 SO4 The formula is written as (NH4)2SO4. \_Comment

Note that *if more than one group of atoms* are to be represented, the group is enclosed in brackets and the number of groups present is written as a subscript outside the brackets.

#### Formulae involving groups of atoms

Write formulae for the following compounds:

(i) copper(II) sulfate

(ii) copper(II) nitrate
(iii) ammonium chloride
(iv) sodium phosphate
(v) calcium phosphate
(vi) sulfuric acid (dihydrogen sulfate)
(vii) nitric acid (hydrogen nitrate)
(vii) aluminium nitrate
(ix) lithium carbonate
(x) ammonium carbonate
(xi) calcium hydroxide
(xii) potassium hydrogencarbonate
(xiv) sodium hydrogensulfate
(xv) iron(III) hydroxide.