Nat 5 : Unit 1 – Chemical Changes and Structure

Key area – Atomic structure

Lesson 1 – Writing formula

Learning Outcomes

By the end of the lesson, you should be able to …

1. Name compounds correctly using naming rules
2. Describe how chemical formula can be determined from names with prefixes, models or structures.
3. Write formula

Success Criteria

You will have been successful in this lesson if you:

1. Read and learn the notes given
2. Watch the links provided
3. Complete the self-checks provided
4. Complete **homework 9** (Attached at the end of the document) for **Friday 29th January to be submitted via MS teams or glow email to your class teacher...**

If you have any questions about the content of this lesson, you should ask your **class teacher** either through your class MS team or via email. MS Teams will be monitored throughout the week by a chemistry teacher. If you need help or clarification with either the task or the content of the lesson, just ask.

Links to Prior Knowledge:

The first part of this lesson is REVISION from 2nd year. You will see that Nat4 chemistry is mentioned. It is essential that you understand the Nat 4 chemistry before we progress to Nat5 which we will do in lesson 8 and 9.

You may wish to have a copy of the data booklet handy for this lesson. Download from the SQA website - ChemistryDataBookletSQPN5.pdf (sqa.org.uk)

What to do

Work through the power point slide in class materials. Copy the notes (or print and stick into your note book). Follow the instructions to complete diagrams or tables. Remember to watch the video links

WATCH – National 4: Writing Chemical Formulae - Bing video

Compounds and Formulae

A compound is a substance that is made up of two or more elements that are chemically joined together.

Since they are joined together, it is difficult to separate out the elements that make up the compound … energy must be supplied to do this, e.g. silver oxide can be broken up into silver and oxygen by heat energy, electrical energy can be used to break up copper chloride solution.

Compounds are formed when elements join together.

Definition

A compound is a substance that is made up of two or more elements that are chemically joined together.

There are millions of different compounds in the world and they have a variety of uses – their properties depend on the type of bonding present in these compounds.

Naming Compounds:

The naming of a compound can be worked out using these rules.

1. **Rule one:**

The element that is furthest left in the periodic table comes first, e.g. Sodium Chloride/Carbon dioxide

2. **Rule two:**

If there are only two elements in the compound then the compound name ends in –ide, e.g. A compound of copper and sulfur is called copper sulfide.

3. **Rule three:**

If the compound contains three elements one of which is oxygen then the compound name will end in –ate or –ite, e.g. Calcium carbonate contains calcium, carbon and oxygen.

The exception to these rules is hydroxide – compounds with a "hydroxide" ending contain three elements, including hydrogen and oxygen.

In summary …

The names of compounds tell us the elements which they contain.

-IDE contains the 2 elements obvious from the name

-ATE contains the 2 elements obvious from the name **plus oxygen**

-ITE contains the 2 elements obvious from the name **plus oxygen**

CLick on the link below to access the power point lesson on formula

Lesson 7: https://youtu.be/sFVPrm6CRO4

Remember to add to your notes by copying or printing out and sticking in.

Copy and complete

(this is the same as on the power point - no need to do twice)

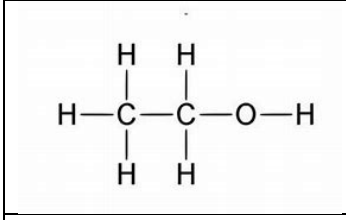
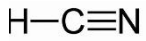
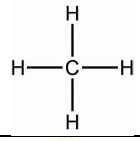
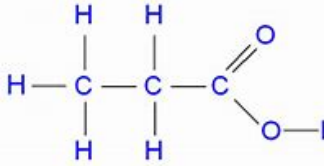
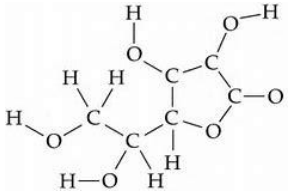
Compound	Elements present
iron sulphide	
sodium chloride	
magnesium nitride	
	hydrogen, fluorine
	lithium, oxygen
	calcium, iodine
	Magnesium, hydrogen, oxygen
copper sulphate	
lead phosphate	
aluminium sulphite	
zinc carbonate	
Potassium cyanide *	

Chemical Formulae

The chemical formula of a molecule shows the number of atoms of each element in the molecule. For example, the formula for carbon hydride is CH_4.

This tells us that there are four hydrogen atoms bonded to one carbon atom. If a molecule contains only one of a certain atom there is no need to put a '1' in the formula. For example, the formula of hydrogen chloride is HCl and not H_1Cl_1.

Copy and complete

Structre	Name	Formula
	Ethanol	
	Hydrogen cyanide	
	Methane	
	Propanoic acid	
	Vitamin C	

Using prefixes

For compounds that contain **prefixes** we can use the prefix to tell us the number of atoms.

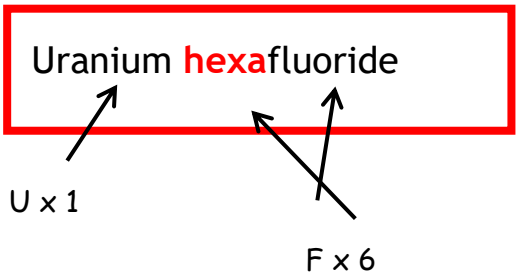
Prefix	Number of atoms
Mono-	One
Di-	Two
Tri-	Three
Tetra-	Four
Penta-	Five
Hexa-	Six

Dinitrogen monoxide has the formula N_2O

Phosphorus pentachloride has the formula PCl_5

When you see one of the prefixes in a formula you do not use valencies to work out the formula.

Example: Uranium **hexa**fluoride



Uranium hexafluoride has the formula: UF_6

Use the names of the following compounds to determine their formulae:

a) carbon **tetra**chloride

b) sulphur **tri**oxide

c) **di**fluorine **mon**oxide

d) aluminium **tri**chloride

e) lead **di**oxide

f) **di**nitrogen **tetr**oxide

Further work

WATCH – National 4: Writing Chemical Formulae - Bing video

To learn more about atomic structure, try the following online resources:

BBC Bitesize: Formula from names of compounds - Chemical formulae - National 5 Chemistry Revision - BBC Bitesize

Evans2 chem web: https://www.evans2chemweb.co.uk/login/index.php#

Username: snhs password: giffnock

Select any teacher → revision material → Nat5 chemistry → Unit 1: chemical changes and structure → formula

Check your understanding - Answers the questions below in you class jotter

Self-Check 1

1. What is the formula of each of the following compounds? (Hint, the names help you!)

a)	Carbon dioxide	b)	Sulphur dioxide
c)	Hydrogen chloride	d)	Carbon disulphide
e)	Phosphorus trichloride	f)	Carbon monoxide
g)	Nitrogen dioxide	h)	Phosphorus tribromide
i)	Silicon dioxide	j)	Sulphur dioxide

Revision Self-check

(Use this to check your knowledge and what areas you are confident in)

1.In questions (a) to (f) decide whether each of the following lists of substances contain

A **ONLY** elements **B** **BOTH** elements and compounds

a) copper sulphide, copper, zinc
b) nitrogen, oxygen, magnesium
c) sodium chloride, lead sulphide, carbon dioxide, zinc
d) O_2, Mg, Br_2
e) NaBr, KF, N_2
f) Zn, H_2O, H_2

2. Explain what is meant by
   a) an element
   b) a compound

3,Explain clearly what is meant by
   a) a solute
   b) a solvent
   c) a solution

4. In questions a) to e), name the compounds formed from each of the following elements combine.

a) copper and chlorine
b) sodium, bromine and oxygen
c) iron and bromine
d) magnesium, carbon and sulphur
e) Potassium, hydrogen and oxygen

5. In each of the following reactions, what might you see that shows that a chemical reaction has taken place?

a) sodium reacting with chlorine to form sodium chloride
b) the burning of coal
c) magnesium reacting with dilute acid to form hydrogen

1

6. Name **TWO** possible compounds formed when potassium, sulphur and oxygen join together.

Homework 9

Ions 9

1. The symbol for the sodium ion is Na^+. The symbol for the copper (II) ion is Cu^{2+}. What are the symbols for the following ions:

(a)	calcium ion	(b)	chloride ion	(c)	oxide ion
(d)	copper(II) ion	(e)	potassium ion	(f)	aluminium ion

2. A sodium atom has the symbol Na and an electron arrangement of 2,8,1.
When sodium forms an ion it loses one electron to form the ion Na^+, which has an electron arrangement of 2,8. Give the symbol and electron arrangement of the following:

(a)	a lithium atom	(b)	a chloride atom
(c)	a lithium ion	(d)	a sulfide ion

3. For the following ions give:
   i) the number of protons
   ii) the number of neutrons,
   iii) the number of electrons,
   iv) the electron arrangement

(a) $^{24}_{12}Mg^{2+}$ (b) $^{31}_{15}P^{3-}$ (c) $^{16}_{8}O^{2-}$ (d) $^{23}_{11}Na^{+}$ (e) $^{27}_{13}Al^{3+}$

4. Fluoride ions are effective in preventing tooth decay. A fluoride ion contains 9 protons, 10 neutrons, and 10 electrons. The symbol for a fluoride ion is $^{19}F^{-}$.

   Write the symbols for the following ions:

   (a) A chloride ion which contains 17 protons, 20 neutrons, and 18 electrons.
   (b) A calcium ion which contains 20 protons, 20 neutrons, and 18 electrons.
   (c) A potassium ion which contains 19 protons, 20 neutrons, and 18 electrons.