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WORKSHEET 16

School: Ba Sangam College **Year:** 11
Subject: Chemistry **Name:**

Strand	**4 - Materials**
Sub strand	**4.2 Oxides of Metals and Non-Metals**
Content Learning Outcome	**-Work out and write the names and formula of oxides of metals and non-metals.** **-Distinguish the formation of oxides of metals from the formation of non-metals oxides with balanced chemical equations.**

Oxides of Metals and Non-metals

- Metals are reactive so they react naturally with oxygen in the air to form their oxides.
- Metal oxides are the coating on the metal which tarnishes their appearance.
- Metal oxides are ionic compounds thus having ionic bond which holds the metal ion and the oxide ion.
- The ionic bond is the result of the transfer of electrons from the metal to oxygen.

Example

1. $4Na_{(s)} + O_{2(g)} \rightarrow 2Na_2O_{(s)}$
2. $2Mg_{(s)} + O_{2(g)} \rightarrow 2MgO_{(s)}$

Exercise

Complete the table given below for the formation of metal oxides.

Metal	Equation
Aluminium	
Copper	
Zinc	
Iron	
Lead	

- Oxides of non-metals are covalent compounds formed when non-metals burn in oxygen.
- The covalent bond is formed from the non-metal and oxygen sharing electrons. Phosphorous react with oxygen on its own.

Example

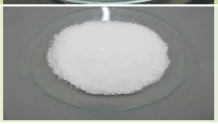
1. $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$
2. $P_{4(s)} + 5O_{2(g)} \rightarrow P_4O_{10(s)}$

Exercise

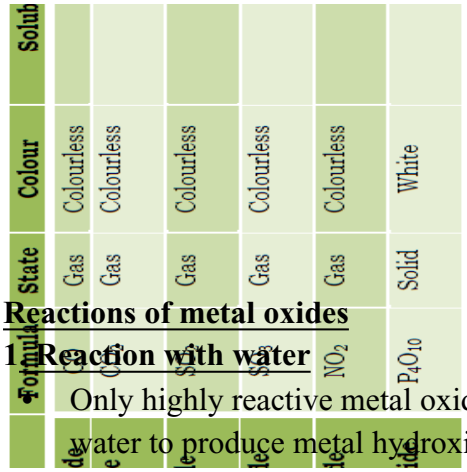
Complete the table below for the formation of non -metal oxides

Non-Metal	Equation
Carbon	
Nitrogen	
Sulphur	

Metal Oxides

Name	Formula	State	Colour	Diagram	Solubility in Water
Sodium oxide	Na_2O	Solid	White		Soluble
Magnesium oxide	MgO	Solid	White		Very slightly soluble
Calcium oxide	CaO	Solid	White		Soluble
Aluminium oxide	Al_2O_3	Solid	White		Insoluble
Copper oxide	CuO	Solid	Black		Insoluble
Zinc oxide	ZnO	Solid	White		Insoluble
Iron oxide	Fe_2O_3	Solid	Red Brown		Insoluble
Lead oxide	PbO	Solid	Yellow		Very slightly soluble

Non-metal Oxides



Reactions of metal oxides

1. Reaction with water

- Only highly reactive metal oxides react with water to produce metal hydroxides which are basic in nature.
- Metal oxides turn moist red litmus paper blue confirming that they are basic in nature.
- The less reactive metal oxides do not react with water but they can react with dilute hydrochloric acid to form metal-chloride and water.
- There would be no change to the litmus paper since metal chlorides and water are neutral.

Example

$Na_2O_{(s)} + H_2O_{(l)} \rightarrow 2NaOH_{(aq)}$

Exercise

Complete the reactions given below.

Metal Oxide	**Reaction with water**
MgO	
CaO	

2. Reaction with Dilute Hydrochloric acid

Example

$Al_2O_{3(s)} + 6HCl_{(aq)} \rightarrow 2AlCl_{3(aq)} + 3H_2O_{(l)}$

Exercise

1. Complete the reactions given below.

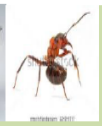
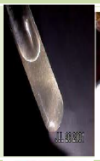
Metal Oxide	**Reaction with dilute HCl**
CuO	
ZnO	
Fe_2O_3	
PbO	

2. What type of bonding is found in:
   i. MgO - _____
   ii. CO_2 - _____
2. Name the following oxides.
   i. Al_2O_3 - _____
   ii. P_4O_{10} - _____

- Non- metals oxides are acidic in nature because they react with water to form acidic solutions.

Exercise

Complete the table given below:

Non-metal oxide	Reaction with water	Acid produced	Acid Diagram
CO	$CO_{(g)} + H_2O_{(l)} \rightarrow HCOOH_{(aq)}$	Methanoic acid	 
CO_2		Carbonic acid	 
SO_2		Sulphurous acid	 
SO_3		Sulphuric acid	 
NO_2		Nitric acid	 
P_4O_{10}	$P_4O_{10(s)} + 6H_2O_{(l)} \rightarrow 4H_3PO_{4(aq)}$	Phosphoric acid