3055 BA SANGAM COLLEGE

PH: 6674003/9264117 E-mail: basangam@connect.com.fj

WORKSHEET 7

School: **Ba Sangam College** Subject: **Chemistry**

Year:**12** Name:

Strand	**4 Materials**
Sub strand	**4**.1 Inorganic Chemistry
Content Learning Outcome	Investigate the properties and reactions of oxides and chlorides of elements.

Amphoteric oxides

Amphoteric oxides are metallic oxides, which reacts with both, an acid and a base. Generally, amphoteric oxides form with metalloids eg. aluminium oxide.

1.Aluminium oxide (Al_2O_3)

- Also known as alumina.
- White solid at 20 °C.
- Melting point is 2072 °C.
- Has ionic bonding with giant ionic structure.
- A conductor of electricity in molten state.
- Does not react with water (insoluble in water).
- Reacts with acids and bases.

Reaction with an acid	Reaction with a base
Generally:	**Generally:**
$Al_2O_{3(s)} + 6H^+_{(aq)} \rightarrow 2Al^{3+}_{(aq)} + 3H_2O_{(l)}$	$Al_2O_{3(s)} + 2OH^-_{(aq)} \rightarrow 2AlO_2^-{}_{(aq)} + H_2O_{(l)}$
Example:	**Example:**
$Al_2O_{3(s)} + 6HCl_{(l)} \rightarrow 2AlCl_{3(s)} + 3H_2O_{(l)}$	$Al_2O_{3(s)} + 2NaOH_{(aq)} \rightarrow 2NaAlO_{2(aq)} + H_2O_{(l)}$

3. Acidic oxides

Acidic oxides are the oxides of non-metals. These oxides form acids with water.

Examples include:

i. Silicon dioxide (SiO_2)

- White solid at 20 °C.
- Melting point is 1610 °C.
- Has covalent bonding with giant molecular structure.
- A non-conductor of heat and electricity.
- Does not react with water.

ii. Phosphorous pentoxide (P_4O_{10})

- White solid at 20 °C.
- Melting point is 340 °C.
- Has covalent bonding with simple molecular structure.
- A non-conductor of heat and electricity.
- Reacts with water to form phosphoric acid.

$P_4O_{10(s)} + 6H_2O_{(l)} \rightarrow 4H_3PO_{4(aq)}$

iii. Sulphur trioxide (SO_3)

- Gas at 20 °C.
- Melting point for SO_3 is 17 °C.
- Covalent bonding with simple molecular structure.
- They are non-conductors of heat and electricity.

Reaction with water: SO_3 reacts to form sulphuric acid.
$SO_{3(g)} + H_2O_{(l)} \rightarrow H_2SO_{4(aq)}$

General trends in the oxides of Period 3 elements across left to right of the period are:

- Bonding changes from ionic to covalent.
- Structure changes from giant ionic to macromolecular to simple (discrete).
- The melting point decreases.
- The nature of the oxides changes from basic to amphoteric to acidic.

Activity

1. Most of the oxides of non-metallic elements are
A. ionic and basic.
B. ionic and acidic.
C. covalent and basic.
D. covalent and acidic.

2. Which of the following chlorides gives a neutral solution when added to water?
I NaCl II $AlCl_3$ III PCl_3

A. I only. B. I and II only. C. II and III only. D. I, II and III.

3. The compounds Na_2O, Al_2O_3 and SO_2, respectively, are
A. acidic, amphoteric and basic.
B. amphoteric, basic and acidic.
C. basic, acidic and amphoteric.
D. basic, amphoteric and acidic.

4. When sodium oxide and sulphur dioxide are added to separate test tubes containing water the solution will be _____ and _____, respectively.
A. acidic, acidic
B. acidic, basic
C. basic, acidic (4 marks)
D. basic, basic

5. Complete the following equations:
i. $Na_2O_{(s)} + H_2O_{(l)} \rightarrow$ ----------

ii. $Al_2O_{3(s)} +$ ------- $\rightarrow 2AlCl_{3(s)} + 3H_2O_{(l)}$

iii. $P_4O_{10(s)} + 6H_2O_{(l)} \rightarrow$ ---------

iv. $SO_{3\,(g)} +$ -------- $\rightarrow H_2SO_{4(aq)}$

v. $SiCl_{4(l)} +$ -------- $\rightarrow Si(OH)_{4(s)} + 4HCl_{(g)}$

vi. $PCl_{3(l)} + 3H_2O_{(l)} \rightarrow H_3PO_{3(aq)} +$ ---------

vii. $Cl_{2(g)} + H_2O_{(l)} \rightarrow$ ------- + $HCl_{(aq)}$

(7 marks)

.