3055 BA SANGAM COLLEGE

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

WORKSHEET 9

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

Strand	**3 - Reactions**
Sub strand	**3.3 – Acids, Bases and Salt**
Content Learning Outcome	**-Study and show examples of neutralization reactions with balanced chemical and ionic equations.** **-Investigate and prepare solutions of required concentrations in g/L.**

Neutralization reaction – the formation of a salt

Acids dissolve in water to produce solutions containing hydronium ions/hydrogen ions (H_3O^+/H^+). Bases dissolve in water to produce hydroxide ions (OH^-). When an acidic solution and a basic solution are mixed, hydroxide ions react with hydronium ions to produce water molecules:

$H_3O^+ + OH^- \rightarrow 2H_2O$

or $H^+ + OH^- \rightarrow H_2O$

The other substance formed is the **salt**.

In general: Acid + Base → Salt + Water

Example

$HCl + NaOH \rightarrow NaCl + H_2O$

The following shows the ionic equations:

1. $HCl_{(g)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$

2. $NaOH_{(s)} \rightarrow Na^+_{(aq)} + OH^-_{(aq)}$

3. $H^+_{(aq)} + Cl^-_{(aq)} + Na^+_{(aq)} + OH^-_{(aq)} \rightarrow Na^+_{(aq)} + Cl^-_{(aq)} + H_2O$

4. $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O$

5. $HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O$

Other examples:

1. $H_2SO_4 + 2NH_4OH \rightarrow (NH_4)_2SO_4 + 2H_2O$
2. $2NaOH + H_2CO_3 \rightarrow Na_2CO_3 + 2H_2O$

Properties Salts

- Salts are product of an acid-base reaction.
- Many salts are soluble:
  - o for this reason, most drugs are salts (Most often sodium). This gets the drug into the bloodstream as all sodium compounds are soluble
  - o If a drug cannot be turned into a salt, it will not dissolve in water and is useless to a patient as it will not enter the bloodstream.
- Salts are ionic compounds
- Salts are hydroscopic: they absorb water very well to form hydrates.

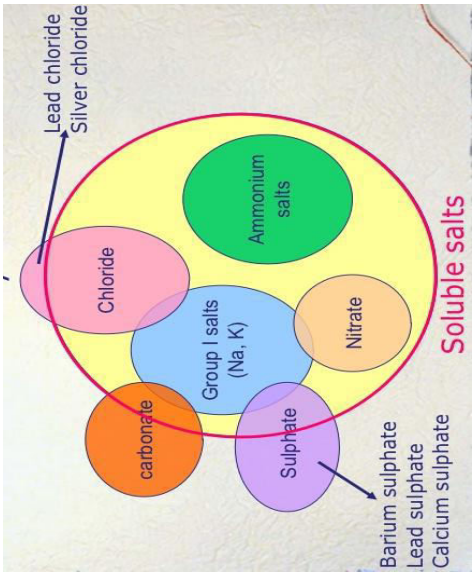
Common salts, their names and important uses

Chemical Name	Formula	Common name	Uses
Ammonium chloride	NH_4Cl	Salt ammoniac	Electrolyte in dry cell
Copper sulphate	$CuSO_4$	Blue stone	Drying agent, fungicide
Calcium carbonate	$CaCO_3$	Marble/chalk	Blackboard chalk, dietary supplement
Calcium sulphate	$CaSO_4$	Plaster of Paris	Making Plaster of Paris, food additive
Calcium oxychloride	$CaOCl_2$	Bleaching powder	Commercial bleach, water treatment
Magnesium sulphate	$MgSO_4$	Bitter salt	Laxative, as fertilizer
Sodium chloride	$NaCl$	Salt	Flavor enhancer, preservative
Sodium hydroxide	$NaOH$	Caustic soda	Making paper, manufacturing textile
Sodium sulphate	Na_2SO_4	Glaubers salt	Dyeing textile
Sodium bicarbonate	$NaHCO_3$	Baking soda	Antacid, soothe insect bite

Preparing soluble and insoluble salts

Solubility Rules – solubility of the salt in water

- All nitrates are **soluble**
- All sulphates are **soluble** except barium, $Ba^{2+,}$ calcium, Ca^{2+} and lead, Pb^{2+}
- All chlorides are **soluble** except those of silver, Ag^+ and lead, $Pb^{2+.}$
- All carbonates are **insoluble** except those of K^+, Na^+ and NH_4^+.
- All hydroxides are **insoluble** except those of K^+, Na^+ and NH_4^+.



Solutions and Concentration

Concentration is a measure of the amount of dissolved solute in a given volume of solution.

Formula

c= m/V

c = concentration in gram per litre (g/L).
m = mass of solute in grams
V = volume of solution in litres.

Example

Calculate the concentration (in g/L) of the following solution:
10 g of NaOH dissolved in enough water to make 2 L of the solution.

Solution

c =m/V
=10g/2L
= 5 g/L

Exercise

1. A solution with a pH of 9 is:
   A. a neutral solution
   B. an acidic solution **(1 mark)**
   C. an alkaline solution
   D. a dilute solution

2. Which of the following is a strong base?
   A. NaOH
   B. NH_3
   C. Na_2CO_3 **(1 mark)**
   D. NH_4OH

3. Which of the following is a weak acid?
   A. H_2SO_4
   B. H_2CO_3 **(1 mark)**
   C. HNO_3
   D. HCl

4. Determine the concentration in each of the following cases.
   a. When 20 g of NaOH is dissolved in enough water to make 1 litre of NaOH solution. **(1 mark)**

   _____
   _____
   _____
   _____

   b. When 45 g of glucose, $C_6H_{12}O_6$ is dissolved in enough water to make 0.5 litres of glucose solution. **(1 mark)**

   _____
   _____
   _____
   _____

   c. When 116 grams of KF is dissolved in enough water to make 4 L of KF solution. **(1 mark)**

   _____
   _____
   _____
   _____

5. In which of the following reaction will a precipitate form? **(1 mark)**
   A. KOH reacting with HCl

   B. AgNO3 reacting with NaCl

6. Give the formula of the salts below: **(3 marks)**
   i. Copper sulphate: _____
   ii. Sodium bicarbonate: _____
   iii. Sodium sulphate: _____

7. Complete and balance the reaction equations below. **(3 marks)**
   i. $HCl + Zn \rightarrow$ _____ $+ H_2$
   ii. $HNO_3 +$ _____ $\rightarrow Cu(NO_3)_2 + H_2O$
   iii. $H_2SO_4 + CaCO_3 \rightarrow$ _____ $+ H_2O + CO_2$

3.