Raffles Institution Raffles Programme
Year Three Chemistry

Name: _____ ( ) Class: _____ Date: _____

Exercise – The Definitions and Chemistry of Acids and Bases

Definitions

	ACID	**BASE**
Common definition (Arrhenius)	a substance that produces H^+ in aqueous solution	a substance that produces OH^- in aqueous solution
Expanded definition (Bronsted-Lowry)	a substance that donates H^+	a substance that accepts H^+

Fill in the blanks.

Chemistry of Acids

1 Acid reacts with Base to form Salt and Water

(a) Hydrochloric acid + Sodium hydroxide → Sodium chloride + water

(b) Hydrochloric acid + Potassium hydroxide → ……..

(c) Sulfuric acid + Sodium hydroxide → Sodium sulfate + water

(d) Sulfuric acid + Potassium hydroxide → ……..

(e) Nitric acid + Sodium hydroxide → Sodium nitrate + water

(f) Nitric acid + Calcium hydroxide → ……...

2 Acid reacts with Carbonate to form Salt, Water and Carbon dioxide

(a) Hydrochloric acid + Sodium carbonate → Sodium chloride + water + carbon dioxide

(b) Hydrochloric acid + Calcium carbonate → ……....

(c) Sulfuric acid + Magnesium carbonate → ……

(d) Nitric acid + Iron(II) carbonate → …….

Acids also react with substances called 'bicarbonates' or 'hydrogen carbonates'. In these reactions the bicarbonates behave exactly like carbonates.
For example:
Hydrochloric acid + Sodium hydrogen carbonate → Sodium chloride + water + carbon dioxide

3 Acid reacts with Reactive Metal to form Salt and Hydrogen

(a) Hydrochloric acid + Magnesium → Magnesium chloride + hydrogen

(b) Hydrochloric acid + Iron → …….

(c) Sulfuric acid + Zinc → …….

The Chemistry of Bases

Note: According to the expanded definition of bases, all metal oxides and hydroxides are considered bases

1 Base reacts with Acid to form Salt and Water

(a) Sodium hydroxide + Hydrochloric acid → Sodium chloride + water

(b) Calcium oxide + Hydrochloric acid → ……..

(c) Copper(II) oxide + Sulfuric acid → ……...

(d) Magnesium oxide + Nitric acid → …….

2 Base reacts with Ammonium salt to form Salt, Water and Ammonia

(a) Sodium hydroxide + Ammonium chloride → Sodium chloride + water + ammonia

(b) Calcium hydroxide + Ammonium nitrate → ……

(c) Magnesium oxide + Ammonium sulfate → …….

(d) Iron(II) oxide + Ammonium chloride → ……

3 Alkali reacts with (some) Salt solutions to form Salt and Insoluble Hydroxide
{An alkali is a soluble base}

(a) Sodium hydroxide + Copper(II) sulfate → Sodium sulfate + Copper(II) hydroxide

(b) Sodium hydroxide + Iron(II) sulfate → ……

(c) Sodium hydroxide + Zinc chloride → ……..

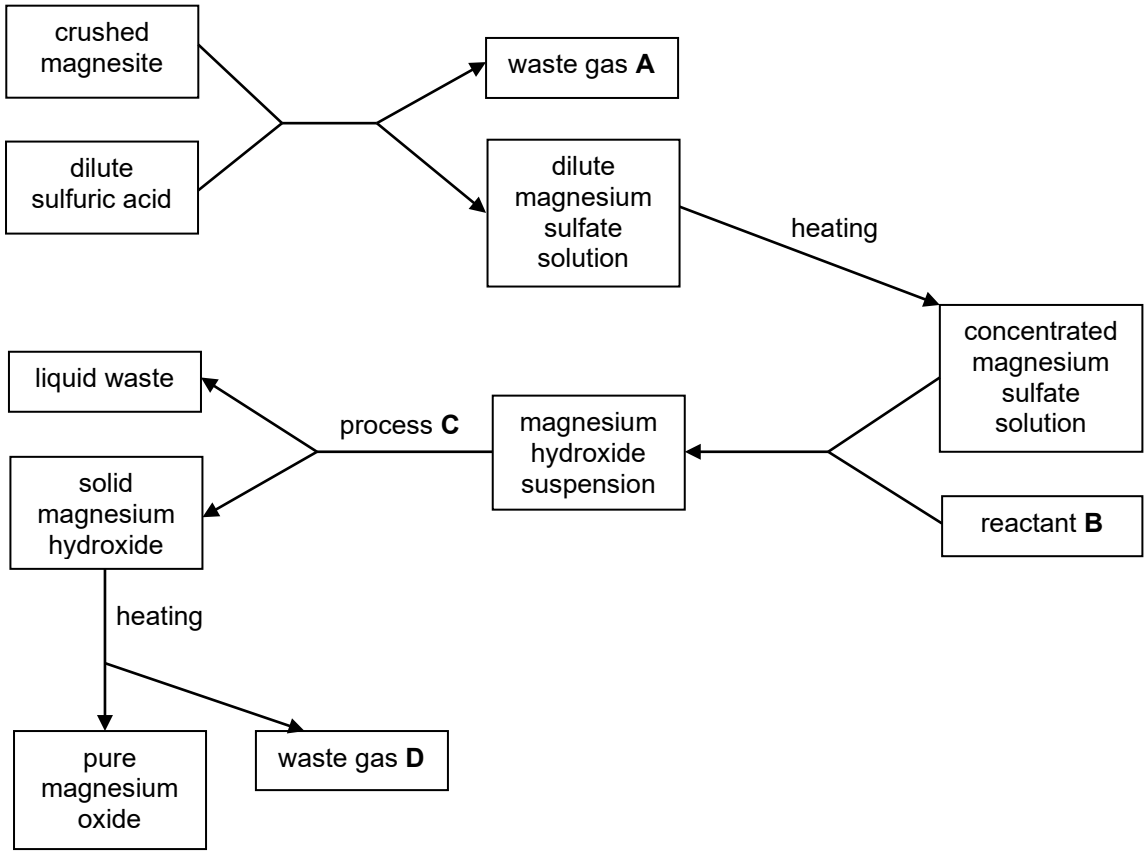
(d) Potassium hydroxide + Aluminium sulfate → ……

(e) Potassium hydroxide + Lead(II) nitrate → ……

(f) Potassium hydroxide + Iron(III) nitrate → ……..

Data-based Question

Magnesium oxide is used to make many medicines. It is made from magnesite mineral by the process shown in the flow chart. Magnesite contains 75% magnesium carbonate.



Use knowledge gained from the previous 2 pages and the above flow chart to answer the following questions.

(a) Give the name of the main gas in waste gas A. …….

(b) Name reactant B. …….

(c) What method should be used to separate out the solid magnesium hydroxide in process C?

…….....

(d) Gas D is a common compound. Suggest the identity of gas D, based on the formula of magnesium hydroxide, $Mg(OH)_2$, and magnesium oxide, MgO.

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(e) Magnesium citrate is used as a laxative. It can be made by reacting citric acid with one of the compounds in the above flow chart. Write a word equation for the formation of magnesium citrate.

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