

S.3 CHEMISTRY

ACIDS, BASES, SALTS AND QUALITATIVE ANALYSIS

INSTRUCTIONS:

- *Section A contains Six Structured questions*
- *Section B contains 4 Essay questions*
- *Attempt **ALL** questions from both Section A and Section B*

SECTION A

1. Write equation(s) only to show the reaction that would take place if each of the following was strongly heated in air.

(a). KNO_3

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(b). $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

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(c). FeCO_3

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(d). $\text{Pb}(\text{NO}_3)_2$

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2. (a). Define the term acid

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(b). State what would be observed if an aqueous solution of each of the following substances were tested with a blue litmus paper.

(i). Ammonium chloride

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(ii). Sodium chloride

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(iii). potassium carbonate

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(c). Write the equation for the reaction between potassium oxide and:

(i). Hydrochloric acid

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(ii). nitric acid

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(iii) Sulphuric acid

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3. A mixture containing Copper(II) sulphate and Copper(II) carbonate was shaken with excess water and filtered.

(a). Identify the residue

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(b). The dry residue was heated strongly.

(i). State what was observed

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(ii). Write an equation for the reaction

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(c). (i). Name the reagent that can be used to identify the anion in the filtrate

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(ii). Write an ionic equation for the anion and the reagent you have named in c(i)

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4. (a). Lead(II) nitrate was heated until there was no further change.

(i). What was observed

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(ii). Write an equation for the reaction that took place

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(b). Dilute hydrochloric acid was added to a solution of lead(II) nitrate and the resultant solution was warmed.

(a). State what was observed.

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(b). What can you deduce from your observation

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(c). Write an equation for the reaction that took place before warming.

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5. (a). A solution of sodium carbonate was added to a solution of calcium ions.

(i). State what was observed.

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(ii). Write an equation for the reaction that took place.

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(b). Dilute hydrochloric acid was added to the mixture formed in (a) above.

(i). State what was observed.

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(ii). Write an equation for the reaction.

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6. State one reagent that can be used to distinguish between each of the following pairs of ions and in each case, state what would be observed if each ion is treated with the reagent.

(a). Lead(II) ions and Aluminium ions

Reagent:

Observation

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(b). Sulphate ion and Carbonate ion.

Reagent:

Observation

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SECTION B

7(a). Define the term:

(i). An acid

(ii). A base

(iii). An alkali

(iv). An indicator

(b). Describe how a pure sample of dry Magnesium sulphate crystals can be prepared in the laboratory and write equations to illustrate your answer.

(c) i). State what is meant by the term "Solubility of a solute"

(ii). The table below shows the solubility of Iron(II) sulphate in water at various temperatures.

Temperature /°C	0	10	20	30	40	50	60
Solubility of FeSO ₄ (g/100g of water)	12	20	32	46	62	85	110

(i). Plot a graph of solubility of Iron(II) sulphate against temperature.

(ii). Using your graph, determine the mass of Iron(II) sulphate that would crystallize if temperatures were cooled from 55°C to 15°C.

8. (a). State the difference between:

(i). A normal salt and an acid salt

(ii). A base and an Alkali

(b). Explain the following observation:

Aluminium oxide reacts with both dilute hydrochloric acid and sodium hydroxide solution.

(c). Briefly describe how a pure sample of Lead(II) Sulphate can be prepared. (Diagram not required).

(d). (i). Describe how a dry sample of copper(II) sulphate may be prepared from Copper(II) oxide.

(ii). Crystals of Copper(II) sulphate were heated gently and then strongly until there was no further change. State the observations made and the equation(s) for the reaction(s) that took place.

9. (a). (i). Describe how a pure sample of iron(II) sulphate -7-water can be prepared in the laboratory.

(ii). Write an equation for the reaction.

(b). (i). State what would be observed when iron(II) sulphate -7- water was heated strongly.

(ii). write an equation for the reaction in b(i).

(c). Sodium hydroxide solution was added dropwise to a solution of iron(II) sulphate until there was no change.

(i). State what was observed

(ii). Give a reason for your observation in c(i).

(iii). Write an equation for the reaction.

10 (a). Copper(II) carbonate was heated strongly until there was no further change.

(i). State what was observed.

(ii). Write an equation for the reaction.

(iii). Name one reagent that can be used to identify the gaseous product.

(b). Excess dilute sulphuric acid was added to the residue in (a).

(i). State what was observed.

(ii). Write an equation for the reaction

(c). To the product in (b), was added dilute sodium hydroxide solution dropwise until in excess.

(i). State what was observed.

(ii). Write an equation for the reaction.

END

STAY HOME – STAY SAFE.