Name …….Centre/Index No….

545/2
CHEMISTRY
2 HOURS

B.O.T II EXAMS 2019

545/2 CHEMISTRY
PAPER 2
2 HOURS

SECTION A:

Answer **all** the questions

1. Under suitable conditions, hydrogen peroxide, H_2O_2 can decompose rapidly to produce oxygen
   (a) (i) Write equation for the decomposition of hydrogen peroxide. (1 ½ marks)
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   (ii) State two ways in which the decomposition of hydrogen peroxide can be made to occur rapidly. (1 mark)
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   (b) Burning magnesium ribbon was lowered into a jar of oxygen
   (i) State what was observed (1 mark)
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   ii) Write an equation for the reaction that took place. (1 ½ marks)
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2. A colourless gas, G decolourised potassium manganate (VII) solution

(a) Name two gases that are likely to be G. (1 mark)

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(b) G also decolourised a solution of bromine in tetrachloromethane, but did not have any effect on acidified potassium dichromate solution.

(i) Identify G (½ mark)

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(ii) Write an equation to show the reaction between G and bromine in tetrachloromethone. (1 mark)

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(c) G was burnt in air containing plentiful supply of oxygen. Write equation for the reaction that took place.

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(d) Name two substances that can react to produce G. (1 mark)

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3. (a) Give one example of a mixture of substances that can be separated by each of the following methods

(i) Sublimation (1 mark)

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(ii) Fractional crystallization (1 mark)

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(b) Air is a mixture of mainly two gases

(i) Name the two gases and give their approximate composition in ordinary air by volume. (2 marks)

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(ii) State two reasons why air is considered a mixture and not a compound. (1 mark)

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(iii) Name the industrial method by which the two major gaseous components of air can be separated. (1 mark)

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4. (a) When mixed with a solution containing copper (II) ions, zinc granules react with sulphuric acid at room temperature to produce hydrogen gas.

(i) State the condition under which sulphuric acid reacts with the zinc granules (½ mark)

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(ii) Suggest the property of sulphuric acid in this reaction (½ mark)

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(iii) What is the role of copper (II) ions in the reaction? (½ mark)

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(iv) Write an ionic equation for the reaction leading to the formation of hydrogen gas (1 ½ marks)

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(b) Dry hydrogen gas was passed over a strongly heated copper (II) oxide

(i) State what was observed. (1 ½ marks)

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(ii) Write equation for the reaction that took place (1 ½ marks)

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5. Write equation only, to show the reaction that takes place when each of the following substances is strongly heated in air. (1 ½ marks @)

   (a) copper metal

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   (b) Potassium nitrate

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   (c) Sodium hydrogen carbonate

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   (d) Zinc nitrate

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6. 50.0cm^3 of a 2M sodium hydroxide solution was accurately measured into a volumetric flask and water added to make 1 dm^3 of dilute solution. Calculate the volume of the dilute solution that would be required to react completely with 25.0cm^3 of a 0.04M copper (II) sulphate solution [copper (II) sulphate reacts with sodium hydroxide according to the following ionic equation:

   $Cu^{2+}(aq) + 20H^{-}(aq) \longrightarrow Cu(OH)_2(s)]$ (4 marks)

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7. (a) State what would be observed if each of the following substances was left exposed in air for sometime.

(i) Sodium carbonate – 10 – water (1 ½ marks)

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(ii) Fused calcium chloride (1 ½ marks)

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(b) State **one** word which describes the property of each of the compounds shown in (i) (a) (i)

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(ii) (a) (ii)

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(c) State **one** practical application of fused calcium chloride that is as a result of the property that you have stated in (b) (ii) (1 mark)

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8. Ammonia can react with lead (II) oxide to produce lead according to the following equation

$3PbO(s) + 2NH_3(g) \longrightarrow 3Pb(s) + N_2(g) + 3H_2O(l)$

(a) State

(i) the condition(s) under which the reaction takes place (1 mark)

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(ii) the property of ammonia shown in the reaction (1 mark)

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(b) 3.1g of lead was obtained when ammonia reacted with lead (II) oxide. Calculate the maximum volume of ammonia, measured at s.t.p that reacted with lead (II) oxide. (Pb = 207, O = 16, 1 mole of a gas occupies 22.4dm^3 at s.t.p)

(2 marks)

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9 (a) A dilute solution of copper (II) chloride was electrolysed between graphite electrodes

(i) State what was observed at the cathode (1 mark)

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(ii) Give a reason for your observation in (i) (½ mark)

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(iii) Name the product obtained at the anode (1 mark)

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(c) The electrolysis in (a) above was repeated using a concentrated solution of copper (II) chloride.
Write an ionic equation to show the reaction at the anode. (1 ½ marks)

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10. When a mixture of a compound **R** and concentrated sulphuric acid was warmed, a vigourous effervescence took place and a colourless gas W with a choking smell was evolved. W gave dense white fumes with concentrated ammonia solution.

(a) (i) Name W (1 mark)

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(ii)Suggest a possible identity of the anion in **R** (1 mark)

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(iii) Name **one** reagent which would be used to confirm the identity of the anion which you have suggested in (ii) (½ marks)

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(b) Write an ionic equation to show the reaction that can take place between lead (II) nitrate solution and an aqueous solution of **R** (1 ½ marks)

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SECTION B:

Attempt any **two** questions in this section

11. A compound Q consists of 26.7% carbon and 2.2% hydrogen by mass, the rest being oxygen.

(a) Calculate the empirical formula of Q. (3 ½ marks)

(H = 1 , C = 12, O = 16)

(b) An aqueous solution of Q turns blue litmus paper pale red.

(i) Suggest how the pH value of a 2M aqueous solution of Q would compare with the pH value of a 2M hydrochloric acid. Give a reason for your suggestion

(ii) Predict how Q would react with sodium hydrogen carbonate. (2 marks)

(iii) Write an ionic equation for the reaction that you have predicted in (ii) (1 ½ marks)

(c) 20cm^3 of a solution containing 4.5g of per dm^3 of the solution required exactly 25cm^3 of a 0.08M sodium hydrogen carbonate solution for complete reaction. (1 mole Q reacts with 2 moles $NaHCO_3$)

Calculate:

(i) the concentration of Q in mol dm^{-3} (3 marks)

(ii) the molar mass of Q (1 ½ marks)

(d) Determine the molecular formula of Q (1 ½ marks)

12. (a) With the help of a labelled diagram, briefly describe how a sample of dry chlorine can be prepared in the laboratory, starting from concentrated hydrochloric acid (9 marks)

(b) Chlorine was bubbled through a dilute solution of potassium hydroxide
(i) State what was observed
(ii) Write an equation for the reaction that takes place (1 ½ marks)

(c) When exposed to sunlight, chlorine water produces a colourless gas, Name the gas

(d) (i) Write an equation for the reaction that can take place between iron and chlorine.

(ii) Give a reason why the reaction in (i) is regarded as oxidation of iron. (1 mark)

13. (a) (i) Outline an experiment which can be carried out to show that the rate of the reaction between calcium carbonate and dilute hydrochloric acid depends on the surface area of the calcium carbonate. (No equations or diagrams required) (7 marks)

(ii) State two conditions that would affect the rate of the reaction in (i) other than the surface area of the calcium carbonate. (1marks)

(b) In an experiment to investigate the rate of the reaction of magnesium with dilute sulphuric acid, a flask containing magnesium and sulphuric acid was weighed after every 10 minutes for a total time interval of 50 minutes. The results obtained are shown in the table below.

Time/minutes	0	10	20	30	40	50
Mass of flask + contents/g	95.0	64.5	39.0	24.4	15.0	11.9

(i) Plot the graph of mass of flask + contents against time (4 marks)

(ii) Determine the rates of the reaction after 15.0 and 27.5 minutes respectively and comment on your results (3 marks)

14. Iron (III) oxide (haematite) is one of the common ores of iron from which iron can be extracted in a blast furnace.

(a) Name

(i) one common ore of iron other than iron (III) oxide (1 mark)

(ii) One major impunity that can be found in the ore you have named in (i) (1 mark)

(b) Outline the reactions which occur in the blast furnace during the extraction of iron from iron (III) oxide ore.

(c) (i) Name the major components of stainless steel (1 mark)

(ii) State one use of stainless steel (½ mark)

(iii) Give a reason why stainless steel is more used than pure iron (1 mark)

(d) Most common compounds of iron are either those of iron (II) or iron (III) Write the formula of one compound of

(i) Iron (II) (½ mark)

(ii) Iron (III) (½ mark)

(e) Name one reagent that could be used to distinguish between iron (II) and iron (III) compounds and in each case state the observations that would be made if the reagent you have named was used. (2 ½ marks)

END