Name: ..... Stream: .....

545/2
Chemistry
Paper 2
Nov 2020
2hrs

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Uganda Certificate of Education
RESOURCEFUL MOCK EXAMINATION 2020
CHEMISTRY
PAPER 2
2hours

Instructions;

- *This paper consists of **two** sections **A** and **B**.*
- *Section **A** is **compulsory**. Attempt only **two** questions in section **B**.*
- *Answers to section **A** must be written in the **spaces provided** only. While those to questions in section B must be written on answer sheets provided.*
- ***Do not** use a pencil.*

For Examiner's use only.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

SECTION A

All questions are **compulsory**.

1. The full symbols of some atoms are given below.

$^{14}_{6}W$, $^{19}_{9}X$, $^{27}_{13}Y$, $^{37}_{17}Z$

a) Identify the atoms of elements which are in **the same group** in the Periodic Table. (1mark)

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b) State **the period** in the Periodic Table to which element with atom **W** belongs. (½ mark)

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c) Write the formula of;

i) the ion of atom **X**. (½ mark)

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ii)the compound formed when atom **Y** reacts with atom **Z**. (1mark)

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d) Atom **Z** can react with atoms **W** and **Y** to form compounds **Q** and **R** respectively. State which one of the compounds

i) can conduct electricity. (1mark)

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ii) would have a lower solubility in water. (1mark)

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2. A substance **G** contains **52.2%** of carbon, **13.0%** of hydrogen and **34.8%** of oxygen. The relative molecular mass of **G** is **46**. (H=1, C=12,O=16)

a) i) Calculate the empirical formula of **G**. (2 ½ marks)

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ii) Determine the molecular formula of **G**. (1mark)

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b) When a mixture of **G** and excess concentrated Sulphuric acid was heated to **175^{0}C**, ethene was evolved.

i) Name **G** (½ mark)

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ii) Write equation for the reaction that led to the formation of ethene. (1mark)

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3. During electrolysis of dilute Sulphuric acid between platinum electrodes, **two volumes** of **hydrogen** were formed for **one volume** of **oxygen**.

a) Write the formulae of all the ions present in the solution before electrolysis. (1 ½ marks)

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b) Write equation for the reaction that occurred at the **anode**. (1 ½ marks)

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c) A red litmus paper was placed in the solution near the cathode during electrolysis.

i) State what was observed. (½ mark)

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ii) Give a reason for your observation in (c) (i) (1mark)

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d) Show how the ratio of volumes of products of the electrolysis agrees with the formula of water. (1mark)

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4. a) When hydrogen chloride was passed through solution containing cation**A**, a **white shiny precipitate** was formed. The precipitate **dissolved** when the mixture was **heated**, but recrystallized as needle like crystals on cooling the solution.

i) State the identity of **A**. (1mark)

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ii) Write an ionic equation for the reaction that took place between hydrogen chloride and **A**. (1½ marks)

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b) Silver nitrate can react with sodium chloride to form silver chloride according to the following equation.

$Ag^{+}(aq) + Cl^{-}(aq) \longrightarrow AgCl(s)$

Calculate the maximum **mass** of silver chloride that would be formed if excess sodium chloride solution was added to **20.0cm³** of a **0.5M** silver nitrate solution (C=35.5, Ag=108) (2 ½ marks)

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5. Diamond is one of the crystalline allotropes of carbon and it is widely used as a jewellery.

a) State;

i) What is meant by the term **"allotrope"**. (1mark)

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ii) The property of diamond, which makes it useful as jewellery. (½ mark)

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iii) **One** use of diamond , other than as jewellery. (½ mark)

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b) Name

i) **another**crystalline allotrope of carbon. (½ mark)

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.....

ii) **one** amorphous carbon. (½ mark)

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c) State;

i) **one** property of the allotrope you have named in (b) (i). (½ mark)

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i) **one** use of the allotrope you have named in (b)(I) which is because of its property that you have stated in (c)(i). (½ marks)

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ii) **one** use of the amprphous carbon you have named in (b)(ii). (½ mark)

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6. Under suitable conditions, iron can be converted into hydrated iron (iii) oxide.

a) State;

i) the process in which iron is converted into hydrates iron (iii) oxide. (½ mark)

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ii) **two** conditions necessary for the process you have stated in (a)(i) to take place. (1mark)

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iii) **one** method used to prevent the process in (a)(i) from occurring. (½ mark)

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b) The data below was obtained when carbon monoxide was passed over a heated sample of an oxide of iron until there was no further change.

mass of empty dish = 10.98g
mass of dish + the oxide of iron = 13.30g
mass of dish + residue = 12.66g

Determine the formula of the oxide of iron. (Fe=56, O=16) (3marks)

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7. a) i) Name **one** substance that when reacted with dilute Sulphuric acid can produce sulphur dioxide. (1mark)

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ii) Write an **ionic** equation for the reaction of the substance you have named in (a)(i) with dilute Sulphuric acid. (1 ½ marks)

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b) When sulphur dioxide was bubbled through acidified potassium manganate(VII) solution, the colour of the solution changed from purple to colourless. Give a reason. (1mark)

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i) Name **one** of the reagent that can react with sulphur dioxide in a similar way to potassium manganate(VII) solution. (½ mark)

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ii) State what would be observed of the reagent you have named in (c)(i) was treated with sulphur dioxide. (1mark)

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8. a) State what is meant by the term **"acid."** (1mark)

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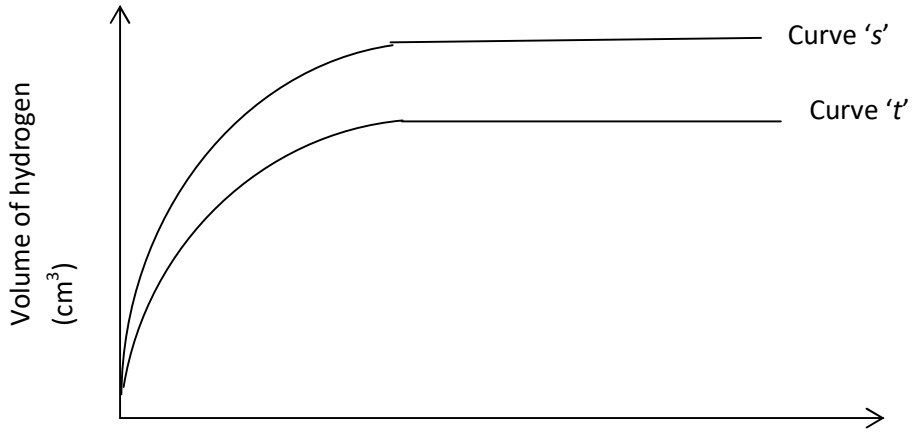
b) **50cm³** each of **1.0M** solutions of **ethanoic acid** and **hydrochloric acid** were reacted with equal masses of magnesium ribbon at **40⁰C**. The volume of hydrogen evolved was measured with time. The twocurves below show the results of the experiment.



i) Write an ionic equation for the reaction that took place between magnesium ribbon and ethanoic acid. (1 ½ marks)

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ii) Identify the curve for;
ethanoic acid (½ mark)

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hydrochloric acid (½ mark)

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iii) Give a reason for your answer in (b)(ii). (1mark)

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iv) Sketch on the graph above, the curve you would obtain when an equal mass of magnesium powder was reacted with hydrochloric acid under the same conditions. (½ mark)

9. Dilute sodiumhydroxide was added to a sample of ammonium chloride. On heating the mixture, a **gas J** was evolved, which was tested using moist litmus paper.

a) State;

i) what was observed (1mark)

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ii) the property of sodium hydroxide upon which the reaction depended. (1mark)

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iii) the practical application of the reaction. (1mark)

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b) i) Name the laboratory reagent which is used to identify**J**. (1mark)

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ii) State what is observed when **J** is treated with the reagent you have named in (b)(i) (1mark)

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10. Some carbon compounds form polymers.

a) State what is meant by the term **"polymer"** (1mark)

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b) Name one

i) natural polymer (½ mark)

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ii) synthetic polymer (½ mark)

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c) i) Write equation to show how a polymer is formed from ethene. (1mark)

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ii) State **one** use of the polymer formed in (c) (i) (½ mark)

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iii) The relative formula mass of the polymer formed in (c)(i) is **16,940**.
Determine the number of ethene molecules that combined to form the polymer.
(1½ marks)

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SECTION B

*Answer **two** questions only in this section, extra – questions answered will not be marked.*

11. a) Excess copper(II) carbonate was added to dilute Sulphuric acid.
i) State what was observed. (1½ marks)
ii) Write equation for the reaction that took place. (1½ marks)
iii) Briefly describe how pure crystals of the production in the reaction in (a)(ii) can be obtained from the reaction mixture. (4marks)

b) State what would be observed and write equation for the reaction that takes place if to aqueous solution of the crystals in (a)(iii) was added.
i) Zinc powder (3marks)
ii) Acidified barium chloride solution. (2marks)

c) **7.5g** of copper(II) chloride were dissolved in water and lead(II) nitrate solution was added, drop wise until in excess. Calculate the maximum mass of lead (II) chloride formed. (Pb=207, cl=35.5, CuCl2 = 135) (3marks)

12. a) Chlorine can be prepared by the reaction between manganese (IV) oxide and hydrochloric acid.
i) State the conditions necessary for obtaining a reasonable quantity of chlorine by this methods and write equation for the reaction. (2½ marks)
ii)Name**two** principal impurities in the gas produced and state how you would remove each. (2marks)
iii) Explain briefly how you would collect the gas. (1mark)

b) Describe and explain the reactions that take place when chlorine is passed into aqueous solutions of;
i) Iron(II) chloride (3marks)

ii) Potassium iodide (2½ marks)
(No equations are required)

c) When dry chlorine is passed through hot iron wool in a combustion tube, the iron glows strongly and black crystals are deposited in the cooler parts of the tube.
i) Name the substance formed as black crystals and state its property which is the reason for its deposition in the cooler parts as black crystals. (1½ marks)

ii) The black crystals were dissolved in water and to resultant solution, aqueous sodium hydroxide added drop wise until in excess. State what would be observed and write an ionic equation for the reaction that takes place.
(2 ½ marks)

13. a) (i) Write equation for the reaction of ammonia with air in the presence of a catalyst and name the catalyst. (2marks)

ii) The resulting gas in the reaction in (a)(i) was cooled and then reacted with oxygen. State what was observed and write equation for the reaction that took place. (2marks)

b) Describe briefly how the product of the reaction in (a)(ii) can be converted to nitric acid and write equation for the reaction that leads to the formation of nitric acid. (2 ½ marks)

d) Outline how nitric acid can react with each of the following substances. (Your answer in each case should include condition(s), a brief mention of what is observed and equation for any reaction that takes place.
i) Lead(II) oxide (2marks)
ii) Sulphur (3marks)

e) State one use of nitric acid (½ mark)

14. Both the water containing dissolved calcium hydrogen carbonate and one containing dissolved magnesium sulphate are described as **"hard water"**.
a) Define the term **"hard water".** **(1mark)**

b) State the **type** of water hardness caused by the presence in water of dissolved;
i) calcium hydrogen carbonate (1mark)
ii) magnesiumsulphate (1mark)

c) Explain how calcium hydrogencarbonate may get into a water body and illustrate your explanation with suitable equation(s). (5marks)

d) One litre of tap water containing dissolved calcium hydrogen carbonate required **12.0cm^3**of **0.5m** hydrochloric acid for complete reaction.
i) Write equation for the reaction that took place. (1 ½ marks)

ii) Calculate the concentration in gdm^3 of calcium hydrogen carbonate in tap water. (Ca=40, H=1, C=12, O=16) (2marks)

e) State **one** physical and **one** chemical method by which water containing dissolved calcium sulphate can be made soft. (2marks)

f) Since hard water wastes soap, soapless detergents are always preferred for laundry work.
i) Give a reason (1mark)
ii) State **one**disadvantages of soapless detergents. (½ mark)

END