Candidate' Name..

Signature. .... Random No...../...../...../...../...../..../...Personal no.......

545/2

Chemistry.

Paper 2

Sept /2022.

2 hours.

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CHEMISTRY DEPARTMENT.

Resourceful chemistry Pre- UNEB Set 5.

Uganda Certificate of Education

Paper 2

</div>

INSTRUCTIONS TO CANDIDATES.

*Section **A** consists of 10 structured questions. Answer **all** questions in this section. Answers to these questions **must** be written in the spaces provided.*

*Section **B** consists of 4 semi-structured questions Answer any **two** questions in this section. Answers to the questions **must** be written in the answer booklet(s) provided.*

*In both sections all working **must** be clearly shown and **must** be in **blue** or **black** ink. Any work done in **pencil** will not marked except drawings.*

Where necessary use

[H = 1 : C =12 : O =16 : Na = 23 : S = 32 Cl = 35.5]

1 mole of a gas occupies 24 litres at room temperature.

1 mole of q gas occupies 22.4 litres at s.t.p

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***For Examiners use only.***

</div>

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

Attempt all questions from this section

1. 10 g of pure substance X was strongly heated in a hard glass tube until there was no further change, The changes in temperature of pure substance X during heating was measured and recorded at regular time intervals . Below is temperature- time graph of substance X during heating .   Study it and answer the questions that follow.

Time (seconds)
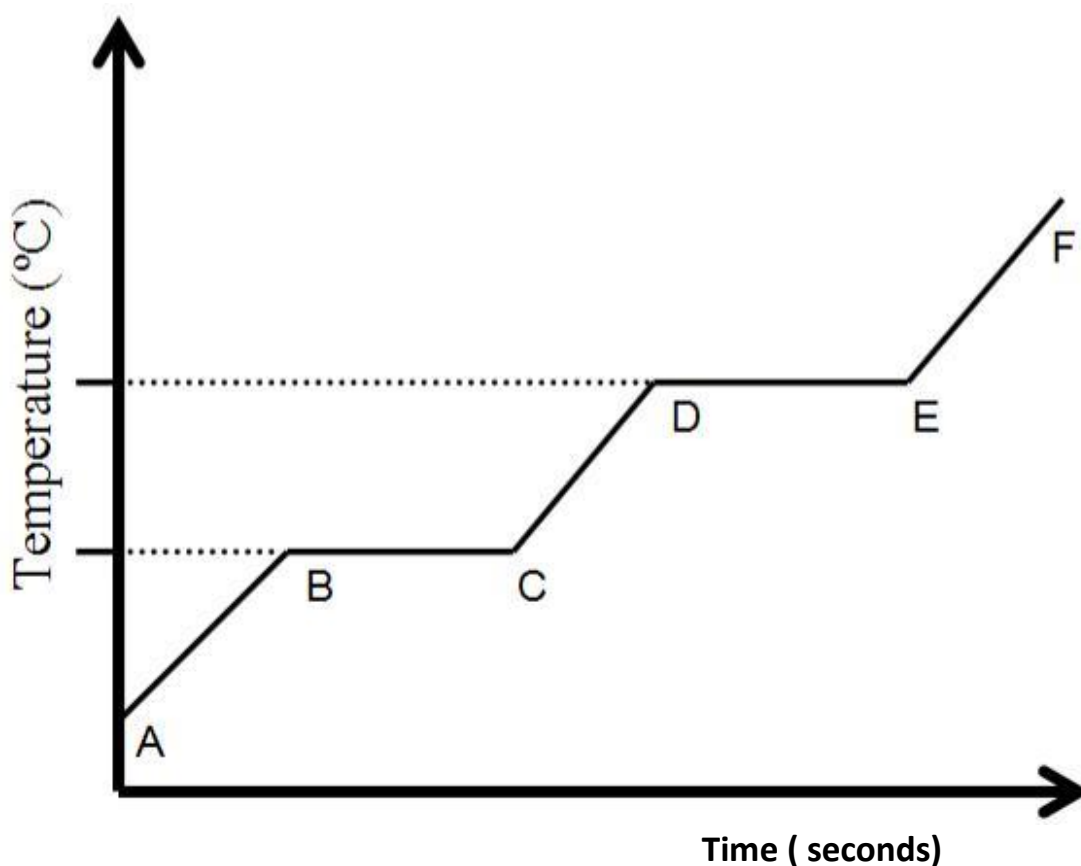
(a).From the graph ,what name is given to the constant temperature of pure **X** corresponding,

   (i) to feature BC.   (½ mark)

....

   (ii) to feature DE   (½ mark)

....

(b)Give a reason why the temperature of pure substance X remains constant along BC. (½ mark)

....

....

....

(b).Name the state of matter of pure substance X,

    (i) between B and C. (½ mark)

....

    (ii)at point F. (½ mark)

....

(c)Name the process that occurs when pure substance X changes from E to F.

(½ mark)

....

2.(a)Sodium peroxide can be formed from sodium and air.

  (i) State the condition of reaction leading to the formation of sodium peroxide. (½ mark)

....

  (ii) Write equation of reaction that would take place leading to the formation of sodium peroxide. (1 ½ marks)

....

....

  (b) (i)Oxygen gas can be prepared in the laboratory from sodium peroxide. Briefly state how oxygen gas can be produced from sodium peroxide.(½ mark)

....

....

(ii)State what would be observed in the reaction in (b) (i)   (01 mark)

....

....

....

(c) (i) Write equation of reaction that took place in (b)   (1½ marks)

....

....

(ii) Give one industrial use of oxygen gas.   (½ mark)

....

3.The atomic number and atomic mass of elements V , W , X , Y and Z are given in table below. Study it and answer the questions that follow.

Elements	V	W	X	Y	Z
Atomic number	12	17	8	17	15
Atomic mass.	24	36	16	37	31

(a) State the
   (i)   number of neutrons of w.   (½ mark)

....

   (ii)   sum of protons and neutrons in the nucleus of atom Z. (½ mark)

....

(b) Write the electronic configuration of,
   (i)   Atom Y.   (½ mark)

....

   (ii)   Ion formed by atom V.   (½ mark)

....

(c)   (i) identify two atoms which belong to the same element.   (½ mark)

....

      (ii)Give a reason for your answer in (c) (i) from the table.   (½ mark)

....

....

(d) Atom X separately reacted with atoms Z and V forming compounds P and Q respectively. Write the formula of compound,

    (i)   P.   (½ mark)

....

    (ii)   Q.   (½ mark)

....

(e)State ;

    (i)   type of bond that exists in compound Q.   (½ mark)

....

    (iii)   how the formation of bond in compound P differs from that in compound Q.   (½ mark)

....

....

....

4.(a)At a water treatment plant , impure water from lake is first passed through **graded screens**, then passed through a tank where **potash alum** is added , and through **sand and gravel**. Water is then treated with regulated amount of substance **R** which makes it more safe and finally compound **T** added to water before directed to storage tanks ready for distribution

(i)State why water is passed through,

    •graded screens.   (½ mark)

....

....

    • tank where potash alum is added.   (½ mark)

....

....

•sand and gravel. (½ mark)

....

....

(ii)Name ,

•substance **R** , and state its role. (01 mark)

....

....

•compound **T**, and state its role. (01 mark)

....

....

(iii)Write ionic equation of reaction to show how compound **T** serves its purpose during water treatment. (1½ marks)

....

....

(b)Write equation of reaction between aluminium and water. (1 ½ marks)

....

....

5(a) A crystalline compound B of relative formula mass 84 ,consists of 27.38% by mass of metal **M** , 1.19% by mass of **hydrogen**, 14.29% by mass of **carbon** and the rest being **oxygen**.

(i)   Calculate the simplest formula of compound B. (2 marks)
(M = 23 , H = 1 , S = 32 , O = 16)

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(ii)   Determine the molecular formula of compound B.   (01 marks)

....

....

....

....

(b)Dilute sulphuric acid was added to aqueous solution of compound M. state what was observed   (½ mark)

....

6   (a) (i) Write the molecular formula and structural formula of ethene and ehane in the table below.   (02 marks)

Compound	Molecular formula	Structural formula
Ethene		
Ethane		

 (c)(i) Name the reagent that can be used in the laboratory to distinguish between ethene and ethane, and state what would be observed when each compound is treated separately with the reagent named.

    Reagent.   (½ mark)

....

Observations   (01 mark)

....

....

....

(ii)Write equation of reaction that took place in (d) (i)   (01 mark)

....

....

7. (a) (i) State the condition(s) of reaction under which nitrogen gas readily reacts with calcium   (½ mark)

....

....

(ii)Write equation of reaction that would take place when calcium reacts with calcium under the conditions stated in (b)   (1½ marks)

....

....

(b)Explain briefly why the nitrogen readily reacts with calcium under the condition(s) stated in (a).   (1 ½ marks)

....

....

....

(c)When substance **G** was added to product formed in (a), a colourless gas with a chocking smell, that turns moist red litmus paper blue was evolved.

(i) Identify substance **G**.   (½ mark)

....

(ii)Write equation of reaction leading to the formation of the colourless gas.

(1½ marks)

....

....

8.Sodium hydroxide also known as *caustic soda* is manufactured on a large scale by electrolysis using specially designed cell consisting of flowing mercury at the bottom of cell.

(a) (i) Name the electrolyte used in the manufacture of sodium hydroxide.

(½ mark)

....

(ii)Name the substance used as anode in the cell. (½ mark)

....

(iii)State the role of flowing mercury in the cell. (½ mark)

....

(b)Write ionic equation of reaction that takes place at the;

(i) anode. (01 mark)

....

(ii)cathode. (01 mark)

....

(ii)Write equation of reaction leading to the formation of sodium hydroxide using the mercury cell. (01 mark)

....

....

(c)State one commercial use of Sodium hydroxide. (½ mark)

....

9.In a thermometric titration between sodium hydroxide solution and monobasic acid **B** which is hydrochloric acid, 10cm3 of acid **B** (hydrochloric

acid) was added to 40cm3 of 2M sodium hydroxide solution and mixture immediately stirred. The highest temperature and increase in temperature were recorded. The process was repeated with addition of 5.0cm3 of acid **B**(hydrochloric acid) six times until a total of 40 cm3 of acid was added. The results of the experiment were plotted on the graph below.
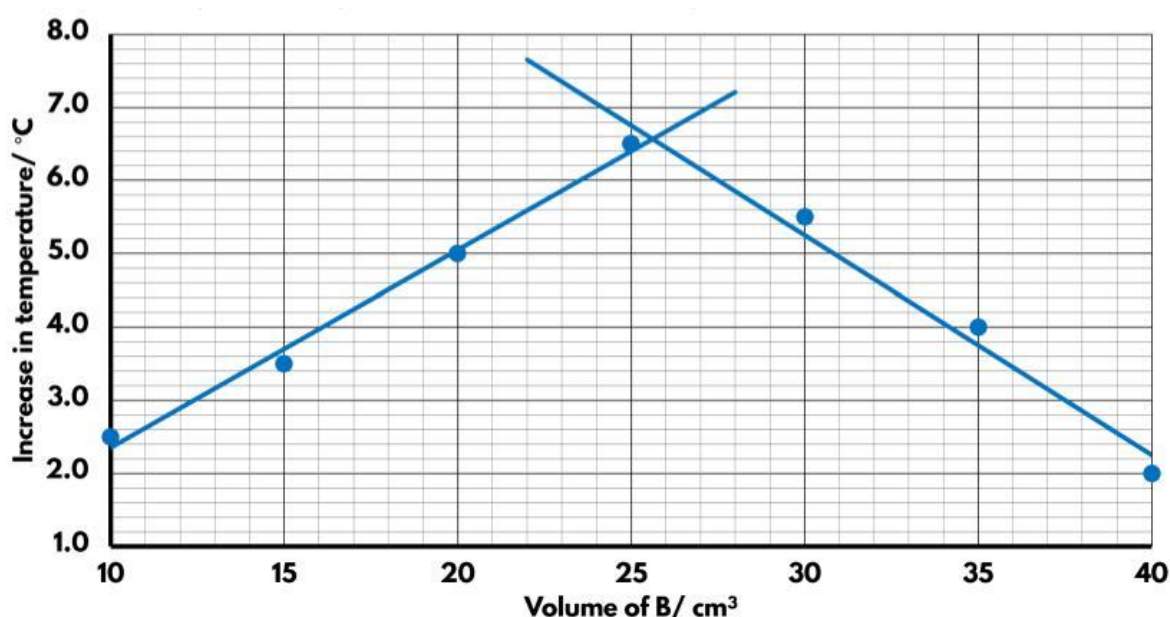
(a)Write ionic equation of reaction that took place during thermometric titration.   (1 ½ marks)

....

....

(b)(i) From the graph, determine the volume of acid **B**(hydrochloric acid) that completely reacted with sodium hydroxide solution at neutralization. (½ mark)

....

....

   (ii)Calculate the molar concentration of hydrochloric acid in moles per dm3.

                                                                                    (01 mark)

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(c)Calculate the molar enthalpy of neutralization of sodium hydroxide with dilute hydrochloric acid.   (02 marks)

(*Specific heat capacity of water = 4.2gcm -3, density of water = 1gcm -3)*

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10.State what would be observed and write ionic equation of reaction that would take place when place when,

(a) Chlorine gas was bubbled into ammonium iodide solution.

(i)Observation.   (01 marks)

....

(ii)Ionic equation.   (1½ marks)

....

....

(b)excess ammonia solution was added to aqueous lead(II) nitrate.

(i) Observation. (½ mark)

....

(ii) Ionic equation. (1½ marks)

....

....

(c)few drops of aqueous sodium iodide were added to solution mixture of zinc nitrate and lead(II) iodide.

(i) Observation. (½ mark)

....

(ii) Ionic equation. (1½ marks)

....

....

SECTION B (30 MARKS)

Attempt only two questions in this section.

*Additional question(s) answered will **not** marked.*

11.(a)State one difference between,

(i) mixture and compound? (01 mark)

(ii)Heterogeneous mixture and homogenous mixture? (01 mark)

(b)Name one liquid that when added to water forms a,

(i) heterogeneous mixture. (½ mark)

(ii)homogenous mixture. (½ mark)

(c)Giving a reason in each case, state a method that can be used in the laboratory to obtain water from its mixture with the liquid you have named ,

(i) in (b) (i). (02 marks)

(ii) in (b) (ii). (02 marks)

(d) Draw a well labelled diagram of the set up that can be used in the laboratory to separate the mixture in (b) (i) (2½ marks)

(e)A mixture of magnesium sulphate and zinc carbonate can be separated by filtration.

(i)Give a reason for the mode of separation used. (½ marks)

(ii)The residue obtained after filtration was dried , and strongly heated unti there was no further change. State what was observed and write equation of reaction. (2½ marks)

(iii)Describe briefly how the anion in the filtrate can be tested in the laboratory. Include equation of reaction. (2 ½ marks)

12.(a)Starting from ammonia , describe the process leading to formation of nitric acid on a commercial scale. (07 marks)

(b)Describe how nitric acid reacts with carbon. (2½ marks)

(c)When 20.0g of impure nitric acid was added to copper(II) carbonate, 3.20 dm3 of gaseous product was evolved at s.t.p.

(i)Write ionic equation of reaction. (1½ marks)

(ii)Calculate the percentage purity of nitric acid. (3½ marks)

(d)State one industrial use of nitric acid. (½ mark)

13.(a)(i) Define the term *salt*. (01 mark)

(ii)Describe briefly how pure zinc sulphate crystals can be prepared in the laboratory. (5½ marks)

(b)when 6.26 g of hydrated zinc sulphate, $ZnSO_4.nH_2O$ was heated to constant mass, 3.15 g of anhydrous salt was left . Calculate the number of moles *n*, in the hydrated salt $ZnSO_4.nH_2O$.   (3½ marks)

(Zn =65 , S=32 ,O=16 Fe = 56)

(c)State what would be observed and write ionic equation of reaction that would take place when 2 drops of,

(i) ammonia solution were added to zinc sulphate solution.   (02 marks)

(ii) sodium carbonate were added to zinc sulphate solution.   (02 marks)

(d)Excess ammonia solution was added to the resultant mixture in (c) (i).

(i)State what was observed?   (½ mark)

(ii)Write the formula of the cation in the resultant product in (d)(i)

(½ mark)

14.Carbon dioxide gas can be used in the laboratory to prepare a sample of anhydrous sodium carbonate powder commonly known as *soda ash*.

(a) (i)Write equation(s) of reaction(s) leading to the formation of anhydrous sodium carbonate starting from carbon dioxide gas.   (4½ mark)

(ii)State one industrial use of sodium carbonate formed in (a)(i) (½ mark)

(b)State how anhydrous sodium carbonate powder can be converted to hydrated sodium carbonate crystals, $Na_2CO_3.10H_2O$.   (01 mark)

(c)Sodium carbonate crystals were left in an open place.

(i)State what was observed?   (01 mark)

(ii)Explain your observation in c(i) above.   (01 mark)

(d)4.4 g of organic acid *CH3(CH2)n COOH* was dissolved in 500cm3 of distilled water to make a solution. 24.90 cm3 of the resultant solution completely neutralized 25.0 cm3 of 0.05 Mol per dm3 of sodium carbonate solution using methyl orange indicator.

(i)Write ionic equation of reaction that took place.   (1½ marks)

(ii)calculate the number of moles of sodium carbonate solution that reacted. (1½ marks)

(iii)Calculate the molar concentration of organic acid. (02 marks)

(iv)Calculate the value of n in formula of organic acid $CH_3(CH_2)_n COOH$.

(02marks)

END.

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