Name…………………………………………… Signature……………………...…………

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545/2
CHEMISTRY
Paper 2
March 2022
2 hours

MID TERM EXAMINATIONS-2022

Uganda Certificate of Education

S.4 CHEMISTRY

Paper 2

2 hours

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 from this section.*

  Answers to section **B** *must be written in the answer booklet/sheets provided and stapled at the back of the question paper.*

- *Show all your working clearly in both sections.*
  Where necessary use;
  [Mg= 24 Ag=108, C = 12, O = 16, H = 1, Molar gas volume at s.t.p = 22.4dm^3]

For examiner's use only														
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**Total**

© Midtermexaminations2022   **Turn Over**

1.　(a)　Define the term "flame".　*(01 mark)*

_____

_____

　(b)　Figure 1 below is the structure of a Bunsen burner luminous flame obtained as a result of burning methane. Study it and answer the questions that follow.
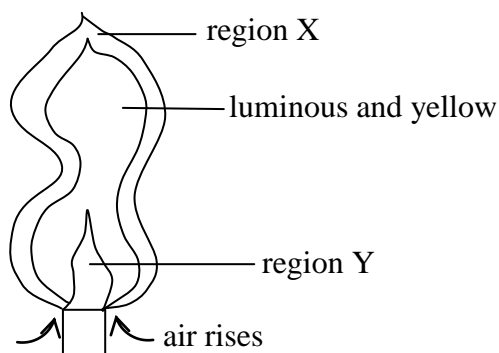
Fig 1

State what is observed when a match stick head is put at;

i)　region X _____ *($^1/_2$ mark)*

_____

ii)　region Y _____ *($^1/_2$ mark)*

_____

　(c)　Briefly explain your answer in b(ii) above.　*(01 mark)*

_____

_____

　(d)　The gas which is used as a fuel in the Bunsen burner is a hydrocarbon of molecular formula C_4H_{10},

i)　Name the gas.　*(01mark)*

_____

ii)　State the homologous series to which the hydrocarbon belongs.　*(01mark)*

_____

2. State how the following mixtures can be separated.   *(05 marks)*

Mixture	Method of separation
(a) Salt solution	
(b) Sodium chloride and potassium nitrate	
(c) Ammonium chloride and sodium chloride	
(d) Sand and iron fillings	
(e) Crude oil	

3. (a) Water was added to sodium peroxide;

    (i).   State what was observed;   *(1½ marks)*

_____

_____

    (ii).   Write equation for the reaction which took place.   *(1½ marks)*

_____

_____

(b) State;

    (i).   How the gaseous product from the reaction between sodium peroxide and water can be tested?   *(01 mark)*

_____

_____

    (ii).   **One** use of the other product of reaction between sodium peroxide and water.   *(01mark)*

_____

_____

4. (a)   Name **one** substance in each case, which is;

    (i).   a carbonate that shows no change in mass when heated.   *(½ mark)*

_____

_____

    (ii).   a compound that when heated turns directly into gas (es) without first melting.   *(01mark)*

_____

_____

(iii). a nitrate, which when heated, produces oxygen as the only gaseous product;

(½ marks)

_____

_____

(b) Write equation for the reaction that would take place if each of the following mixtures was heated;

(i). Iron and sulphur. *(1 ½ marks)*

_____

_____

(ii). Iron and chlorine *(1 ½ marks)*

_____

_____

5. (a) Define the term allotropy. *(01 mark)*

_____

_____

(b) (i) Name the two crystalline allotropes of carbon. *(01 mark)*

_____

_____

(ii) Give one use of each of the allotropes you have named in b(i) above.

(01 mark)

_____

_____

(c) Name two other elements that show allotropy. *(01 mark)*

_____

_____

6. (a) Define the term basicity of an acid. *(01 mark)*

_____

_____

(b) State one example in each case of a mineral acid that is; *(01mark)*

   i) Dibasic

   _____

   ii) Mono basic *(01 mark)*

   _____

c) i) Write the equation for the reaction between the acid named in b(i) and aqueous sodium hydroxide. *(1$^1/_2$marks)*

   _____

   _____

   ii) The atomic numbers of elements **X, Y** and **Z** are **11, 15** and **17** respectively;

(a) Write the electronic configuration of;

   X : *(01mark)*

_____

   Y: *(01mark)*

_____

   Z: *(01mark)*

_____

(b) State the period in the periodic table to which the three elements belong. *(01mark)*

_____

(c) Element **Z** can react with both **X** and **Y** to form solid products **Q** and **R** respectively;

   (i). Identify which **one** of the products would have a lower melting point. *(½ mark)*

_____

   (ii). Give a reason for your answer in (c) (i) above. *(½ mark)*

_____

7. (a) Define the term Molar gas volume. *(01 mark)*

_____

_____

(b) Silver nitrate crystals decompose on heating according to the equation.

$$2AgNO_3(s) \longrightarrow 2Ag(s) + 2NO_2(g) + O_2(g)$$

Calculate the volume of oxygen produced at s.t.p when 2.14g of silver nitrate is heated (Ag = 108, N=14, O = 16, 1 mole of a gas occupies 22.4dm^3 at s.t.p) *(3^1/$_2$ marks)*

_____

_____

_____

_____

(c) Suggest one anion that can be identified by silver nitrate solution. *(^{1}/$_2$ marks)*

_____

_____

_____

8. (a) Define the term saturated hydro carbon. *(01 mark)*

_____

_____

(b) Give the structural difference between ethene and ethane *(01 mark)*

_____

_____

(i). Name one reagent that can be used to distinguish ethene from ethane in the laboratory. *(^{1}/$_2$mark)*

_____

_____

(ii). State what is observed when the reagent named in b(i) above is separately treated with ethene and ethane. *(01 mark)*

_____

_____

(iii). Write the equation for the reaction between ethene and the reagent named in b(i) above. *(1^1/$_2$mark)*

_____

_____

9. An oxide of hydrogen, **Q**, of molecular mass 34 consists of 5.9% hydrogen and the rest being oxygen. **(H=1, O=16)**

(a) Determine;
  (i).   the empirical formula of Q.   *(02marks)*

_____

_____

_____

_____

_____

_____

  (ii).   the molecular formula of Q.   *(01mark)*

_____

_____

_____

_____

(b) **Q** decomposes to a colourless gas in presence of catalyst.
  (i).   Identify the colourless gas.   *(½ mark)*

_____

_____

  (ii).   Write the equation for the decomposition of **Q**.   *(1 ½ marks)*

_____

_____

10. (a)   (i)   Define the term **"alloy"**   *(01mark)*

_____

_____

        (ii)   Name **one** common alloy of iron.   *(½ mark)*

_____

_____

(iii) Give **one** reason why the alloy you have named in (a) (ii) is more often used than iron itself. *(01mark)*

_____

_____

(b) Name the major components of the following alloys;

(i). Solder *(01mark)*

_____

_____

(ii). Duralumin *(01mark)*

_____

_____

(c) State **one** use of duralumin *(01 mark)*

_____

_____

SECTION B
*Answer any **two** questions in this section.*

11. (a) What is meant by reaction rate? *(01 mark)*

(b) Describe an experiment to show the effect of concentration of reactants on the rate of the reaction. *(07 marks)*

(c) 2.4g of Magnesium powder was added to $25cm^3$ of dilute sulphuric acid at 23^0C.
   i) Sketch a graph to show how the rate of the reaction would vary with temperature. *(02 marks)*

   ii) On the same graph, sketch another graph to show what would happen to the rate when the temperature was increased to 30^0C but keeping the mass of Magnesium powder. *(01 mark)*

   iii) Explain the shape of your graphs in c(ii) above. *(01 mark)*

   (iv) Calculate the molarity of the acid (Mg = 24 , H=1 , S = 32 , O = 16) *(03 marks)*

12. (a) i) State one reason why air is considered a mixture and not a compound. *(01 mark)*
   ii) Name one method by which the components of air can be separated. *(01 mark)*

(b) Oxygen gas can be prepared in the laboratory by addition of water to substance Q
   i) Identify Q. *(01 mark)*

ii) Write the equation for the reaction between water and Q. *(1½ mark)*

i) Draw a well labelled diagram of the setup of apparatus that can be used to prepare oxygen from substance Q. *(2½ mark)*

(c) A piece of burning sulphur was lowered into a gas jar of oxygen.
i) State what was observed. *(01 mark)*
ii) Write equation for the reaction that took place. *(1½ marks)*

(d) Water was added to the gaseous product in (c) and to the resultant solution a red rose flower was immersed.
i) State what was observed. *(01 mark)*
ii) Write equation for the reaction between water and the gaseous product in (c). *(1½ marks)*
iii) Explain your observation in d(i) above. *(02 marks)*

(e) State how the gaseous product in(c) can be identified in the laboratory. *(01 mark)*

13. Under suitable conditions iron can rust.
(a) Sate
(i) what is meant by the term "rusting." *(01 mark)*

(ii) The condition(s) necessary for iron to rust. *(02 marks)*

(b) (i) Draw labeled diagram(s) for a set up of an experiment which can be used to show that the condition(s) you have stated in (a)(ii), is / are necessary for iron to rust. *(05 marks)*

(ii) State and explain observations that would be made if the experimental set up in the diagrams that you have drawn in (b) (i) was allowed to stand for some days. *(04 marks)*

(c) (i) State two methods by which rusting can be prevented. *(02 marks)*

(ii) Give one reason why rusting must be prevented. *(01 mark)*

14. (a) (i) Draw a labelled diagram to show how a dry sample of ammonia can be prepared from ammonium chloride in the laboratory. *(04marks)*
(ii) Write equation for the reaction leading to the formation of ammonia. *(1½ mark)*

(b) Dry ammonia gas was passed over-heated lead (II) oxide.
(i) State what was observed. *(01 marks)*
(ii) Write equation for the reaction that takes place. *(1½ mark)*

(c) Describe how ammonia can be converted to nitric acid. Use equation to illustrate your answer. *(07₂ marks)*

END