**Name…………………………………………………………..Index No………………../………….**

**School……………………………………………………….Candidate’s signature…………………… Date…………………………….……**

**233/1**

**Chemistry**

**Theory**

**Paper 1**

**March/April 2019**

**2 hrs**

***MALIET SCHOOLS EXAMINATION- 2019***

***Kenya Certificate of Secondary Education (K.C.S.E)***

**INSTRUCTIONS TO CANDIDATES:**

Answer ALL the questions in the spaces provided

Mathematical tables and electronic calculations may be used

All working MUST be clearly shown where necessary

**FOR EXAMINER’S USE ONLY:**

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| **Questions** | **Max. score** | **Candidates score** |
| **1 – 29** | **80** |  |

*This paper consists of 10 printed pages.*

*Candidates should check carefully to ascertain that all the*

*pages are printed as indicated and no questions are missing.*

1. Explain how a mixture of Iodine and ammonium chloride can be separated. (2mks)

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2. Cardboard X and Y were placed in different zones of a Bunsen burner flame.



Cardboard

 Explain the difference between X and Y. (2mks)

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3. (i) What is rusting? (1mk)

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 (ii) Explain why galvanizing rather than tinning is a better method of prevention of rusting.(2mks)

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4. When magnesium was burnt completely in air the total mass of the products was found to be greater than the original mass of the piece of magnesium. Explain (2mks)

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5. Element M has an atomic number of 16 while element N has an atomic number of 1.

 (a) Write down the electron arrangement of:

 (i) Ion M (1mk)

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 (ii) Ion N (1mk)

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 (b) Draw dot (**.**) and cross (x) diagram to show the bonding between M and N. (1mk)

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6. Use the information below to answer the questions that follow

 Equations enthalpy of formation

 H2(g) + ½ O2(g) H2O(l) ΔH1 = -286KJmol-1

 C(s) + O2(g) CO2(g) ΔH2 = -394 KJmol-1

 2C(s) + 3 H2(g) + ½ O2(g) C2H5OH(l) ΔH3 = -277KJmol-1

 (a) Define the term “enthalpy of formation for a compound”. (1mk)

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 (b) Calculate the molar enthalpy of combustion, ΔH4 of ethanol. (3mks)

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7. The table below shows the first ionization energies of elements B and C

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| Element  | Ionization energy KJmol-1 |
| B | 500 |
| C | 750 |

 What do these values indicate about the reactivity of B compared to that of C? Explain (2mks)

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8. Study the diagram below and answer the questions that follow. The diagram shows the method of separating components of mixture Q.

Thermometer



Mixture Q

 Heat

a) Name apparatus X and Y. (1 mk)

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b) What is the purpose of apparatus X? (1 mk)

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c) Show the direction of flow of cold water used for cooling the vapour formed. (1 mk)

d) What name is given to the above method of separating mixtures? (1 mk

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9. Study the chart below for the Contact process and other extensions.

P

SO2

Q

Oleum

Chamber A

Water

Substance R

Hot copper

Solution M

Gas N

a) Identify the substances: (2 mks)

Q …………………………………………

 P ……………………………………….

R………………………………………………

N…………………………………………………….

b) Name solution M and state its colour. (1 mk)

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10. (a) Define the terms

 (i) Efflorescence (1mk)

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 (ii) Deliquescence (1mk)

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 (iii) Hygroscopy (1mk)

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11. The set up below was used to prepare gas Y. Study it and answer the questions that follow.



Gas Y

Warm water

Heat

Ammonium nitrate

 a) Identify gas Y. (1 mk)

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b) Explain why the gas is preferably prepared for heating a mixture of potassium nitrate and ammonium sulphate rather than directly heating ammonium nitrate. (1 mk)

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c) State one use of gas Y. (1 mk)

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12. When heated in a current of nitrogen gas, magnesium reacts to form a compound, magnesium nitride. Calculate the volume of nitrogen at s.t.p required to react with 8g of magnesium.

 (Mg = 24, molar gas volume at s.t.p = 22.4dm3) (3mks)

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13. Explain how crystals of copper (II) sulphate crystals can be prepared starting with copper turnings and concentrated sulphuric (iv)acid. (3mks)

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14. The reaction between a piece of magnesium ribbon with excess 2M hydrochloric acid was investigated at 250C by measuring the volume of hydrogen gas produced as the reaction progressed. The sketch below represents the graph that was obtained.

Time (sec)

Total volume of H2(g) cm3

14. (a) Name one piece of apparatus that may be used to measure the volume of hydrogen gas produced. (1mk)

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 (b) On the same diagram, sketch the curve that would be obtained if the experiment was repeated at 350C (2mks)

15. Both diamond and graphite have giant atomic structures. Explain why graphite is soft while diamond is hard. (3mks) ……………………………………………………………………………………………………

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16. A gaseous compound X contained 46.2% carbon and 53.9% nitrogen.

 In 20 seconds 50cm3 of X diffused through a porous plug and the same volume of oxygen diffused in 15.7 seconds. Deduce the formula of X.(N = 14, C = 12, O = 16) (3mks)

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17. The table below shows the pH values of solution J to N.

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| --- | --- | --- | --- | --- | --- |
|  Solution | J | K | L | M | N |
| pH | 5 | 13 | 2 | 10 | 7 |

 a) Which solution

 (i) Contains the largest concentration of hydroxyl ions? (1 mk)

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(ii) Is likely to be a solution of acetic Acid (ethanoic acid)? (1 mk)

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b) Explain why a solution of hydrogen chloride gas in methylbenzene was identifies as N. (1 mk)

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18. Explain why a high temperature is required for nitrogen to react with oxygen. (1mk)

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19. Use the bond energies given below to answer the questions that follow.

 Bond Bong energy KJ /mole

 C – H 414

 Cl – Cl 244

 C – Cl 326

 H – Cl 431

 a) Calculate the heat change for the reaction. (2 mks)

 CH4 (g) + Cl2 (g) CH3Cl (g) + HCl(g)

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 b) State the condition necessary for the above reaction to occur. (1 mk)

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20. 70g of salt W were added to 80cm3 of water at 250c.after stiring 10g of crystals of salt W were filtered out. Determine the solubility of salt W at 250C. (2mks)

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21. An oxide of Nitrogen was bubbled into a solution of sodium hydroxide in which phenolphthalein indicator has been added. The solution turned colourless after sometime.

 (a) Name the oxide. (1mk)

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 (b) Write an ionic equation to explain the observation. (1mk)

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22. In the manufacture of sodium carbonate by solvay process, ammoniated brine trickles down the carbonator while carbon (iv) oxide rises up the same tower.

 a) What is ammoniated brine? (1 mk)

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b) What is the main source of carbon (iv) oxide in the above process? (1 mk)

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c) Write two equations for the reactions in the carbonator (2 mks)

I……………………………………………………………………………………………………….

II…………………………………………………………………………………………………….

23. In an experiment, sulphur(IV)oxide was bubbled into water followed by chlorine gas. The resulting clear solution gave a white precipitate when mixed with acidified barium chloride solution. Explain this observation. (2mks)

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24. The set up below was used to prepare a certain gas X.



Sodium chloride solid

Heat

Gas X

Concentrated sulphuric (iv) acid

Iron wool

 (a) name the gas X being collected (1mk)

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(b) Name the product formed in the combustion tube and write an equation for its formation. (2mks)

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25. 10cm3 concentrated hydrochloric acid of density 1.18g/cm3 and purity of 36percent dissolved in 250cm3 of distilled water. Calculate the morality of the solution.

 (H = 1, Cl = 35.5) (2mks)

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26.

Flame test

Yellow flame

Solution of salt X

Addition of Ba(NO3)2 followed by dil. HCL

(i) White precipitate which dissolves to colourless solution in dilute hydrochloric acid.

(ii) Gas D which has no effect on acidified potassium manganate VII solution.

a) Name

 (i) Gas D (1mk)

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 (ii) Salt X (1 mk)

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b) Write ionic equation for the reaction between solution X and Barium Nitrate solution. (1 mk)

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c) State the observation made when salt X is heated. (1 mk)

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27. Explain the observation made in the experiment whose set up is shown below. (3mks)



Water

Rubber stopper

Porous pot

Gas jar of hydrogen

Oxygen

28. An element P contains two isotopes  whose relative abundance is in the ratio 9:1. find the relative atomic mass of P. (2mks)

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29. The atomic and ionic sizes of chlorine and sodium are given in the table below.

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| --- | --- | --- |
| Element  | Atomic size (nm) | Ionic size(nm) |
| Sodium | 0.154 | 0.095 |
| Chlorine  | 0.099 | 0.181 |

 Give reasons for the differences in the sizes of the atoms and ions in each case.

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