**MID TERM TWO EXAMS**

**CHEMISTRY FORM THREE.**

**MARKING SCHEME 2022**

1. A student separated liquid P (B.P 78°C) and liquid Q (B.P 100°C) wring the apparatus shown below.



(i) Name the apparatus labelled

(a) M (1 mark)

**liebig condenser**

  (b) R (1 mark)

**Fractionating column**

  (ii) State one function of the glass bead in apparatus labelled R (1 mark)

**To increase surface area for condensation**

(iii) What is the reading on the thermometer when the first jar drops of the distillate appeared in the beaker.(1 mark)

**78**

  (iv) Which of the liquids remains in the flask.(1 mark)

**water**

2. Name a method that can be used to extract the following:-

 (i) Common salt from a salt solution.(1 mark)

**evaporation**

(ii) Paraffin from crude oil.(1 mark)

**Fractional distillation**

3. A compound of carbon, hydrogen and oxygen contain 54.55% carbon, 9.09% and remaining 36.36% oxygen. If its relative molecular mass is 88, determine its molecular formula(C=12.0, H =1.0, O= 16.0) [4mark]

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Carbon | Hydrogen | Oxygen |
| Symbol | C | H | O |
| Moles present = % composition  Molar mass | 54.55  12 | 9.09  1 | 36.36  16 |
| Divide by the smallest value | 4.5458  2.2725 | 9.09  2.2725 | 2.2725  2.2725 |
| Mole ratios | 2 | 4 | 1 |

Empirical formula is **C2H4O**

The molecular formula is thus determined :

**n**  = Relative formular mass = 88 = 2

Relative empirical formula 44

The molecular formula is (C2H4O ) x 2 = **C4H8O2**.

4.Sodium nitrate(V)can also be used to prepare nitric(V)acid. State two reasons why potassium nitrate(V) is preferred over Sodium nitrate(V). (2marks)

**(i) Potassium nitrate(V) is more volatile than sodium nitrate(V) and therefore readily displaced from the less volatile concentrated sulphuric(VI)acid**

**(ii) Sodium nitrate(V) is hygroscopic and thus absorb water . Concentrated sulphuric(VI)acid dissolves in water. The dissolution is a highly exothermic process**

5. The atomic number of an element A is 11 and that of B to 8.

(a) Write down a possible formula of compounded formed between A and B(1mark)**A2B**

  (b) Draw a dot (•) and cross (×) diagram to show bonding in compound farmed. (2 marks)



 6**.** (a) Below is a paper chromatogram of pure substances W, X and Y



a) The mixture K contains substances W and X only. Indicate on the diagram the chromatogram of K.(2 marks)



  (b) State one application of chromatography.(1 mark)

**Testing of illegal drugs in urine**

7.  Study the set up below and use it to answer the questions that follow.



   (a) What observations are made in the boiling tube. Explain.(1 mark)

**Red residue cooled to a yellow residue**

**Brown fumes produced**

***½***

  (b) Write an equation of reaction occurring in the boiling tube.(1 mark)



 8. When excess dilute hydrochloric acid was added to sodium sulphate, 960cm³ of sulphuric (IV) oxide gas was produced. Calculate the mass of sodium sulphite that was used. (Molar mass of sodium sulphite = 126g) and molar gas volume at rtp is 24dm³.(3 marks)



**1 mole Mole**



**Mole ratio 1 : 1 🗸*½***

**Moles of Na2SO3 = 0.04 ü*½***

**RMM of Na2SO3 = 126**

**Mass of Na2SO3 = 0.04 × 126 *½***

**= 5.04 g **

9. The table below shows atomic and ionic radii of some elements represented by letters U, V, W, X (*Not the actual symbols*) Study it and answer the questions that follow.

|  |  |  |
| --- | --- | --- |
| Element | Atomic Radius (nm) | Ionic radius (nm) |
| U | 0.174 | 0.099 |
| V | 0.203 | 0.133 |
| W | 0.099 | 0.181 |
| X | 0.136 | 0.065 |

(a) Classify element X as a metal or non-metal. Explain. (1 mark)

**Its a metal½ since atomic radius is greater🗸½ than ionic radius**

  (b) Which of the elements is the strongest reducing agent? (1 mark)

**V**

(c) Which element forms an anion.(1 mark)

**W**

10.**(**a) State Graham’s law of diffusion.(1 mark)

**The rate of diffusion of a gas is inversely proportional to the square root of its density provided the initial conditions remain constant**

(b) 400cm3 of gas D diffuses from porous plug in 50 seconds while 600cm3 of oxygen diffuses from the same porous plant in 30 seconds. Calculate the relative molecular mass of gas. (O = 16)(3 marks)



11.The flow chart below shows the industrial preparation of ammonia and process used in the manufacture of ammonium compounds. Study it and answer the questions that follow.



  (a) Give the name of the:

(i) Process in step 1(1 mark)

**Fractional distillation**

  (ii) Reaction that takes place in step 5 (1 mark)

**neutralization**

(b) (i) State **one** other source of hydrogen gas apart from natural gas. (1 mark)

**Cracking of long chain alkanes**

   (ii) Explain why it is necessary to compress nitrogen and hydrogen in this process. (2 marks)

**High pressure brings the molecules closer/increasing the concentration of gas**

**molecules/the pressure shifts the equilibrium the right; Hence the yield of ammonia increases**

  (c) (i) Write an equation for the reaction which takes place in step 2(1 mark)

**NH3(g) + CH3COOH(aq)  CH3CHOONH4**

  (ii) Name the catalyst and the reagents used in step 3.

  a) Catalyst- **Platinum rhodium /platinum** (1 mark)

b) Reagents **Water and oxygen** (1 mark)

  (d) Name compound Z1(1 mark)

**Ammonium nitrate; rej Formula**

  (e) Give one commercial use of compound Z2 (1 mark)

**as fertilizer; rej manufacture of fertilizer;1**

12. Starting with zinc metal, describe how a solid sample of zinc hydroxide can prepared.(3 marks)

**To nitric acid add excess zinc metal, filter to remove excess zinc. Add sodium hydroxide to zinc nitrate solution.**

**A precipitation reaction will occur where zinc hydroxide will be precipitated out. Filter to obtain zinc hydroxide as the residue and dry it between filter paper.**

13. The substances and apparatus below were used to test the presence of nitrate in substance D.



      (a) Identify substance D (1 mark)

**Concentrated sulphuric acid**

(b) What are the components of the brown ring.(1 mark)

**Iron (II) sulphate-nitrogen (II) oxide complex**

**14.** Nitrogen does not support combustion yet burning magnesium introduced into a gas jar of nitrogen continues to burn, forming a white solid. Explain.(1 mark)

**Burning magnesium produce a lot of heat capable of breaking triple bond holding nitrogen atoms together**

(a) Write an equation for the reaction forming the white solid.(1 mark)

**Mg + N2\_\_\_\_\_\_\_\_>Mg3N2**

  (b) State two uses of nitrogen.(1 mark)

**Haber process**

**Manufacture of nitrogenous fertilizer**

15. Study the flow chart below and answer the questions that follow.



Identify

  (a) Solution K.(1 mark)

**Nitric acid**

(b) Solid L(1 mark)

**PbO**

c) gas M ( 1 mk)

**Oxygen gas**