**NAME: ………………………………. ADM NO: ……….. CLASS: …………….**

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**FORM THREE CHEMISTRY**

**MID TERM 1 EXAMS 2021**

**TIME: 1 ½ HOURS**

**Answer all the questions in the spaces provided.**

1. What is the temperature on the Kelvin scale for each of the following? (3 marks)

 (a) 100oC – **373K**

 (b) -100oC – **173K**

 (c) 22oC – **295K**

2. State any three differences between luminous and non-luminous flame. (3 marks)

|  |  |
| --- | --- |
| Luminous | Non-Luminous |
| **Sooty** | **Not sooty** |
| **Not very hot** | **Very hot** |
| **Not steady** | **Steady** |

3. The table below shows liquids that are miscible and those that are immiscible.

|  |  |  |
| --- | --- | --- |
| **Liquid** | **L3** | **L4** |
| **L1** | Miscible | Miscible |
| **L2** | Miscible | Immiscible |

 (i) Name the method that can be used to separate L1 and L3 from a mixture of the two.

 (1 mk)

 **Fractional distillation**

 (ii) Describe how a mixture of L2 and L4 can be separated. (2 mks)

 **- Since the two liquids are immiscible, pour both the liquids in a separating**

 **funnel and allow to settle. The denser liquid will settle down and the less dense will form a second layer on top. Open the tap and run out the liquid**

 **in the bottom layer leaving the liquid in the second layer in the funnel.**

4. A gas occupies 450cm3 of 27oC. What volume would the gas occupy at 177oC if its

 pressure remains constant? (3 mks)

 **V1 = V2**

 **T1 T2**

 **450 = X**

 **350 450**

 **= 675cm3**

5. The electron arrangement of ions X+3 and Y2- are 2.8 and 2.8.8

 (a) Write the electronic arrangement of the elements X and Y. (2 mks)

 **X – 2.8.3**

 **Y – 2.8.6**

 (b) Write the formula of the compound that would be formed between X and Y.(1 mk)

 **X2Y3**

6. Explain why there is general increase in the first ionization energies of the elements in

 period 3 of the periodic table from left to right. (2 mks)

 **- Across the period, there is a gradual increase in number of protons in the**

 **nucleus. This increases the force attraction between the nucleus and the**

 **electrons.**

7. How would you obtain a sample of pure iodine from a mixture of iodine and lead sulphate?

 **- Heat the mixture. Iodine sublimes and can be collected on the cooler parts of the**

 **test tube.**

8. (a) State Gay Lussacs law. (1 mk)

 **- When gases react, they do so in volumes that bear a simple ratio to one another**

 **and to their products of gaseous temperature and pressure are kept constant.**

 (b) 10cm3 of a gaseous hydrocarbon (C2Hx) required 30cm3 of oxygen for complete

 combustion. If 20cm3 steam and 20cm3 of carbon (iv) oxide were produced, what

 is the value of X. (3 mks)

 **C2HX = 3O2 2CO2 + 2H2O**

 **10cm3 30cm3 20cm3**

 **X = 4**

9. Explain how conduction of electricity take place in the following: (2 mks)

 (a) Iron metal – **delocalized electrons**

 (b) Molten lead (II) iodide – **mobile ions**

10. Study the set up below and answer the questions that follow.



 (a) What observation would be made in the tube? (1 mk)

 **- White dense fumes of ammonium chloride would be formed.**

 (b) Indicate with a cross (x) on the diagram the likely position where observations

 stated in (a) above would be made. (1 mk)

11. An organic compound had the following composition 37.21% carbon, 7.75% hydrogen

 and the rest chorine. Determine the molecular formula of the compound given that the

 molecular mass of the compound is 65 (C = 12, H = 1), Cl = 35.5) (5 mks)

|  |  |  |  |
| --- | --- | --- | --- |
| **Element**  | **C** | **H** | **Cl** |
| **Mass %** | **37.21** | **7.75** | **55.04** |
| **RAM** | **12** | **1** | **35.5** |
| **Moles** | **37.21****12** | **7.75 = 7.75****1** | **55.05 = 1.55****3.5** |
| **D.S.R** | **3.1**= 2**2.55** | **7.75**= 5**1.55** | **1.55**= 1**1.55** |
| **M.R** | **2** | **5** | **1** |

  **E.F = C2H5Cl**

 **(E.F)n = 65**

 **(C2H5Cl)n = 65**

 **(24 + 5 + 35.5)n = 65**

 **(65.5)n = 65**

 **64.5 64.5**

 **n = 1**

 **M.F = C2H5Cl**

12. Write an ionic equation for the reaction between an aqeous solution of Sodium hydroxide

 and dilute hydrochloric acid. (3 mks)

 **- An aqeous solution of Sodium hydroxide and dilute hydrochloric acid.**

 **NaOH(aq) + 2HCl NaCl(aq) + H2O(l)**

 **Na+(aq) + OH-(aq) + H+(aq) + Cl(aq) Na+(aq) + Cl(aq) + H2O(l)**

 **OH-(aq) + H+(aq) H2O(l)**

13. Use the scheme below to answer the questions that follow.

Carbon (iv) Oxide

Solid H

heat

H2O

Ca(OH)2(aq)

Solid J

 (a) Identify the solids H and J. (2 mks)

 H – **Calcium carbonate**

 J – **Calcium oxide**

 (b) State one commercial use of solid J. (1 mk)

 **Used as a drying agent**

14. The diagram below shows a ‘Jiko’ when in use. Study it and answer the questions that

 follow.



 (a) Identify the gas formed at region A. (1 mk)

 **Carbon (iv) oxide**

 (b) State and explain the observation made at region B. (2 mks)

 **- Blue flame, because carbon (II) oxide is burning and usually burns with a blue flame.**

15. (a) Diamond and graphite are allotropes of carbon. What is meant by an allotrope?

 **- These are two or more forms of the same element existing under standard**

 **conditions.**

 (b) Explain why graphite can be used as a lubricant while diamond cannot. (2 mks)

 **- Graphite atoms are bonded by covalent bonds to form layers which are in turn**

 **held by weak van der waals forces making the layers slide easily over each other. In diamond there are only covalent bonds.**

16. (a) Distinguish between a covalent bond and co-ordinate bond. (2 mks)

 **- Covalent bond is formed by equal contribution of the shared electrons by the**

 **atoms. Co-ordinate bond is where the shared electrons are contributed by one**

 **of the atoms.**

 (b) Draw a diagram to show bonding in ammonium ion (N = 7, H = 1) (2 mks)



17. Study the information given in the table below and answer the questions that follow. The

 letters do not represent the actual symbols of the elements.

|  |  |  |
| --- | --- | --- |
| **Element** | **Atomic number** | **Boiling point(k)** |
| S | 3 | 1603 |
| T | 13 | 2743 |
| U | 16 | 718 |
| V | 18 | 87 |
| W | 19 | 1047 |

 (a) Select the elements which belong to the same;

 (i) Group - **(S, W)**  (1 mk)

 (ii) Period - **(T, U, V)** (1 mk)

 (b) Which element;

 (i) Is in gaseous state at room temperature? Explain. (1 mk)

 **(Room temperature = 298K)**

 **V – has a boiling point of below 298K.**

 (ii) does not form an oxide. (1 mk)

 **V**

 (c) Write the;

 (i) formula of the nitrate of element T. (1 mk)

 **T(NO3)3**

 (ii) equation for the reaction between element S and U.

 **2S(s) + U(S) S2u(s)**

 (d) What type of bond would exist in the compound formed when U and T react? Give

 a reason for your answer. (2 mks)

 **- Ionic bond – because T is a metal while U is a non metal. T loses**

 **electrons to U.**

18. The table below shows the relative atomic masses and the percentage abundances of the

 isotopes L1 and L2 of element L.

|  |  |  |
| --- | --- | --- |
|  | **Relative atomic mass** | **% abundance** |
| **L1** | 62.93 | 69.09 |
| **L2** | 64.93 | 30.91 |

 Calculate the relative atomic mass of element L. (3 mks)

 **(62.93 x 69.09) + (64.93 x 30.91)**

 **100**

 **= 4347.8337 + 2006.9863**

 **100**

 **= 64**

19. When magnesium metal is burnt in air, it reacts with both oxygen and nitrogen gases

 giving a white ash. Write two equations for the reactions taking place. (2 mks)

 **2Mg(s) + O2(g) 2MgO(s)**

 **3Mg(s) + N2(g) Mg3N2(s)**

20. The chromatogram below was obtained from a contaminated food sample P.

 Contaminants Q, R, S and T are suspected to be in P. Use it to answer the following

 questions.



 (a) Identify the contaminant in mixture P. (1 mk)

 **R and T**

 (b) Which is the most soluble contaminant in P? (1 mk)

 **T**

21. Classify the following processes as either chemical or physical. (3 mks)

|  |  |
| --- | --- |
| **Process** | **Type of change** |
| (a) Heating copper (II) sulphate crystals | **Chemical** |
| (b) Obtaining kerosene from crude oil | **Physical** |
| (c) Souring of milk | **Chemical** |

22. Name two amphoteric oxides. (2 mks)

 **Lead (II) oxide**

 **Zinc (II) oxide**

 **Aluminium oxide**

23. (a) What is the chemical name for rust. (1 mk)

 **Hydrated ion (III) oxide.**

 (b) State one condition that accelerates rusting. (1 mk)

 **Salty conditions**

24. (a) State Charles law. (1 mk)

 **The volume of a fixed mass of a gas is directly proportional to its absolute temperature at a constant pressure.**

 (b) Draw a sketch graph to illustrate Charles law. (2 mks)



25. (a) Define the term molar solution. (1 mk)

 **This is a solution that contains one mole of a solute in one litre of the solution.**

 (b) In a class of 30 students, each student requires 100cm3 of 0.1M sodium hydroxide

 solution for a titration experiment. Calculate

 (i) The total volume of sodium hydroxide required for the class.

 (K = 39, O = 16, H = 1) (2 mks)

 **(30 x 100) = 3000cm3**

 **= 3L**

 (ii) The total mass of sodium hydroxide required to prepare the total volume of solution

 for the class. (3 mks)

 **M = moles**

 **Vol (1)**

 **3 x 0.1 = x**

**X 3**

 **3**

 **X = 0.3 moles**

 **Moles = mass**

 **RFM**

 **4 x 0.3 = x**

**X 40**

 **40**

 **X = 12g**

26. The table below shows the values of solutions A, B, C and D.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Solution** | A | B | C |  D |
| **pH value** | 2 | 7 | 12 | 14 |

 (a) Which solution is likely to be that of magnesium hydroxide? (1 mk)

 **C**

 (b) Select the solution that reacts with calcium carbonate powder. Give a reason. (1 mk)

 **A – Its acidic**

27. Determine the volume of 2.0M NaOH which when diluted to 250cm3 would produce a

 0.8M NaOH solution. (2 mks)

 **M1V1 = M2V2**

 **2X x = 250 x 0.8**

 **2x**

 **= 200**

 **2**

 **2**

  **X = 100**

 **= 100cm3**