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

**SCHOOL:……………………………………………………SIGNATURE……………………………… DATE…………….……………………………….**

**233**

**CHEMISTRY**

 **(Theory)**

**TIME: 2 HOURS**

**FORM TWO**

**INSTRUCTIONS TO CANDIDATES**

* Write your name and Adm. number in the spaces provided.
* Answer ALL the questions in the spaces provided,

**FOR EXAMINERS USE ONLY**

|  |  |  |
| --- | --- | --- |
| Question | Maximum score | Candidates score |
| 1-22 | 70 |  |

*This paper consists of 10 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.*

**1.** The diagram below shows a bunsen burner when in use.

**A**

**B**

**Bunsen burner**

Name the regions labeled **A** and **B (2 marks)**

 **A……………………………………………………………………………**

 **B……………………………………………………………………………**

**2.** Both chloride and iodine are halogens

 **(a)** What are halogens **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**(b)** In terms of structure and bonding, explain why the boiling point of chlorine is lower than that of iodine **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**3.** A sample of urine from three students **F,G** and **H** suspected to have taken illegal drugs were sported onto a chromatography paper alongside two from illegal drugs **X** and **Y**. A chromatogram was run using methanol. The figure below shows the chromatogram.

**•**

**x**

**x**

**x**

**x**

**x**

**X**

**Y**

**F**

**G**

**H**

**•**

**•**

**•**

**•**

**•**

**•**

**•**

**Baseline**

 **(a)** Identify the student who had used an illegal drug **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** Which drug is less soluble in methanol **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**4.** Using dots (.) and crosses (x) to represent electrons, show bonding in the compounds formed when the following elements react ( Si = 14, Na = 11 and Cl = 17)

 **(a)** Sodium and chlorine **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** Silicon and chlorine **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**5.** Zinc oxide reacts with acids and alkalis.

 **(a)** Write the equation for the reaction between zinc oxide and;

 **(i)** Dilute sulphuric acid  **(1 mark) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(ii)** Sodium hydroxide solution **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** What property of zinc oxide is shown by the reaction in (a) above **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**6.** Use the information in the table below to answer the questions that follow. (The letters do not represent the actual symbol of the elements)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Element**  | **A** | **B** | **C** | **D** | **E** |
| Atomic number | 18 | 5 | 3 | 5 | 20 |
| Mass number | 40 | 10 | 7 | 11 | 40 |

**(a)** Which **two** letters represent the same element? Give a reason. **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** Give the number of neutrons in an atom of element **C** **(1 mark)**

**7.** When hydrogen gas is passed over heated lead (II) oxide, a reaction occurs. The diagram below shows a set up that could be used for this reaction

**Hydrogen**

**Burning**

**Lead (ii) Oxide**

**Heat**

 **Dry**

**Hydrogen**

 What observations would be made in the combustion tube? **(2 marks) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**8.** Both molten lead (II) chloride and graphite conduct electricity. State how each of the substances conduct

 electricity.

 **(i)** Graphite **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(ii)** Molten lead (II) chloride **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**9.** Substances J, K, L and M have the following properties.

|  |  |  |  |
| --- | --- | --- | --- |
| Substance | M.P. | Solubility in water | Electrical conductivity |
| Solid state | Liquid state |
| J | Low  | Soluble  | Does not | Does not |
| K | High  | Soluble | Does not | Conducts |
| L | High  | Soluble | Conducts | Conducts |
| M | High  | Insoluble | Does not | Does not |

1. Select the letter which represents a substance which is suitable for making kettle handles. **(1 mark)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(ii)** Which letter represents a substance which is likely to be sodium chloride? **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(iii)** Name the **structure** and **bond type** likely to be in J.

 **a)** Structure. **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

  **b)** Bond type. **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**10.** Starting with red roses, describe how:

 **(a)** A solution containing the red pigment may be prepared; **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** The solution can be shown to be an indicator  **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**11.** The following is a cooling curve of a certain substance.

**B**

**A**

Time (min)

Tem (0C)

 **(a)** Is this a pure or impure substance? Explain  **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** Explain using kinetic theory what happens in region **A**  **(2 marks) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**12.** **(a)** Distinguishing between weak and strong alkali **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** The following is a list of pH values of some substance:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Substance | **M** | **N** | **V** | **X** | **Z** |
| pH | 10.6 | 7.2 | 13.2 | 5.9 | 1.5 |

 Identify:

 **(i)** Strong acid **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(ii)** Weak base **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**13.** Ethanol and pentane are miscible liquids. Explain how water can be used to separate a mixture of

ethanol and pentane **(3 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**14.** The figure below shows part of sodium chloride crystal lattice.

**•**

**•**

**•**

**•**

1. Which ion are represented in

 **(i)** Larger circles (Ο)  **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(ii)** Smaller circle (•)  **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** Sodium chloride has a higher melting point than hydrogen chloride, explain. **(2 marks) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**15.** Elements **X** and **Y** have the atomic masses of 39 and 23 respectively.

 **(a)** Complete the table below by filling the blank spaces **(2 marks)**

|  |  |  |
| --- | --- | --- |
| **Elements** | **X** | **Y** |
| Atomic mass | 39 | 23 |
| Number of neutrons | 20 | 12 |
| Electronic configuration |  |  |

**(b)** Which element has a higher ionization energy? **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

  **(c)** Explain your answer in (b) above. **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**16**. Air was passed through several reagents as shown in the flow chart below.

Air

Concentrated potassium hydroxide solution

Excess hot copper turnings

Excess heated magnesium powder

Escaping gases

1. Write an equation for the reaction that took place in the chamber with the magnesium powder.

 **(1 mark) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

1. Name **one** gas that escapes from the chamber containing magnesium powder. Give a reason for your answer. **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**17**. When the air-hole is fully opened, the Bunsen burner produces a non-luminous flame. Explain. **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**18.** Element **T** consists of two isotopes 62**T** and 64**T** in the ratio 7 : 3 respectively. Calculate the relative

 atomic mass of element **T**.  **(3 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**19.** Study the diagram below and answer the questions that follow.

Boiling tube

Heat

Magnesium

Blue flame

Cotton wool soaked in water

Heat

1. State the observations that would be made when heat is applied. **(1 mark)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

1. Write chemical equations for the reactions taking place in :
2. The boiling tube **(1 mark)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

1. The blue flame **(1 mark)**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**20.** Briefly explain the following:

 **(a)** Alkaline earth metals are generally less reactive than-alkali metals. **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(b)** Though sodium and aluminum are in the same period and are both metals, aluminum is a better

 conductor of electricity.  **(2 marks)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**21**. The diagram **below** represents part of a set-up for preparing and collecting a dry sample of oxygen

 gas.

Liquid J

Sodium Peroxide

Tube

I

 **(a)** Complete the diagram. **(3 marks)**

 **(b)** Write the equation for the reaction in tube I. **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

 **(c)** State **one** commercial use of oxygen gas. **(1 mark)**

 **……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

1. The table below shows physical properties of some substances. Use the information in the table to answer the questions that follow.

|  |  |  |  |
| --- | --- | --- | --- |
| **Substance** | **Melting point 0C** | **Boiling point 0C** | **Electrical conductivity** |
| solid | Liquid |
| **M** | 1083 | 2595 | Good | Good |
| **N** | 801 | 1413 | Poor | Good |
| **O** | 5.5 | 80.1 | Poor | Poor |
| **P** | -114.8 | -84.9 | Poor | Poor |
| **Q** | 3350 | 4827 | Poor | Poor |

 Which substance is likely to be:

1. An ionic compound? Give reason **(2 marks)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

1. A liquid at room temperature? **(1 mark)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

1. Simple molecular? **(1 mark)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

1. Giant atomic?  **(1 mark)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

***SET 2***

**CHEMISTRY MARKING SCHEME**

**1.** **A** – yellow one (luminous flame) ✓1

 **B** – Region of unburnt gas (colourless zone) ✓1

**2.** **(a)** Elements found in group seven of the periodic tables/

 Elements with seven electrons in the outer shell *(rej. Salt forming)* ✓1

1. Chlorine exists in discrete gaseous molecules with negligible forces of attraction**✓1** between them

while iodine exists in layers held together by strong forces of attraction✓1

- Weak van der waals forces /inter molecular forces in chlorine while iodine has stronger intermolecular

**3. a)** G; **✓1**

 **b)** Y; **✓1**

**4.** **(a)** Sodium and chlorine**✓1**



+

Empty diagram loses mark

 ;

Cl

Na

 **(b)** Silicon and chlorine**✓1** 

**Cl**

**Cl**

**Cl**

**Cl**

x•

x•

x•

x•

**Si**

**5. (a) (i)** ZnO(s) + H2SO4(aq) → ZnSO4(aq) + H2O(l) **✓1**

 ZnO(s) + 2H+ (aq) → Zn2+ + H2O(l) →Na2Zn(OH)4(aq) **✓1**

 **(ii)** ZnO(s) + 2NaOH+(aq)+H2O(l) → Na2ZnO2(aq) + H2O(l) **✓1**

 ∴ ZnO(s) + 2OH-(aq) + H2O(l) → Zn(OH)2-

4

 ZnO(s) + 2OH2- (aq) → ZnO2- + H2O (l)

 **(b)** Amphoterism **✓1**

**6. (a)** **B** & **D; ✓1**

 **b)** 4 **✓1**

**7.** Yellow solid melts to orange. **✓1** A grey residue is formed/Lead (II) oxide will be residue and change to lead which is silvery balls of residue; colourless droplets on cooler parts ; of the tube **✓1**

**8.** **(i)** Graphite has a free delocalised electrons which is free to move and therefore make it a conductor of electricity **✓1**

**(ii)** Molten lead (II) chloride is charged (Pb2+ and Cl(-) / conduct by increment of ions, When connected to electricity in the ions. When connected to electricity by the ions will move and transport electrons so conduct electricity). **✓1**

1. **(i)** M **✓1**

**(ii)** K **✓1**

**(iii) a)** Simple molecular **✓1**

**b)** Covalent bonds**✓1**

**10. (a)** - Crush the roses with suitable solvent (methyl/ethanol/propanol) **✓1**

 - Filter to obtain pigments / decant suck with a dropper**✓1**

 **(b)** Add the pigments to an acid and base separately**✓1** and state colour change red and green

 respectively. **✓1**

**11.** **(a)** Impure **√ 1mk**

 It condensed and freezed √ 1mk over arrange of temperatures *Rej:* Melting point/boiling point

1. Particles of the substance in gaseous form are losing kinetic **√ ½mk** and come closer to one another, developing stronger interparticle forces of attraction. **√ ½mk**

**12.** **(a)** Weak alkali is the one that does not ionize completely in solution **√½mk** /less OH- ions

 while strong alkali is the one that undergoes complete ionization / many OH- ions **√ ½mk**

**(b) (i)** Z, **✓1**

 **(ii)** M **✓1**

**13.** Add water to the mixture √ Water mixes with the ethanol and forms the lower layer while upper layer is pentane.

 Use separating funnel; √ to separate pentane, and use fractional distillation; √ 1/2 to obtain ethanol from water √ 1.2

**14. a) (i)** Chloride ions / Cl- ions √ 1/2mk

 **ii)** Sodium ions / Na+ ions √ 1/2mk

1. Sodium Chloride has strong ionic bonds ; √ 1/2

 Which requires a lot of energy to √ 1/2mk break. While HCl has weak van der waal forces √ between its molecules that can easily break.√ 1/2mk

 X Y

**15. (a)** 2.8.8.1 **✓1** 2.8.1**✓1**

 **(b)** Y**✓1**

 **(c)** It has a smaller atomic radius than X and stronger nuclear attraction for outermost energy level electrons that makes electron loss more require more energy. **✓1**

**16.**

1. 3Mg(s) + N2 (g) Mg3N2(s)√
2. Argon - it is inert √

**17.** The laboratory gas burns in excess oxygen

 OR burns completely or produces CO2 and H2O only

 No unburnt carbon remains

 OR no soot is found produced. **✓1**

**18.** RAM = 7 x 62 + 3 x 64 √

 10 10

 = 43.4 + 19.2√ **= 62.6**√

**19.** **(a)** Magnesium burns with a brilliant white √ (½) flame to form a white residue. **✓1**

 **(b)** **(i)** Mg (s) + H2O (g) MgO (s) + H2 (g) (1)

 **(ii)** 2H2 (g) + O2 (g) 2 H2O (1)

1. **(a)**Because their outermost elections are strongly bound by the nucleus due to a bigger nuclear than the alkali metals**.(2mks)**
2. Aluminum has more delocalized electrons i.e. three of them wheas sodium has only one delocalized electron in the valency shell**. (2mks)**
3. **(a)**

Conc. sulphuric

(VI) acid

**🗸** Identifying of drying **🗸½**

 **🗸** Method of collection **🗸½**

 Accept any other correct drying agent

 e.g. CaCl2

 Workability  **🗸¹**

1. 2H2O(l) + 2Na2 O2(S) → 4NaOH(aq) + O2(g) **🗸¹**  **max 1** - 1mk for missing state symbols.

- 0mk for unbalanced equation

- 0mk for joining letters

1. – Purification of iron. **🗸¹**
	* In oxy-acetylene flames for welding.
	* Liquid oxygen used to boost rocket fuel. **(max 1)**
	* In deep sea diving/in mountain climbing.
	* In hospitals with patients with breathing difficulties.

**22. i.** N - does not conduct in solid state due to lack of delocalized ions

 **ii.** O

 **iii.** P

 **iv.** Q