**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ INDEX NO\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**CLASS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**233/1**

**CHEMISTRY**

**PAPER 1**

**(THEORY)**

**2HRS**

**TERM 1 2014 F4**

**MWAKICAN JOINT EXAM TEAM (MJET) - TERM 1 2014**

**CHEMISTRY**

**PAPER 1**

**(THEORY)**

**2HRS**

**INSTRUCTIONS TO CANDITATES**

1. **Write your name and index number in the spaces provided above**
2. **Answer all the questions in the spaces provided in the question paper**
3. **Mathematical tables and silent electronic calculators may be used**
4. **All working must be clearly shown where necessary.**

|  |  |  |
| --- | --- | --- |
| **QUESTIONS** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| **1-29** |  |  |
|  |  |  |

**This paper consist of 10 printed pages candidates should check the questions paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

1. Element A and B with atomic numbers 12 and 17 respectively react together
2. Write the electronic configurations of each

A ------------------------------------------------------ ( ½ mk)

B ------------------------------------------------------- ( ½ mk)

1. Write the formula of a the compound formed between A and B (1mk)
2. The table below shows the PH values of solutions A, B, C and D

|  |  |
| --- | --- |
| **SOLUTION** | **PH** |
| A | 2.0 |
| B | 7.0 |
| C | 10.0 |
| D | 14.0 |

1. Which solution is likely to be that of ammonia solution (1mk)
2. Select a solution in which a sample of aluminium oxide is likely to react. Give a reason for your answer (2mks)
3. A hydrocarbon was found to contain 92.3% carbon, and the remaining is hydrogen. If its molecular mass is 78, determine its molecular formula ( C =12, H=1) (3mks)
4. In an experiment, sulphur (IV) oxide was bubbled into water followed by chlorine gas. The resulting solution gave a white precipitate when mixed with Barium chloride. Explain these observations. (3mks)
5. Below is a set up of apparatus used to react ammonia gas with iron(II) chloride

Ammonia gas

 inverted funnel

 Dilute solution of iron (II) chloride

1. State the observation made in the beaker (1mk)
2. State the reason for using a funnel to deliver the ammonia into the beaker (1mk)
3. Write an ionic equation for the reaction that takes place (1mk)
4. a) State Graham’s law of diffusion (1mk)

b ) 200cm3 of methane diffused through a porous pot in 40secs. Calculate the time taken for the same volume of hydrogen chloride gas to diffuse under the same conditions (H = 1, C=12, Cl = 35.5 ) (2mks)

1. In an experiment, soap solution was added to three separate samples of water The table below shows volumes of soap solution required to form lather with 100cm3 of which sample of water before and after boiling.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SAMPLE I** | **SAMPLE II** | **SAMPLE III** |
| Volume of soap before water is boiled (cm3) | 25.0 | 5.0 | 10.0 |
| Volume of soap after water is boiled | 25.0 | 5.0 | 5.0 |

1. Which water sample is likely to be soft? Explain (1mk)
2. Explain the change in the volume of soap solution used in sample III (2mks)
3. Study the flow chart below and use it to answer the questions that follow

 HCl (aq) AgNO3(aq)

Solution

T

Sodium carbonate

Solid P

gas X

Solid Q

 Ca(OH)2 (aq) Excess Ca(OH)2 (aq)

SOLUTION L

1. Identify using chemical formula substances L,P,Q and X

L ( ½ mk)

P ( ½ mk)

Q ( ½ mk)

X ( ½ mk)

1. write an ionic equation for the reaction between T and silver nitrate solution (1mk)
2. The following thermo-chemical equations show the combustion of carbon and hydrogen. The heat of formation of ethane is also given.

 C+ O2  CO2  HC = -394KJ mol-1

 (s) (g) (g)

 H2 + ½ O2  H2O HC = -286KJ mol-1

 (g) (g) (g)

 2C+ 2H2  C 2H4 Hf = + 52.3 KJ mol-1

 (s) (g) (g)

Using the above information calculate the heat of combustion of ethane (3mks)

1. Starting with nitric (v) acid, distilled water, lead (II) carbonate and sodium sulphate crystals. Describe how you can prepare solid lead (II) Sulphate (3mks)
2. a) State the observation made when chlorine gas is bubbled through aqueous potassium iodide (1mk)

b) When chlorine water is left under sunlight its bleaching property is lost. Explain (1mk)

c) Workout the oxidation state of chromium in Cr2 O72- (1mk)

1. A solution of hydrogen chloride in methyl benzene goes not react with carbonates. However a solution of hydrogen chloride in water produces a vigorous effervescence with carbonates Explain the above observation (2mks)
2. The experiment below was used to study the effect of electric current on molten compound mx2

 

1. Identify from the above diagram the anode (1mk)
2. Write the equation of the reaction taking place at
3. Cathode (1mk)
4. Anode (1mk)
5. Hydrogen sulphide was passed through aqueous lead nitrate
6. State and explain the observation that was made (2mks)
7. Write an ionic equation for the above reaction (1mk)
8. Ammonia gas in solution dissociates according to the equation below

NH3+ H2 O NH4+ + OH-

(g) (l) (aq) (aq)

1. Identify the acidic species in the above equation (1mk)
2. Write the formula of the complex ion formed when ammonia is added to copper (II) Sulphate solution until in excess (1mk)
3. Solubility of Potassium chloride at 100°C is 39.8g/100g of water and at 80°C is 35.9/100g of water. If a saturated solution of Potassium chloride dissolved in 70g of water at 100°C is cooled to 80°C, Calculate the mass of potassium chloride which will be deposited (3mks)
4. When excess carbon (II) oxide gas was passed over heated lead (II) oxide in a combustion tube, lead(II) oxide was reduced.
5. Write an equation for the reaction which took place (1mk)
6. What observation was made in the combustion tube when the reaction was complete (1mk)
7. Name another gas which could be used to reduce lead (II) Oxide (1mk)
8. 8 g of methanol require 178 KJ to vaporize completely. Calculate the heat required to vaporize one mole of methanol completely (C = 12.0, H =1.0, O =16.0 ) (2mks)
9. Given a sample of concentrated sulphuric acid was left in an open beaker in a room for two days, the volume was found to have increased slightly.
10. What property of concentrate sulphuric acid is shown by the above reaction (1mk)
11. State one use of concentrated sulphuric acid that depends on the above property (1mk)
12. State another use of sulphuric acid. (1mk)
13. Study the information given in the table below and answer the questions below the table.

|  |  |
| --- | --- |
| **BOND**  | **BOND ENERGY KJ mol-1** |
| C-H | 414 |
| Cl-Cl | 244 |
| C-Cl | 326 |
| H-Cl | 431 |

Calculate the enthalpy change for the reaction (3mks)

 CH4 + Cl2 C H3 Cl + HCl

 (g) (g) (g) (g)

1. The set up below shows a reaction between magnesium ribbon and steam.

 

1. Identify gas X (1mk)
2. Write an equation for the reaction between the magnesium ribbon and steam (1mk)
3. Name two other metals that react with steam. (1mk)
4. The molecular formula of a hydrocarbon is C6H14. The hydrocarbon can be converted into two other hydrocarbons as shown below

 heat

C6H114 + Cl2 X + C3 H8

1. What name is given to the above process (1mk)
2. Draw the possible structure of X (1mk)
3. State the observations made if a few drops of bromine water are added to a sample of X (1mk)
4. The table below shows some properties of some elements in period 3 of the periodic table

|  |  |  |  |
| --- | --- | --- | --- |
| **ELEMENT** | **SODIUM** | **MAGNESIUM** | **ALUMINIUM** |
| Melting point  | 97.8 | 650 | 660 |
| Atomic radii (nm)  | 0.152 | 0.136 | 0.125 |

Explain the trend of

1. Melting points from sodium to aluminium (1 ½ mks)
2. Atomic size of atoms from sodium to aluminium (1 ½ mks)
3. Red hot carbon was found to remove oxygen from the oxides of metals A, B, C but not from the oxide of D. metal C removes oxygen from the oxide of metal A but not from the oxide of metal A but not from the oxide of metal B. Arrange the metals A, B,C, D in increasing order of their reactivity (2mks)
4. Study the flow chart below and use it to answer the questions that follow.

colourless solution

 NaoH(aq) STEP I Excess NaOH (aq)

solution K

white precipitate

 Excess Ammonia solution STEP II Dilute HCl (aq)

white precipitate L

colourless solution

1. Write the formula of the metal ion in solution K (1mk)
2. Name the white precipitate L (1mk)
3. What property of the white precipitate is illustrated in steps I and II (1mk)
4. 25cm3 of 0.12m Potassium hydroxide was neutralized by 30.0cm3 of a solution of a dibasic acid ( H2x) containing 3.15 g per 500cm3 . Calculate
5. The morality of the acid solution (2mks)
6. The relative formula mass of the acid (1mk)
7. Oxygen can be prepared in the laboratory using the set up below

 

1. Name liquid Q and solid R

Q\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( ½ mk)

R \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( ½ mk)

1. Complete the set up to show how the oxygen gas produced is collected (1mk)
2. Write an equation to show how oxygen is obtained from liquid Q and solid R (1mk)
3. The atomic numbers of element W and X are 14 and 17 respectively. W and X are not the actual symbols of the elements ) illustrate the type of bonding present in the compound formed when the two react using dots

(**.**) and crosses (x) (3mks)

1. Hardwater reacts with sodium stearate which is a soapy detergent to form scum. Given that the chemical formula of sodium stearate is c17 H35 COONa, write the chemical formula of scum (1mk)