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

**INDEX NO. ……………..…………..**

**SIGNATURE ……………..…………..**

**233/1**

**CHEMISTRY**

**(THEORY)**

**PAPER 1**

**JULY/AUGUST 2017**

**TIME: 2 HOURS.**

**ST. CLARE GIRLS’ HIGH SCHOOL,GATITU.**

***Kenya Certificate of Secondary Education.***

**233/1**

**CHEMISTRY**

**(THEORY)**

**PAPER 1**

**TIME: 2 HOURS.**

**INSTRUCTIONS TO CANDIDATES.**

1. Write your **NAME** and **INDEX NUMBER** in the space provided above
2. Sign and write the date of examination in the spaces provided above
3. Answer **ALL** the questions in the spaces provided
4. **ALL** working must be clearly shown where necessary.
5. Mathematical tables and silent electronic calculators may be used.
6. This paper consists of 9 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

**FOR EXAMINER’S USE ONLY.**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum score** | **Candidate’s score** |
| **1 − 28** | **80** |  |
| **Total score** | **80** |  |

233/1

Chemistry

(Theory) Paper 1

1. Solutions can be classified as acids, bases or neutral. The table below shows solutions and their pH values

|  |  |
| --- | --- |
| Solution | Ph – values |
| K | 1.5 |
| L | 7.0 |
| M | 14.0 |

1. Select any pair that would react to form a solution of pH 7 (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Identify two solutions that would react with aluminium hydroxide. Explain (2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. 9.12g of a gaseous compound contain 8g of silicon while the rest is hydrogen. Determine the empirical formula of the compound. (H = 1, Si = 28) (3 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. The scheme below shows various reactions starting with ammonia. Study it and answer the questions that follow.

Ammonia

Compound R

Nitric Acid

Solution P

Copper II Oxide

Aqueous

Potassium Nitrate

Sulphur

(i) Oxygen + Catalyst

(ii) Water

Step I

 Step III

 H2S(g)

Cu(s)

Brown solid Q

Step IV

Step II

 Heat

(i) Name the catalyst used in step I (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(ii) Explain how the reaction in step III takes place (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(iii) Name the process that takes place in step II (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(iv) Write the formula of compound R (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(v) Calculate the percentage of nitrogen by mass in R. (1 Mark)

 (N = 14 ; H = 1; O = 16)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. When iron metal is being axtracted from siderite (FeCO3). What must be done first before extraction and why? Use equations to support your answer (3 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Oxygen gas can be prepared in the laboratory by heating potassium nitrate.

(a) Write the equation of reaction to show the decomposition of potassium nitrate (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) State two physical properties of oxygen gas (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

 (c) Outline one industrial use of oxygen gas (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. 12.0cm3 of 0.05M hydrochloric acid reacted with calcium hydrogen carbonate to form calcium chloride, water and carbon (IV) oxide.

(a) Write the chemical equation for the reaction (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) Calculate the number of moles of hydrochloric acid used (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(c) Determine the number of moles of calcium hydrogen carbonate used (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. On complete combustion of a hydrocarbon 3.52g of carbon IV oxide gas and 1.44g of water were formed. Determine the molecular formula of the hydrocarbon

(RMM of hydrocarbon = 56.0, C = 12, O = 16, H = 1) (3 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. The arrangement below was used to compare the penetrating power of emissions in a radioactive decay.

 N Source Paper Zinc plate Lead block

 F G H

(a) Name the radioactive that can be detected at F, G, H (1½ Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) Name the material N (½ Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. The half-life of $\begin{matrix}234\\92\end{matrix}$ is 4500 years. The isotope decays by alpha emission. Write a nuclear equation for its decay to form Thorium (Th) (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. (a) State two differences between a luminous flame and a non-luminous flame (2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) The apparatus below is commonly used in a chemistry laboratory. Give its name and state it use

 (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Study the set-up below and answer the questions that follow.

Flame

Oxygen gas

Glass tube

Glass wool

Gentle warming

Aqueous ammonia

(a) Why is aqueous ammonia warmed gently? (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) What is the colour of the flame? (1 Mark)

…………………………………………………………………………………………………………

(c) Write the chemical equation for the reaction that takes place (1Mark)

 …………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. (a) What is meant by solubility? (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) In an experiment to determine the solubility of solid x in water at 300C the following results were

obtained;

Mass of evaporating dish = 26.2g

Mass of evaporating dish + saturated solution = 42.4g

Mass of evaporating dish + dry solid x = 30.4g

Using the information, determine the solubility of solid x at 300C in g/100g water. (2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. A form one student set-up the following apparatus to investigate the percentage of oxygen in air.

c

 Sodium

Hydroxide

a

b

(a) (i) Why is sodium hydroxide preferred to water in the above experiment? (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

 (ii) Write an equation to show how the percentage of oxygen can be calculated (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. A balloon contains 80cm3 of gas at 300C and 4 atmospheres. Calculate the volume of the balloon at 500C and 2 atmospheres. (3 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Study the set-up below for electrolysis of copper (II) sulphate using copper electrodes.

C

Switch

Cell

Bulb

Copper electrode

Copper electrode

Copper II Sulphate

1. Write ionic equations for reactions that took place at

I Anode (½ Mark)

…………………………………………………………………………………………………………

II. Cathode (½ Mark)

…………………………………………………………………………………………………………

1. State the observation made at each electrode

I. Anode (½ Mark)

…………………………………………………………………………………………………………

II. Cathode (½ Mark)

…………………………………………………………………………………………………………

1. State and explain the observations made on the electrolyte (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. If 25cm3 of 0.1M H2SO4 solution neutralized a solution contain 1.06g of sodium carbonate in 250cm3 of solution, calculate the morality and volume of sodium carbonate solution. (Na = 23, O = 16, C = 12)

(3 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. 50cm3 of oxygen gas diffused through a porous plug in 80 seconds. How long will it take 100cm3 of sulphur (IV) oxide to diffuse through the same plug? (S = 32, o = 16) (3 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. (a) State the role of the following parts during fractional distillation of a mixture of water and ethanol

(i) Glass beads in the fractionating column (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(ii) Fractionating column (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) State any one application of fractional distillation (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

Hydrogen

Lead (II) Oxide

Heat

Anhydrous

Calcium Chloride

Hydrogen flame

(i) Write an equation for the reaction that takes place in the tube (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(ii) What property of hydrogen makes this reaction possible? (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(iii) What would you expect to happen, if sodium oxide (Na2O) was used instead of Lead (II) oxide?

(1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. The formula given below represents a portion of a polymer.

H H H H

 C C C C

 H H

 n

(a) Give the name of the polymer (1 Mark)

…………………………………………………………………………………………………………

 (b) State one disadvantage of continued use of this polymer (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Ammonia can be converted to nitrogen II oxide as shown in the equation below.

4NH3(g) + 5O2 (g) 4NO(g) + 6H20(g)

Energy

Reaction path

4NO(g) + 6H20(g)

4NH3(g)+

5O2(g)

(a) Explain how an increase in temperature would affect the yield of nitrogen (II) oxide (2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) On the energy level diagram above sketch the energy level diagram that would be obtained if the

reaction is carried out in the presence of a platinum catalyst. (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. The chromatogram of two inks and three dyes is drawn below.

Ink INK B RED BLUE YELLOW

A B DYE DYE DYE

(a) Name the colours of ink A (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) Suggest how separated components can be recovered (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(c) Suggest two reasons why separations occur in this method (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. 16g of ethanol (C2H5OH) were completely burnt in air. The heat evolved the temperature of 600cm3 of water to change from 200 to 850C. Calculate the molar enthalpy of combustion of ethanol.

(H = 1, C = 12, O = 16. Specific heat capacity of water = 4.2KJKg-1K-1) (3 marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. A gaseous compound consists of 86% carbon and 14% hydrogen by mass. At s.t.p 3.2dm3 of the compound has a mass of 6g. (C = 12, H = 1 M.G.V at s.t.p = 22.4dm3)

(a) Calculate its empirical formula. (2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) Calculate the molecular formula (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. (a) With a reason define the term alkaline earth metals (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) In order, name the first two alkaline earth metals. (Give their chemical syllabus) and their electronic

arrangement. (2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. (a) Why is reaction between calcium and dilute sulphuric (VI) acid not used in preparation of hydrogen

gas

(2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) Calcium is an element in period 2, what do members of the period have in common? (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Given element W has atomic number 14 and consists of isotopes as shown below.

Isotope A B C

Isotope mass 28 29 30

Percentage abundance 92.2 4.7 3.1

(a) What are isotopes? (1 Mark)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

(b) Determine the relative atomic mass of W (2 Marks)

…………………………………………………………………………………………………………

…………………………………………………………………………………………………………

 THIS IS THE LAST PAGE PRINTED.

 CHEMISTRY TEACHERS WISHING YOU SUCCESS.