**NAME…………………………………………… ADM NO…………………CLASS……**

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| **MAXIMUM SCORE** | **STUDENTS**  **SCORE** |
| **80** |  |

**END**

**YEAR EXAMINATIONS 2019**

**FORM THREE**

**CHEMISTRY PAPER 1** CODE: **233/1**

**TIME 2 HOURS**

**INSTRUCTIONS TO CANDIDATES**

* *Write your name, class and Admission Number in the spaces provided above.*
* *Answer* ***ALL*** *questions in the spaces provided.*
* *Mathematical tables and electronic calculators may be used.*
* *All workings* ***must*** *be clearly shown where necessary.*

1. Explain why burning magnesium continues to burn in a gas jar full of sulphur (IV) oxide while a burning splint would be extinguished. (3 marks)
2. Draw structural formulae and name two positional isomers with molecular formula C4H8. (2 marks)

1. Dry Hydrogen chloride gas was made to dissolve in water using the set of apparatus shown below



(a) What is the use of the inverted funnel? (1 mark)

(b) State and explain the observations made on the litmus paper (2 mark)

(c) State and explain the observation made on the litmus paper if methylbenzene is used instead of water in the above set up. (2 mark)

1. Using sodium hydroxide solution, describe a chemical test that can be used to distinguish between copper (II) ions and iron (II) ions (2 marks)
2. The flow chart below shows laboratory preparation of chlorine gas. Study it and answer the questions that follow:

**Mn O2 + W**

**Heat**

**Water**

**Y**

**Cl2(g)**

**Dry chlorine gas**

(a) Name substances (2 marks)

W-…………………………………………Y-…………………………………

(b) What is the function of water in the above set up? (1 mark)

1. An unknown mass of anhydrous potassium carbonate was dissolved in water and the solution made up to 200cm3. 25cm3 of this solution neutralized 18.0cm3 of 0.22M nitric (v) acid. Calculate the unknown mass of potassium carbonate (**K**=39, **C**=12, **O**=1) (3 marks)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | | | |  |
|  |  |  |  |  |  |  |  |  |
| I |  |  |  |  | Q | M |  |
|  | J |  |  |  |  |  | N |  |
| K | L | P |  |  |  |  |  |

1. Below is a sample of the periodic table

a) Give the family name to which elements **M** and **N** belong (1 mark)

(b) Compare the reactivity of elements **I** and **K**. Give a reason (2 mark)

(c) Write the formula of the compound formed when **P r**eacts with **Q**  (1 mark)

1. Study the experimental set up of apparatus shown below.



(i) State two observations made in the set up as the experiment progressed (2 marks)

(ii) Using an equation, explain the change that occurred in the boiling tube (1 mark)

(iii) Why was the gas burned in the flame? (1 mark)

1. Painting, oiling, galvanizing and tin plating are methods of rust prevention.

(a) Explain the similarity of these methods in the way they prevent rusting (1 mark)

(b) Explain why galvanized iron objects are better protected even when scratched (1mark)

1. The chemical equations below are the main reactions in large scale manufacture of sodium carbonate.

NH3(g) + CO2(g) + H2O(l) NH4HCO3(aq)

NH4HCO3(aq)  + NaCl(aq) Nahco3(s) + NH4Cl(aq)

(a) Explain how the two products NaHCO3 and NH4Cl are separated (1 mark)

(b)How sodium carbonate is finally obtained from NaHCO3? (1 mark)

(c) Explain how ammonia is recovered in this process. (1 mark)

1. 80 cm3 of oxygen gas diffused through a porous hole in 50 seconds. How long will it take 120cm3 of Nitrogen (IV) oxide to diffuse through the same hole under the same conditions? (N =14, O=16) (3 marks)

1. Filtration is carried out in the apparatus shown



Name : (2 marks)

X *…………………………….*  Y *………………………….*

1. Two carbonates **P** and **Q** are weighed before and after heating. The results are given in the table below.

|  |  |  |
| --- | --- | --- |
| Carbonate | Mass in grams | |
|  | Before heating | After heating |
| P | 15.0 | 15.0 |
| Q | 15.0 | 10.0 |

Which one is likely to be sodium carbonate? Explain. (2 marks)

1. Describe how you would separate a solid mixture of lead(II) chloride and copper(II) oxide (3 marks)
2. The general formula for a homologous series of organic compounds in CnH2n+2

(a) Give the name and structural formula of the fourth member of the series (2 marks)

(i) Name ………………………

(ii) Structural formula

(b) Write an equation for the combustion reaction of the above molecule (1mark)

1. The scheme below shows some reactions sequence starting with solid **N**. Study it and answer the questions that follow:

**Excess NH3(aq)**

**Few drops of** **NH3(aq)**

**Solution P**

**White precipitate**

**Colourless solution Q**

**Gas R which explodes**

**With a pop sound**

**Solid N**

**Dil**

**HCl(aq**)

(a) Identify solid N…………………………………………………………………………… (1 mark)

b) Write the equation for the formation of the colourless solution Q (1 mark)

c) Give the identity of gas R (1 mark)

1. In an experiment, a gas jar containing moist sulphur (IV) oxide was inverted over another gas jar containing hydrogen sulphide gas.

(a) State and explain the observation that was made (2 marks)

(b) State the precautions that should be taken when carrying out this experiment (1 mark)

1.  The graph below shows the behavior of a fixed mass of a gas at constant temperature

(a) What is the relationship between the volume and pressure of the gas? (1 mark)

(b) 3 litres of oxygen gas at one atmosphere pressure were compressed to two atmospheres at constant temperature. Calculate the new volume occupied by the oxygen gas. (2 marks)

1. The table below shows the relative atomic masses and percentages abundance of the isotopes **M1** and **M2**of element **M**

|  |  |  |
| --- | --- | --- |
|  | Relative abundance | % abundance |
| **M1** | **60.57** | **59.71** |
| **M2** | **62.83** | **40.29** |

Calculate the relative atomic mass of element **M** (2 marks)

1. The table below shows the pH values of solutions **A,B,C** and **D**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| solution | A | B | C | D |
| pH | 2 | 7 | 11 | 14 |

(a) Which solution is likely to be that of calcium hydroxide (1 mark)

(b) Select the solution in which a sample of aluminum oxide is likely to dissolve. Give a reason for your answer

(1 mark)

1. Name one property of neon that makes it possible to be used in electric lamps. (1mark)
2. Distinguish between ionic bond and covalent bond (2 marks)
3. Explain why the boiling point of hexane is higher than that of ethane. (relative molecular mass of ethane is **30** while that of hexane is **86**) (2 marks)
4. When a student was stung by a nettle plant, a teacher applied an aqueous solution of ammonia to the affected area of the skin and the student was relieved of pain. Explain (2 marks***)***
5. Using dots(.) and crosses (x) show the bonding (3mks)
6. NH4+
7. Carbon (IV) oxide.
8. Potassium chloride
9. On complete combustion of a hydrocarbon gas X, 1.32g of carbon (IV) oxide and 0.54g of water. Calculate the empirical formula of X (C = 12.0, H = 1, O = 16.0) (3 marks)
10. Study the diagram below and answer the questions that follow. (3 marks)

Gas jar

Dilute

Hydrochloric acid

Clamp

Liquid **Z**

Zinc granules

(a) Write an equation for the reaction between zinc granules and dilute hydrochloric acid. (1 mark)

(b) What property of hydrogen is demonstrated by the method of collection shown on the diagram? (1 mark)

1. Hydrogen gas passed through liquid **Z**. What is the name of liquid **Z** and what is the purpose of liquid **Z**? **(2 mark)**
2. Name one industrial use of hydrogen. (1 mark)
3. Three liquids were mixed together accidentally and this included lubricating oil, kerosene and water. The table below gives information about the properties of the liquids.

|  |  |  |  |
| --- | --- | --- | --- |
| Constituent | Boiling point in 0C | Solubility in water | Solubility kerosene |
| Lubricating oil | 350 – 400 | Insoluble | Soluble |
| Kerosene oil | 175 – 250 | Insoluble |  |
| Water | 100 |  | Insoluble |

Suggest a method you would use to separate the three liquids. (2 marks)

1. a) Define the term allotropy (1mk)

b) Name the two allotropes of sulphur (2 mks)

1. A concentrated solution of Sulphuric (VI) acid contains 70% H2S04 and has a density of 1.8g cm3. Determine the molarity of Sulphuric (VI) acid solution. (H= I, S=32, 0=16) (3 mrks)