**CHEMISTRY PAPER 1**

**END OF TERM 1 EXAM -2022**

**FORM THREE**

**MARKING SCHEME:**

1. (a) Give the main allotrope of sulphur. (2mks)

* ***Rhombic***
* ***Monoclinic***

(b) Define transition temperature. (1mk)

* ***Temperature at which one allotrope of an element changes to another.***

1. The figure below shows industrial manufacture of hydrochloric acid. Use it to answer the following question.

*Diagram*

1. Identify gas X. (1mk)

***Dry chlorine gas.***

1. Give three uses of hydrochloric acid. (3mks)

* ***Removing rust from metal***
* ***Treatment of water via chromation***
* ***Sewage treatment.***

1. Give two oxides of sulphur. (2mks)

* ***Sulphur (IV) oxide (SO2)***
* ***Sulphr (III) oxide (SO3)***

1. Give one use of sulphur. (1mk)

* ***Manufacture of sulphuric (VI) acid.***

1. (a) Define crystallization. (1mk)

***This is the process by which crystals are formed when solution are heated to saturation.***

1. A student added some pure potassium nitrate crystals to cold water and stirred the mixture. A few of the crystals did not dissolve at room temperature.
2. Give a reason why some crystals did not dissolve. (1mk)

***The solution reached the saturation point.***

1. What would happen if the contents of the mixture in a beaker were warmed? Explain. (2mks)

***All the solution will dissolve. Temperature increase solubility.***

1. Name two substance that can be reacted to give copper (II) sulphate. (1mk)

***Copper metal + dilute sulphuric acid → Copper (II) sulphate***

1. Ammonia gas was passed into water as shown below.

Water

NH3(g)

1. When a red litmus paper was dropped into the resulting solution, it turned blue. Give a reason for this observation. (1mk)

***Ammonia gas hydrolysed to form hydroxide OH- which is basic***

1. What is the function of the funnel? (1mk)

***Funnel prevent the water from ‘sucking back’ into flask. Hence provide large surface area for absorption of ammonia.***

1. The diagram below is set-up for the laboratory preparation of oxygen gas.
2. Name solid R. (1mk)

***Manganese (IV) oxide***

1. Name the apparatus X. (1mk)

***Dropping funnel***

1. Write an equation for the reaction that takes place in the flask. (2mks)

MnO2

***3H2O2(g) O2(g) + 3H2O(l)***

1. An element Y has electronic arrangement of 2.8.5.
2. State the period and the group which the element belong. (2mks)

***Period (III), group (V)***

1. Write the formula of the most stable ion formed when the element Y ionizes. (1mk)

***Y3-***

1. Lithium has two isotopes with mass number 6 and 7. If the R.A.M (relative atomic mass) of Lithium is 6.94, determine the percentage abundance of such isotope. (3mks)

***Let x and y be related abundance***

1. Give the name of each of the following processes described below when salts are exposed to air for some time.
2. Anhydrous copper (II) sulphate becomes blue.

***Hygroscopic***

1. Magnesium chloride forms an aqueous solution.

***Deliquescence***

1. Fresh crystals of sodium carbonate Na2CO3.10H2O covered with a white powder of formula Na2CO3H2O.

***Efflorescence***

1. A hydrated salt has the following composition by mass; (3mks)

Iron 20.2%, oxygen 23.0%, sulphur 11.5%, water 45.3%. Its relative formula is 278. (Fe=56, S=32, O=16)

1. Determine the formula of hydrated salt. (3mks)

|  |  |  |  |
| --- | --- | --- | --- |
| ***Fe*** | ***S*** | ***O*** | ***H2O*** |
|  |  |  |  |
| ***0.3625*** | ***0.3593*** | ***1.4375*** | ***2.5767*** |
| ***1*** | ***1*** | ***4*** | ***7*** |
| ***FeSO4.7H2O*** | | | |

1. When magnesium is burnt in air it reacts with oxygen and nitrogen gas giving a white ash. Write two equations for the two reactions that take place. (3mks)

***2Mg(s) + O2(g) → 2MgO(s)***

***3Mg(s) + N2(g) →Mg3N2(s)***

1. The set-up was used to collect gas F, produced by the reaction between water and calcium metal.

Beaker

Gas F

Water

Calcium metal

Test tube

1. Name gas F. (1mk)

***Hydrogen gas***

1. At the end of the experiment, the solution in the beaker is a weak base. Explain. (2mks)

***Form hydroxide which is an alkaline solution.***

1. Give the laboratory use of solution of solution formed in the beaker. (1mk)

***Used to test presence of carbon (IV) oxide.***

1. The grid below sow part of the periodic table. The letters are not the actual symbol of the element.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | | | |  |
|  |  |  |  | G |  |  | K |  |
|  |  |  | H |  |  | I |  |
| F |  |  |  |  |  | ***J*** |  |  |

1. Select;
2. Element which has the largest atomic radius. (1mk)

***F***

1. Most reactive non-metal. (1mk)

***K***

1. Show on the grid the position of element ‘J’ which forms J-2 ions with electronic configuration of 2.8.8.8. (1mk)
2. Write the equation between element F and I. (2mks)

***F(s) + 2I(g) → FI2(s)***

1. Use dots (.) and crosses (x) to represents electrons. Draw diagram to show bonding in
2. (i) NH+4 (1mk)

(ii) H3O+  (1mk)

(iii) CO2 (1mk)

1. In terms of structure and bonding, explain why graphite is used as a lubricant. (2mks)

***Graphite has weak van der waals forces which make them to slide over each other.***

1. The following diagram, show the structure of two allotropes of carbon. Study them and answer the questions that follow.

*diagram*

1. Name the allotropes. (2mks)

M - …***Graphite***

N - …***Diamond***

1. Give one use N. (1mk)

***Use to make ornament***

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

Solid H

*Heat*

Carbon (IV) oxide

Solid J

Ca(OH)2(aq)

*H2O*

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

***CaCO3***

1. State one commercial use of solid H. (1mk)

***Used in making glass***

1. Ammonium nitrate was gently heated and the products collected as shown in the diagram below.

Describe one chemical test and physical properties that can be used to identify gas G. (3mks)

* ***Physical properties it has a faint sweet smell.***
* ***Chemical properties – when a glowing wooden splint is brought in the jar containing the gas, it relight the glowing splint.***

1. Form two student in an attempt to prevent rusting, put copper and zinc in contact with iron as shown below.

Iron

Iron

Zinc

Copper

X

Y

State what would happen in the set up X and Y. (2mks)

***Rust will occur in X but no rust in Y. reason, copper is higher in reactivity series than iron hence form rust.***

1. Explain how you would separate a mixture of ammonium chloride and sodium chloride into its pure components. (2mks)

***Put both Ammonium chloride and sodium chloride in a beaker. Cover using a watch glass. Heat the mixture, Ammonium chloride shall sublime leaving behind sodium chloride in the beaker.***

1. Calculate the mass of lead (II) nitrate that must be heated to give 22.3g of lead (II) oxide. (pb = 207, N=14, O=16) (3mks)

***2Pb(NO3)2 → 2PbO + 4NO2 + O2***

***Moles PbO =***

***Mass = RFM No. of moles***

***331 0.1***

***= 33.1g***

1. 0.84g of aluminium reacted completely with chlorine gas. Calculate the volume of gas used. (Molar gas volume is 24dm3, Al=27) (3mks)

***2Al + 3Cl2 → 2AlCl3***

***Moles of Al =***

***Mole = 24dm3***

***0.045***

***0.045***

1. State Gay Lussac’s Law. (1mk)

***When gases reacts, they do so in volumes that bear a simple ratio to one another and to the volumes of the product if gaseous, temperature and pressure remaining constant.***

1. In an experiment 20cm3 of sulphur (IV) oxide are found to react completely with 10cm3 of oxygen to produce 20cm3 of sulphur (VI) oxide. Determine the equation for the reaction. (3mks)

***SO2(g) + O2(g) → SO3***

***20cm3  10cm3 20cm3***

***2 vol 2 vol 2 vol***

***Mole rate 2:12***

***The balanced equation***

***2SO2(g) + O2(g) → 2SO3(g)***

1. Define absolute temperature. (1mk)

***This is the temperature at which the volume of the gas is assumed to be zero.***

1. At 27oC and 740mmHg pressure, a sample of nitrogen gas occupies 30cm3, what will be its volume at standard temperature and pressure (s.t.p) (3mks)
2. Complete the following equation and balance. (3mks)

Heat

NH4NO2 ***N2(g) + 2H2O(g)***

Heat

KNO3 ***KNO2(s) + O2(g)***

Pb(NO3) ***PbO + NO2 + O2***

1. The molecular formula of gas R is 28 and its empirical formula is CH2. (C=12, H=1)

Determine the molecular formula of gas R. (2mks)

***(CH2)n = 28***

***14n = 28***

***n = 2***

***(CH2)2 = C2H4***

1. (a) Define the terms:
2. Electrolyte - (1mk)

***A substance which conducts electricity in molten or aqueous state.***

1. Electrolysis - (1mk)

***Decomposition of an electrolyte by passing an electric current through it.***

(b) Explain the difference in conductivity between magnesium and molten magnesium chloride. (1mk)

***Magnesium uses delocalized electrons while MgCl2 (molten) uses mobile/ free ions.***

1. 30cm3 of hydrogen gas were reacted with 40cm3 of oxygen according to the equation.

2H2(g) + O2(g)  2H2O(g)

Identify the gas that was in excess and by how much volume? (2mks)

***2H2 + O2 → 2H2O***

***30cm3 15cm3***

***Oxygen was in excess by 40 – 15 = 25cm3***