**END TERM 1-2023**

**CHEMISTRY PAPER 1(233/1)**

 **FORM THREE (3)**

 **TIME: 2 HOURS**

**Name …………………………………………….……… Adm. Number…………………………..**

**Candidate’s Signature ………………….…...……….. Date……………………………………**

**Instructions to candidates**

1. Write your name, stream, and admission number in the spaces provided above.
2. Answer **ALL** the questions in the spaces provided, and working **MUST** be clearly shown
3. This paper consists of **9 printed pages**; Candidates should check the question paper to ascertain that all the pages are printed as indicated, and that no question is missing.

**FOR EXAMINERS’ USE ONLY**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| **1 – 28** | **80** |  |

1. Chewing chalk has been used for many years to reduce excess acid in the stomach. The indigestion tablet often contains magnesium carbonate.
2. Write a chemical equation to show the reaction that occurs in the stomach when the tablet is taken (1 mark)

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1. Give **two** other applications of acid-base reactions (2 marks)

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1. A luminous flame of a Bunsen burner is bright yellow in colour. Explain this phenomenon (1 mark)

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1. Differentiate between a mixture and a compound. (2 marks)

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1. Complete the table below. (3 marks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Representation** | **Atomic number** | **Number of neutrons** | **Mass number** | **Electron configuration** |
| $\begin{matrix}39\\19\end{matrix}$M |  | 20 |  |  |
| $\begin{matrix}\\_\\\\_\end{matrix}$W |  |  | 31 | 2.8.5 |

1. The chart below represents a reaction scheme. Study it and use it to answer the questions that follow



1. Identify solution **N** and solid **K**. (1 mark)

Solution **N** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Solid **K** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. State an expected observation made in **step 1** (1 mark)

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1. Name the type of chemical reaction in **step 2** (1 mark)

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1. 20cm3 sulphuric (VI) acid sample required 25cm3 of 0.16M potassium hydroxide solution for complete neutralization. Determine the molar concentration of the acid. (3 marks)

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1. The diagram below represents part of a setup arranged for the collection of hydrogen gas in the laboratory. Study it and answer the questions that follow.



1. Complete **the diagram** to show how a dry sample of hydrogen can be collected. (3 marks)
2. Give the most suitable identity of solid **Z**. (1 mark)

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1. State and explain how the conductivities of sodium and potassium compare. (2 marks)

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1. State **two** applications of the effect of impurities on the melting point of a substance (2 marks)

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1. An element has two isotopes **Q** and **V** with mass numbers 28 and 29 respectively.
2. What are isotopes? (1 mark)

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1. Determine the percentage abundance of **Q** and **V** given that the relative atomic mass of the element is 28.09 (3 marks)

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1. Below, is a table of the first ionization energies of some metallic elements. The letters do not represent actual symbols of elements.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Metal** | A | B | C | D |
| **First ionization energy (kJ/mole)** | 494 | 418 | 519 | 376 |

1. Arrange the metals in their order of decreasing reactivity. (1 mark)

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1. Identify the metal with the highest melting point. (1 mark)

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1. State **one** factor that affects the magnitude of ionization energy. (1 mark)

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1. State Graham’s Law of diffusion. (1 mark)

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1. On the axes provided below, sketch the curve that verifies Boyle’s Law. (2 marks)



1. State **two** laboratory apparatus that are used to measure fixed volumes. (2 marks)

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1. State the use of a desiccator in the laboratory. (1 mark)

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1. Excess samples of magnesium and copper were burnt in separate vessels with equal and fixed volumes of air. Explain the difference in volume of air used in the two vessels at the end of the experiment. (3 marks)

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1. Study the table below and use it to answer the questions that follow. The letters do not represent actual elements.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element** | G | H | I | J |
| **Atomic number** | 11 | 12 | 16 | 18 |

1. Compare the atomic sizes of elements **H** and **I**. Explain. (2 mark)

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1. Identify an element that forms an oxide with acidic properties. (1 mark)

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1. The statements below are attributes of hydrogen gas. Give reasons for the properties mentioned.
2. An advantage of inflating aeroplane tyres with hydrogen gas. (1 mark)

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1. A disadvantage of inflating aeroplane tyres with hydrogen gas. (1 mark)

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1. List **two** industrial uses of hydrogen. (2 marks)

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1. A measuring cylinder was used for investigating a certain property of concentrated sulphuric (VI) acid. The setup was left open in the fume chamber for two days without interference. **Figure 1** illustrates the initial condition of the acid in the measuring cylinder.



1. Draw the expected level of the acid in **Figure 2** after being left in the fume chamber for two days. (1 mark)
2. Explain your illustration in the setup above. (2 marks)

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1. Describe how the following reagents may be used to prepare a pure sample of lead (II) chloride in the laboratory: Distilled water, sodium chloride crystals, lead metal, dilute nitric (V) acid. (3 marks)

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1. Rust affects the strength of iron structures. State **two** ways by which coating iron with a thin coat of aluminium paint prevents rusting. (2 marks)

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1. Use dot (•) and cross (×) diagrams to represent electron bonding in the following substances.
2. Carbon (II) oxide, CO (1½ marks)
3. Magnesium fluoride, MgF2 (1½ marks)
4. The diagrams below represent setups that were used to study properties of some halogens. Study them and answer the questions that follow.



1. State the observation made on the iron wool in **Figure 2** during the experiment. (1 mark)

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1. Name the compound formed in **Figure 1**. (1 mark)

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1. State **one** precaution that should be observed when conducting the experiment above. (1 mark)

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1. 120cm3 of helium diffuses through a porous plug in 30 seconds. Determine the time required by 70cm3 of nitrogen (IV) oxide to diffuse across the same plug (2 marks)

(He = 4, N = 14, O = 16)

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1. When carrying out titration, indicators are used to determine the endpoint.
2. What is an endpoint? (1 mark)

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1. List **two** acid-base indicators that are suitable for use in titration in the laboratory. (2 marks)

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1. The halogen compounds, hydrogen fluoride and hydrogen chloride have boiling points of 19.5oC and -85.05oC respectively.
2. State the expected physical state of hydrogen fluoride at s.t.p. (1 mark)

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1. Explain the differences in boiling points between the two compounds. (2 marks)

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1. The table below shows pH values of solutions **F**, **G**, **Y** and **Z**.

|  |  |
| --- | --- |
| **Solution** | **pH value** |
| F | 8.0 |
| G | 2.0 |
| Y | 12.0 |
| Z | 7.0 |

1. Which solution would react explosively with sodium metal? (1 mark)

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1. State the expected colour of litmus solution in solution **Y**. (1 mark)

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1. Describe how the pH value of solution **F** can be determined. (2 marks)

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1. A compound of carbon, hydrogen and oxygen contains 55% carbon, 9.01% hydrogen, and the rest oxygen. Determine the molecular formula of the compound, given that its relative molecular mass is 88. (3 marks)

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1. The diagram below represents a burning jiko.



1. Write the equation for the reactions that occur in regions **A** and **B**. (2 marks)

**A** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**B** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. It is not advisable to leave a burning jiko overnight in a poorly ventilated room. Explain. (1 mark)

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1. The following table shows the products formed when nitrates of metals **J**, **Y**, and **W** are heated strongly.

|  |  |
| --- | --- |
| **Nitrate of** | **Products formed** |
| J | Metal oxide + Nitrogen (IV) oxide + Oxygen |
| Y | Metal + Nitrogen (IV) oxide + Oxygen |
| W | Metal nitrite + Oxygen |

1. Arrange the metals in their order of decreasing reactivity. (1 mark)

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1. Which metal forms a soluble carbonate? (½ mark)

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1. Give an example of nitrate **Y**. (½ mark)

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