**NAME …………………………..……………….. DATE …………………………**

**INDEX NO. ……….……….…………………...…..… SIGNATURE ……………..…………..**

**233/2**

**CHEMISTRY**

**PAPER 2**

**(THEORY)**

**TIME: 2 HOURS.**

**SET 9**

FORM 3

*Kenya Certificate of Secondary Education.*

**INSTRUCTIONS TO CANDIDATES.**

* Write your name and index number in the spaces provided above.
* Sign and write the date of exam in the spaces provided above.
* Answer **ALL** the questions in the spaces provided.
* Mathematical tables and silent electronic calculators may be used.
* All working **MUST** be clearly shown where necessary.
* This paper consists of 11 printed pages.

Candidates should check to ensure that all pages are printed as indicated and no questions are missing

**FOR EXAMINER’S USE ONLY.**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum score** | **Candidates score** |
| 1 | 11 |  |
| 2 | 10 |  |
| 3 | 14 |  |
| 4 | 10 |  |
| 5 | 13 |  |
| 6 | 10 |  |
| 7 | 12 |  |
| **Total score** | **80** |  |

1. Hydrogen can be prepared by reacting zinc with dilute hydrochloric acid.

(a) Write an equation for the reaction. (1mark)

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(b) Name an appropriate drying agent for hydrogen gas. (1 mark)

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(c) Explain why copper metal cannot be used to prepare hydrogen gas. (1 mark)

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(d) Hydrogen burns in oxygen to form an oxide.

 (i) Write an equation for the reaction. (1 marks)

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 (ii) State two precautions that must be taken before the combustion begins and at the end of combustion. (2 marks)

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(e) Give two uses of hydrogen gas. (1marks)

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(f) When Zinc is heated to redness in a current of steam, hydrogen gas is obtained. Write an equation for

 the reaction. (1mark)

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(g) Element Q reacts with dilute acids but not with cold water. Element R does not react with dilute acids. Element S displaces P from its oxide. P reacts with cold water. Arrange the four elements in order of their reactivity, starting with the most reactive. (2 marks)

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(h) Explain how hydrogen is used in the manufacture of margarine. (1 mark)

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2. The following flow chart shows the industrial manufacture of Nitric (V) acid.

 

1. Identify substances B,C,E and F. (4 marks)

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1. Describe what happens in the catalytic chamber. (2 marks)

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1. State what takes place in chamber D. (1 mark)

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1. 60 – 65% Nitric (V) acid is produced in the absorption chamber. Describe how the acid can be concentrated. (1 mark)

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1. State why Nitric (V) acid is stored in dark bottles. (1 mark)

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1. Copper reacts with Nitric (V) acid and not hydrochloric acid. Explain. (1mark)

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3. The grid below represents part of the periodic table. Study the information and answer the questions that

 follow.

 The letters are not the actual symbols of the elements.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C |  |  |  |  |  |  |  |  |
| B |  | W |  | K |  | D | E | F |
|  | G |  | H |  |  |  | I |  |
| L | M |  |  |  |  |  |  |  |

 (i) Which element will form a divalent anion? (1 mark)

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 (ii) Write the equation for the reaction that would occur between G and E. (1 mark)

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 (iii) Which elements belong to the region labeled W. (1mark)

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 (iv) Which is the most reactive metallic element shown in the table? Explain (2 marks)

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 (v) Explain how you would expect the atomic radius of G to compare with that of H. (2 marks)

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(b) The table shown shows some properties and electron arrangements of common ions of elements represented by letters Q to X. Study the information and answer the questions that follow.

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| --- | --- | --- | --- | --- |
| Element | Formula of ion | Ionic electron arrangement | Atomic radius (nm) | Ionic radius (nm) |
| Q | Q- | 2.8 | 0.072 | 0.136 |
| R | R+ | 2.8.8 | 0.231 | 0.133 |
| S | S3+ | 2.8 | 0.143 | 0.050 |
| T | T2+ | 2.8.8 | 0.133 | 0.074 |
| U | U2+ | 2.8 | 0.160 | 0.064 |
| V | V+ | 2.8 | 0.186 | 0.095 |
| W | W3- | 2.8.8 | 0.110 | 0.190 |
| X | X- | 2.8.8 | 0.099 | 0.181 |

(i) State the atomic numbers of elements T and Q (2marks)

T……………………………………………………………………………………………………………

Q……………………………………………………………………………………………………………

(ii) Select two non-metals that belong to the same period. (1 mark)

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(iii) Element R reacts violently with water. Write the equation for the reaction. (1mark)

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(iv) Why is the Ionic radius of X larger than its atomic radius. (1mark)

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(v) Compare and explain the reactivity of elements T and U. (2 marks)

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4. The diagram below shows a jiko when in use. Study it and answer the questions that follow.

 Region B

Burning charcoal Region A

 Air

 Ash

(a) Using a balanced chemical equation explain the observation made at region B. (2 marks)

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(b) State one safety precaution to be observed when using the jiko. (1 mark)

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(c) The ash that collects in the lower compartment was added to water, the mixture shaken and filtered.

 Suggest the colour of the filtrate in:

 (i) Methyl Orange indicator (1 mark)

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(ii) Phenolphthalein indicator (1 mark)

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(d) When a cleaned nichrome wire was dipped into the filtrate above and heated in a non-luminous flame,

 lilaccolour was observed.

 (i) Write the formula of the cation present in the filtrate. (1 mark)

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 (ii) Write an equation for the reaction at region A. (1 mark)

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(e) Carbon (II) Oxide may be prepared by dehydrating ethanioic acid using concentrated sulphuric (VI) acid

 as shown by the equation below.

 Conc.

 H2C204(s) CO(g) + CO2(g) + H2O(l)

 H2SO4

Draw a set-up of apparatus that can be used to prepare and collect carbon (II) oxide in the laboratory.

 (3 marks)

5. The following diagram shows the extraction of sulphur by Frasch process.

 

(a) State the uses of pipes A, B and C. (3 marks)

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(b) Give two crystalline allotropes ofsulphur. (1mark)

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(c) Write an equation for the combustion of sulphur. ( 1mark)

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(d) Name the product formed when a mixture of sulphur and iron dust is heated. (1mark)

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(e) Give two uses of sulphur. (2 marks)

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(f) 6.0dm3 of Sulphur (IV) oxide were oxidized by oxygen to Sulphur (IV) oxide.

 (i) Write an equation for the reaction. (1mark)

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 (ii) Calculate the number of moles of Sulphur (IV) Oxide and oxygen used at R.T.P (2 marks)

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 (iii) Determine the volume of oxygen used. (Molar volume of a gas at R.T.P is 24.0dm3) (2 marks)

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6. (a) Alkanes, Alkenes and Alkynes can be obtained from crude oil. Draw the structure of the second

 member of the alkynes homologenes series. (1 mark)

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 (b) Name one isomer of Butane (1mark)

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(c) Study the flow chart below and answer the questions that follow.

Butane

J

Ethene

Ethanol

H

K

Polymerization

 Step I

 Step II

 Water at

 Step III 3000C and Cl2(g)

 60 atmospheres

 (i) State the conditions necessary for the reaction in step I to occur. (1 mark)

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 (ii) Identify substance H (1mark)

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 (iii) Give one use of substance H. (1mark)

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 (iv) State one disadvantage of continuous use of substance such as J. (1mark)

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 (v) Name substance J.

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 (vi) Name the process that take place in Step III. (1mark)

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 (vii) Give formulae of substance K (1mark)

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 (viii) Describe two chemical test that will be carried out to distinguish between ethane and ethyne.

 (2 marks)

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7. The diagram below represents incomplete set up for the preparation and collection of dry chlorine gas.

 Study it and answer the questions that follow.

1. Complete the diagram to show how dry chlorine gas is collected. (2 marks)

 

(b) What condition is necessary for the reaction to proceed. (1mark)

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(c) Another reagent that can be used to react with concentrated hydrochloric acid to produce chlorine is

 Potassium Manganate (VIII). Write an equation for the reaction. (1 mark)

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(d) Write an ionic equation for the reaction between chlorine gas and Potassium bromide solution. (1mark)

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(e) Name the compound formed when:

 (i) Dry hydrogen chloride gas reacts with hot iron fillings. (1mark)

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 (ii) Dry chlorine gas reacts with hot iron fillings. (1 mark)

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1. Two solutions of hydrogen chloride labelled P and Q are as follows.

 P – Solution of hydrogen chloride in methyl benzene.

 Q – Solution of hydrogen chloride in water.

 Describe how distinguish between the two solutions using magnesium powder. (2 marks)

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1. 1.68g of hot iron reacted completely with chlorine gas. Calculate the volume of chlorine gas used? (Molar gas volume is 24dm3, Fe = 56) (3 marks)

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