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

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

**233/2**

**CHEMISTRY**

**PAPER 2**

**(THEORY)**

**JULY/AUGUST, 2014**

**TIME: 2 HOURS.**

**MAKINDU DISTRICT INTER – SECONDARY SCHOOLS EXAMINATION**

*Kenya Certificate of Secondary Education.*

**233/2**

**CHEMISTRY**

**PAPER 2**

**(THEORY)**

**TIME: 2** **HOURS.**

**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 12 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 | 13 |  |
| 2 | 12 |  |
| 3 | 13 |  |
| 4 | 10 |  |
| 5 | 10 |  |
| 6 | 12 |  |
| **Total score** | **80** |  |

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233/2

Chemistry

Paper 2 (Theory)

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. The letters do not represent actual symbols.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | S | U | V |
| P | R |  |  |  |  | T |  | W |
| Q |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

(a) Which of the elements has the highest atomic radius? Explain (2 Marks)

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

(b) Identify the most reactive non-metal. Explain (2 Marks)

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(c) Give the electron configuration of: (2 Marks)

(i) Element S

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

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

(ii) Element Q

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

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

(d) Compare the atomic radius of P and R. Explain (2 Marks)

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(e) Given that the atomic mass of W is 40. Write down the composition of its nucleus. (1 Mark)

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

(f) Write the formula of the compounds formed between:

(i) Element P and S (1 Mark)

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

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

(ii) Element R and T (1 Mark)

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

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

(g) Give the formula of one stable ion with an electron arrangement of 2.8 which is:

(i) Negatively charged (1 Mark)

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

(ii) Positively charged (1 Mark)

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

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1. (a) Aqueous potassium sulphate was electrolysed using platinum electrodes in a cell.

(i) Show the products formed at the anode and cathode with the help of an equation. (2 Marks)

Anode………………………………………………………………………………………………

Cathode ……………………………………………………………………………………………

(ii) Why would it not be advisable to electrolyze aqueous potassium sulphate using potassium metal

electrodes? (1 Mark)

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

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

(b) Use the standard electrode potential for elements A, B, C, D and F given below to answer the

questions that follow.

Eθ (Volts)

A + 2e- A(s)  -2.90

B + 2e- B(s) -2.38

C + e- C(g) -0.00

D + 2e- D (s) +0.34

F2(g) + e- F-(aq) +2.87

(i) Which element is likely to be hydrogen? Explain (1 Mark)

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

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

(ii) What is the Eθ value of the strongest reducing agent? (1 Mark)

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

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

(iii) In the space provided, draw a labelled diagram of the electrochemical cell that would be formed

when half cells of elements B and D are combined. (3 Marks)

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(iv) Calculate the Eθ value of the electrochemical cell constructed in (iii) above (1 Mark)

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(c) During electrolysis of aqueous copper (II) sulphate using copper electrodes, a current of 0.2 amperes

was passed through the cell for 5 hours.

(i) Write an ionic equation for the reaction that took place at the anode (1 Mark)

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

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

(ii) Determine the change in mass of the anode which occured as a result of electrolysis. (1 mark)

(Cu = 63.5, 1 Faraday = 96500C)

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

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

1. A student set up the apparatus shown below to prepare and collect dry carbon (IV) oxide gas.

Calcium carbonate

Conc. H2SO4 (l)

Water

Dilute H2SO4 acid

(a) State a correction for three mistakes in the set up above (3 Marks)

(i) …………………………………………………………………………………………………………

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

(ii) …………………………………………………………………………………………………………

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

(iii) …………………………………………………………………………………………………………

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

(b) Give two reasons why carbon (IV) oxide is used as a fire extinguisher (1 Mark)

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

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

(c) The flow chart below is for the manufacture of sodium carbonate by the Solvay process. Use it to

answer the questions that follow.

Brine

Ammoniacal

Brine

Tower P

Filter

Chamber G Solid X

Na2CO3

Heat

Heating limestone

Gas Q

Chamber K

L

Add water

Gas M

Solution F

(i) Name gas M \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 Mark)

Q \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(ii) Name solution F and solid X (1 Mark)

F: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

X: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(iii) Name the product L formed and give one of its uses (2 Marks)

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

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

(iv) Write equations of the reactions in (2 Marks)

Tower

………………………………………………………………………………………………..…………..

Chamber K

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

(v) Name the two raw materials required in the manufacture of sodium carbonate (1 Mark)

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

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

4. (a) Give the names of the following compounds.

(i) (1 Mark)

CH3

C

CH3

CH3

CH3

…………………………………………………………………….

(ii) CHC ≡ CCH2CH3 (1 Mark)

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

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

(b) How would the compounds respond to acidified potassium manganate (VII) solution? (1 Mark)

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

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

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

Calcium

metal

CH3CH2CH2OH

H

P

HKMnO4(aq)

warm

Step I

Step II

CH3CH=CH2

Q

HCl(g)

Q

Step III

Br2(g)

(i) Write an equation for the reaction between P and sodium hydroxide (1 Mark)

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

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

(ii) Draw the structural formula of:

(a) H (1 Mark )

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

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

(b) P (1 Mark )

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

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

(iii) Give specific names for the processes taking place in:

1. Step II (1 Mark )

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

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

1. Step III (1 Mark)

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

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

(d) Study the equation below and answer the questions that follow:

n

n

A B

(i) What type of reaction is represented by the equation. (1 Mark)

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

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

(ii) Give the name of the product, substance B formed (1 Mark)

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

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

5. Study the following reaction scheme for the extraction of zinc metal and then answer the questions that

Zinc ores

Concentration by Froth floatation

Roasting in air

Reduction

method

Solid K

Electrolysis of solution M

Gases

+ Liquid L

Zinc

99.5% Zinc

follow.

1. (i) Name two chief ores from which zinc can be extracted (2 Marks)

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

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

(ii) Write the equations for the reaction that take place at the roasting chamber. (2 Marks)

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1. (i) Name the reducing agents used in the reduction chamber. (1 Mark)

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

(ii) Write the equations for the reduction process to obtain zinc (2 Marks)

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

1. Identify the following: (3 Marks)

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

Liquid L \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Solution M \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. State two uses of zinc metal (1 Mark)

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

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

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

Heated iron

KMnO4

Water

Water

NaOH(aq)

HCl(g) HCl(aq) Gas Q

Solid Y

Brown ppt Solution Y

(a) Identify

(i) Solid Y (½Mark) …………………………………………………………………………………………………………

(ii) Gas Q (½ Mark)

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

(b) Write an equation for the formation of the precipitate (1 Mark)

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

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

(ii) The set – up below was used to react dry chlorine gas with iron powder. The product Z was collected

Dry Cl2(g)

Iron powder

Combustion tube

Heat

Calcium oxide

Guard tube

Product Z

Flask B

in flask B.

(a) Identify product Z. (1 Mark)

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

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

1. What property of product Z makes it possible to be collected as shown in the diagram (1 Mark)

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

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

1. Explain why calcium oxide would be preferred to calcium (II) chloride in the guard tube. (1 Mark)

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

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

1. The total mass of product Z formed was found to be 0.5g. Calculate the volume of chlorine gas that reacted with iron. (Fe = 56, Cl = 35.5, M.G.V at 298k = 24000cm3) (3 Marks)

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(iii) Concentrated sulphuric (VI) acid was added to white crystals as shown. The colourless gas P formed

was passed over heated manganate (VI) oxide and a gas Y which bleached litmus paper was

produced.

The experiment was reacted using powdered metal 2 instead of manganese (IV) oxide. This time a

gas R which burned in air with a blue flame was formed.

Conc. H2SO4(l)

Manganese (IV) oxide

Heat

White crystals

Gas Y

(a) (i) Name gases

Y \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (½ Mark)

R \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (½ Mark)

(ii) What type of chemical reaction occurred between gas P and manganese (IV) oxide (1 Mark?)

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

(iv) State two observations made when acidified potassium manganate (VII) solution is reacted with

hydrogen sulphide. (2Marks)

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7. (a) Name each of the processes described below which takes place when salts are exposed to air for

sometime.

(i) Anhydrous copper (II) sulphate becomes wet. (1 Mark)

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

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

(ii) Common table salt forms an aqueous solution (1 Mark)

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

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

(iii) Fresh crystals of sodium carbonate Na2CO3.10H20 becomes covered with white powder of

formula Na2CO3.H2O (2 Marks)

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

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

(b) Write the formula of the complex ion formed in each of the reactions described below.

(i) Zinc metal dissolves in hot alkaline solution (1Mark)

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

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

(ii) Copper hydroxide dissolves in excess ammonia solution (1Mark)

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

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

(c) A hydrated salt has the following composition by mass. Iron 20.2%, Oxygen 23%, Sulphur 11.5%

and water 45.3%. Its relative formula mass is 278

(i) Determine the formula of the hydrated salt. (3Marks)

(Fe = 56, S = 32, O = 16, H = 1)

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

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

(ii) 6.9g of the hydrated salt was dissolved in distilled water and the total volume made to 250cm3 of

solution. Calculate the concentration of the salt solution in moles per litre. (2Marks)

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

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

(d) Describe how a solid sample of lead (II) chloride can be prepared using the following reagents:-

dilute nitric acid, dilute hydrochloric acid and lead carbonate. (3 Marks)

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

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