**Name………………………………………..……ADM No…………………………/………..**

**Candidates Signature……………**

**Date……………………………….**

**233/2**

**CHEMISTRY**

Paper 2

(THEORY)

**TIME 2 HOURS**

**Kenya Certificate of Secondary Education 2017**

**Form four evaluation examination**

**Instructions**

* Write your name and Adm Number in the spaces provided above.
* Sign and write date of examination 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.

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum Score** | **Candidate’s Score** |
| **1** | 12 |  |
| 2 | 12 |  |
| 3 | 12 |  |
| 4 | 11 |  |
| 5 | 12 |  |
| 6 | 10 |  |
| 7 | 11 |  |
| TOTAL | 80 |  |

***Answer all the questions in the spaces provided.***

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. (The letters are not the actual symbols of the elements)

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

1. Which is the element with the largest atom? (½mk)

……………………………………………………………………………

1. Identify the most reactive non-metal. (½mk)

………………………………………………………………………….

1. Give the electron arrangement of;
2. Element S (½mk)

……………………………………………………………………..

1. Element T (½mk)

……………………………………………………………………

1. Explain why the atom of element W is heavier than that of element V. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Give the formula of one stable ion with an electron arrangement of 2,8 which is
2. Negatively charged (½mk)

…………………………………………………..

1. Positively charged (½mk)

……………………………………………………..

1. Given that the atomic mass of W is 40, write down the composition of its nucleus. (2mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Hydrogen (atomic number 1) can form two types of ions. Write equations for the formation of the two ions. (2mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

h) Write an equation for the reaction between.

1. Element P and element U (2mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Element R and element U. (2mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. a) i. In the space provided sketch a labeled diagram to show how hydrogen chloride gas can be prepared and collected in the laboratory using solid sodium chloride and concentrated sulphuric (VI) and (the gas need not be dry) (4mks)

ii. Name one drying agent for hydrogen chloride gas. (½mk)

……………………………………………………………………………………………..

iii. State and explain the observations that would be made when hydrogen chloride gas is

bubbled through a solution of lead (II) nitrate. (1mk)

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

iv. Concentrated hydrochloric acid is used for removing oxide from metal surfaces (pickling). Explain why concentrated nitric (v) acid cannot be used for the purpose. (2mks)

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

b) The diagram shows the effects of sunlight on chlorine water.

CHEM1.tif

1. Name gas X. (½mk)

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

1. Describe how you would positively identify gas X. (1 mk)

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

1. Write an equation for the reaction that produces gas X. (1½mks)

………………………………………………………………………………………………………………………………………………………………………………\

c) Study the diagram and use it to answer the questions that follow.

CHEM4.tif

1. Name liquids

P (½mk)

………………………………………………………….

M (½mk)

…………………………………………………………

1. Suggest a suitable reagent that can be used as solid W. (½mk)

…………………………………………………………….

1. Identify solid Q. (½mk)

…………………………………………………………………

3. a)(i) What family of organic compounds can be generated from the following general formula?

CnH2n-2 (1mk)

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

(ii) What is a hydrocarbon? (1mk)

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

b) Name each of the following compounds.

* 1. H2C – CH2 – CH2 – CH2 – CH3 (1mk)

CH3 CH2

I

CH3

Cl

I

* 1. CH3 C = C – CH3 (1mk)

I

CH3

c) Draw the structures of the following compounds.

1. 3-methyl but-l-yne (1mk)

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

1. 2-bromopent-2-ene (1mk)

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

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

Ca(OH)2

Cl H

STEP 3

K

C C

L + H2 O

Gas J

H

H

1 Mole H2

step 4

STEP 5

CH3 C H3

C2 H4

Ni/ H2 /150 ® C

1. Identify

Reagent L (½mk)

………………………………….

Gas J. (½mk)

………………………………..

Substance K (½mk)

1. Write an equation for the react which produces gas J. (1½mk)

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

1. Write an equation for the reaction that takes place in Step 4. (1½mk)

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

e) Under certain conditions, hexane can be converted to two products; the formula of one of the products is C3H8.

1. Write the formula of the other product. (½mk)

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

1. Describe a simple chemical test that shows the difference between the two products. (1mk)

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

1. a) The apparatus shown in the diagram was used by a student to obtain dry Nitrogen from air. Study it and answer the questions that follow.

CHEM2.tif

b) Name liquid

A …………………………………. (½mk)

B ……………………………………. . (½mk)

ii) Write equation for the reaction taking place in

The combustion tube. (1mk)

……………………………………………

In Q. (1mk) …………………………………………………..

iii) What observation is made in the combustion tube? (½mk)

…………………………………………………………………………………………

iv) Name one impurity in the Nitrogen gas collected. (½mk)

………………………………………………………………………………………..

v) Another student replaced the copper with magnesium turnings. Explain why a lower yield of Nitrogen was obtained in the syringe. (1mk)

……………………………………………………………………………………………

b) i. The set-up was used to study if ammonia burns in air. Study it and answer the question that follows.

CHEM2.tif

Identify gases X and Y (1mk)

X: …………………………………. Y:…………………………….

ii. Study the diagram below and answer the questions that follow.

CHEM2.tif

i) Identify A and B. (1mk)

A:………………………… B:…………………………

ii) State and explain the observation made in the combustion tube. (2mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

iii) Write an equation for the reaction between ammonia and copper (II) oxide. (1½mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

iv) State one use of ammonia. (½mk)

…………………………………………………………………………………………..

………………………………………………………………………………………….

1. a) i. What is an allotrope? (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

ii. Explain why graphite conducts electricity whereas diamond does not. (2mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Name two carbonates that do not decompose on heating. (2mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Write an equation for the complete combustion of carbon. (1mk)
2. ………………………………………………………………………………………
3. ………………………………………………………………………………………
4. Complete the equation to show products of the reaction. (1mk)

*Conc.H2SO4*

HCOOH +

b) Magnesium metal burns in a gas jar of carbon (IV) oxide forming black specks and white ash.

1. Name;

The black specks (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

The white ash (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Write an equation for the above reaction. (1mk)

…………………………………………………………………………………………..

………………………………………………………………………………………….

c) Carbon (IV) oxide forms a white precipitate when bubbled in lime water for a short time. The precipitate dissolved to colourless solution when excess carbon (IV) is bubbled.

1. Name the white precipitate. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Write an equation for the reaction which produces the colourless solution. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. a) Study the flow chart below and answer the questions that follow.

Colourless

Solution

Solution of BaCl2(aq) White ppt add

Sodium salt X HCl(aq)

Gas Q

Acidified

Cr2O2-(aq)

Solution turns from

orange to green

1. Name the white precipitate X. (½mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

ii. Write the formula of the sodium salt. (½mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Name gas Q (½mk)

………………………………………………………………………………………

………………………………………………………………………………………

1. Write an equation for the reaction between dilute hydrochloric acid and solid X (1mk)

b) The flow chart below shows how sulphuric (VI) acid is produced in a large scale.

Substance G

Solid D Burner Gas F Mixer Catalysed Oleum Dilution

Chamber SO3 chamber

Gas E Gas E Absorption

Chamber Sulphuric

Liquid H acid

Identify (2mks)

1. Gas E

…………………………………

1. Solid D

………………………………………..

1. Substance G

……………………………………….

1. Liquid H

…………………………………….

c) i. Name the catalyst used. (½mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

ii. Write equations for the reactions taking place at:-

Catalyst chamber (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

Dilution chamber (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

b) State and explain what you would observe if concentrated sulphuric (VI) acid is added to;

Sugar (1½mk)

1. ……………………………………………………………………………………
2. ……………………………………………………………………………………
3. Copper (II) sulphate crystals. (1½mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. The set up below was used to prepare hydrogen sulphide gas.

CHEM3.tif

1. Identify acid X and solid Y. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

ii. Write the equation for the reaction taking place in the flask. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Complete the diagram to show how the gas is collected. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

1. Write an ionic equation to show how a solution of lead (II) ions reacts with the gas.

(1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

b) A stock solution of sulphuric acid has labels of density 1.84gcm-3 and percent purity of 98% (H=1, S=32, O=16)

Use this information to determine the concentration of the acid. (3mks)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

…………………………………………………………………………………………..

…………………………………………………………………………………………..

c) Chlorine reacts with hydrogen sulphide as shown.

Cl2(g) + H2S(g) S(s) + 2HCl(g)

From this equation, identify;

1. The reducing agent (½mk)

…………………………………………………………………………

1. The oxidizing agent (½mk)

………………………………………………………………………….

d) Gas T formed white Solid S with ammonia gas, the white solid was dissolved in water and a solution of lead (II) Nitrate solution was added.

1. Identify substances T and S. (1mk)

T:…………………………………….. S:…………………………………..

1. State the observation made when lead (II) Nitrate was added. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..

iii Write an equation for the formation of Solid S. (1mk)

…………………………………………………………………………………………..

…………………………………………………………………………………………..