**Name………………………………………………………. Index No…………………/…….**

**School……………………………………………………… Candidates Signature………………**

**Date ………………………………..**

**233/2**

**CHEMISTRY**

**Theory**

Paper 2

March/April 2019

**2 Hours**

**MALIET - SECONDARY SCHOOL**

**JOINT EVALUATION TEST - 2019**

***Kenya Certificate of Secondary Education (K.C.S.E)***

**INSTRUCTIONS TO CANDIDATES**

* Write your name and Index 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 silent electronic calculators may be used.
* All workings **must** be clearly shown where necessary.

**For Examiners use only.**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum Score** | **Candidates Score** |
| 1 | 16 |  |
| 2 | 15 |  |
| 3 | 11 |  |
| 4 | 14 |  |
| 5 | 11 |  |
| 6 | 13 |  |
| **TOTAL** | 80 |  |

*This paper consists of 13 Printed pages.*

*Candidates should check the question paper to ensure that all the*

*Papers are printed as indicated and no questions are missing*

1. Use the grid below to answer the questions that follow. Letters do not represent the actual symbol of the elements.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | | | | |  |
| F | I |  |  |  | M |  | O |  |
| G | J |  | K | L |  | N | P |  |
| H |  |  |  |  |  |  |  | Q |

a) What family name is given to elements G and H? (1 mark)

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b) State and explain the difference in reactivity between

i) G and J (2 marks)

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ii) N and P (2 marks)

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c) How does atomic radius of K compare to that of L? Explain. (2 marks)

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d) Element R forms an oxide of the formula RO2 and belong to period 2. Indicate in the grid the position of R. (1 mark)

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e) Explain the trend in melting points in the group of elements to which I and J belong. (2 marks)

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f) Write down the formula of the compound formed between K and P. (1 mark)

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g) Name the type of bond formed when F reacts with O. Explain. (2 marks)

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h) Give one use of element Q. (1 mark)

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i) Write down the electronic arrangement of an ion of (2 marks)

H

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N

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2 ) Study the information below and answer the questions that follow.

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Formula of the chloride | NaCl | MgCl2 | A1C13 | SiCl4 | PC13 | SC12 |  |
| M.p. (°C) | 801 | 714 |  | -70 | -91 | -80 |  |
| Formula of the oxide | Na2O | MgO | A1203 | SiO2 | P4O10 | SO2 | C12O7 |
| M.p. (°C) | 1190 | 3080 | 2050 | 1730 | 560 | -73 | -90 |

a) Aluminium chloride. AlCl3, has an unexpected bond type and structure:

i) State the bond type and the structure in A1C13

Bond type (1 mark)

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Structure (1 mark)

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ii) What type of bonding would AlCl3 be expected to have. Why? (1 mark) ………………………………………………………………………………………………………………………………………………………………………………………………………………

iii) Why is the melting point of AlCl3 not indicated in the table above? (1 mark)

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b) A piece of blue litmus paper is placed in a solution of sodium chloride and a solution of

aliminium chloride. Explain what would be observed in each case.

Sodium chloride solution

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Aluminium chloride solution (3 marks)

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c) Explain the large difference in the melting point of the compounds of formula MgO and P4O10

(2 marks)

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d) Write down the equation for the reaction between the compound of formula Na2O and water.

(1 mark)

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e) Silicon (IV) chloride gets hydrolyzed by water. Write balanced equation for this reaction. (1 mark)

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f) Using dots (.) and crosses (x) to represent electrons, draw a diagram to show bonding in the following compounds:

i) A12C16 (2mks)

ii) NaCl (2mks)

**END**

3. a) A hydrocarbon has the general formula CnH2n-2. Name the homologous series to which it belongs.

(1 mk)

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

b) Study the reaction scheme below and answer the questions that follow.

H2SO4 (l)

Step I

Gas R + Liquid P

Colourless gas Q

Step II

Step III

HCl

Ethanol

Product U

Ethane

Step IV

U.V / Sunlight

Excess Chlorine

Product S

(i) Draw the structural formula of gas Q. (1 mk)

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

(ii) Name the types of reaction in steps; (3 mks)

I………………………………………………………………………………………………………

II……………………………………………………………………………………………………

IV…………………………………………………………………………………………………

(iii) Write a chemical equation for the reaction in step III (1 mk)

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(iv) Give the IUPAC name of compound S. (1 mk)

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(v) The empirical formula of a hydrocarbon as C2 H3. The hydrocarbon has a relative atomic mass of 54. Determine its molecular formula.(C = 12, H = 1.0) (2 mks)

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(vi) Draw two different structural formula of the hydrocarbon in (v) above. (2 mks)

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4. The flow chart below illustrates two industrial processes. Haber and contact processes each with air as one of the starting materials and other chemical reactions.

**AIR**

**Nitrogen**

**D**

**B**

**Harber process**

**Hydrogen**

**Oxygen**

**Sulphuric acid**

**C**

**Sulphur dioxide**

**A**

**Water**

**Contact process**

a) (i) Give the name of the process by which air is separated into oxygen and nitrogen. (1 mk)

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(ii) Apart from oxygen and nitrogen gas produced from process a(i) name any other gas produced in the process above. (1 mk)

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b) Name the substances which are represented by the letter. (4 mks)

A……………………………..

B……………………………………..

C …………………………………….

D………………………………………

c) Name the catalyst used in;

(i) The Haber process (1 mk)

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

(ii) The contact process (1 mk)

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

(iii) Explain the role of the catalyst in both the Haber and contact process. (2 mks)

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d) (i) Write a balanced equation for formation of compound D. (1 mk)

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(ii) Calculate the percentage by mass of nitrogen present in compound D

(N = 14.0, H = 1.0, S = 32.0, O = 16.0) (2 mks)

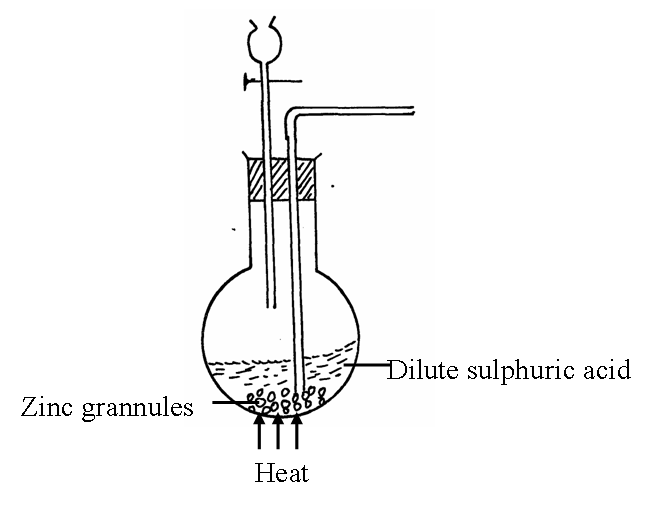
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(iii) Give one use of compound D. (1 mk)

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5. A student set-up the arrangement below to prepare and collect dry hydrogen gas



(a) Identify two errors from the section of the arrangement shown above (2mks)

I: ……………………………………………………………………………………………………………

II: ……………………………………………………………………………………………………………

(b) Complete the diagram to show how dry hydrogen gas can be collected. (2mks)

(c) (i) Explain the effect of hydrogen gas on a wet red litmus paper (1mk)

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(ii) Write a balanced chemical equation for the reaction that takes place when hydrogen gas is burnt in air. (1mk)

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(b) determine the relative atomic mass of zinc, given that when 6.54g of zinc was used, 2.4litres of hydrogen gas was produced. (molar gas volume = 24 litres) (3mks)

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(c) State any **two non**-industrial uses of hydrogen gas (2mks)

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6. At 250C, 50g of sodium nitrate (NaNo3) was added to 100g water to make a saturated solution.

(a) Define the term;

(i) Saturated solution (1mk)

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(ii) Fractional crystallization (1mk)

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(b) The table below gives the solubilities of sodium nitrate at different temperatures

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| --- | --- | --- | --- | --- | --- | --- |
| **Temperature (0C)** | 12 | 20 | 28 | 36 | 44 | 52 |
| **Solubility g/100g water** | 22 | 31 | 42 | 55 | 70 | 90 |

i) Plot a graph of solubility against temperature (4mks)



(ii) From the graph, determine;

I: the solubility of sodium nitrate at 260C (1mk)

II: the temperature at which 35g of solute dissolve in the 100g water (1mk)

III: the mass of the solute that remained undissolved given that 80g of NaNo3 were added to 100cm3 water and warmed to 400C (2mks)

(c) Determine the molar concentration of sodium nitrate at 150C (assume density of water at this temp. is constant, Na = 23.0, N = 14.0, O = 16.0) (3mks)