**Name: …………………………………………………..……… Index No. ………………………**

**School: …………………………………………………………. Candidate’s Sign. ………….........**

**Date: ………………………………..........**

**233/1**

**CHEMISTRY**

**PAPER 1**

**NOV/DEC 2017**

**TIME: 2 HOURS**

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

***Chemistry***

***Paper 1***

**INSTRUCTIONS TO CANDIDATES:-**

* *Write you* ***name*** *and* ***index number*** *in the spaces provided above.*
* *Answer* ***all*** *the questions in the spaces provided.*
* *Mathematical tables and electronic calculators may be used form calculations.*
* *All working* ***MUST*** *be clearly shown where necessary.*

|  |  |  |
| --- | --- | --- |
| **Question**  | **Maximum score** | **Candidate’s score** |
| 1-27 | 80 MARKS |  |

*This paper consists of 11 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions*

*are missing*

1. Element X is a divalent metal while Y is a trivalent non-metal.

 (i) Write the formula of the ions of X and Y. [1mk]

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(ii) If Y is a diatomic gas, write an equation for the direct combination of elements X and Y. [1mk]

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

(iii) Name the type of structure exhibited by the compound formed between X and Y.

 [1mk]

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

2. An impure sample of calcium carbonate contains calcium sulphate as an impurity. When excess dilute hydrochloric acid was added to 6g of the sample, 1200cm3 of carbon (vi) oxide was produced at room temperature and pressure (r.t.p). Calculate the percentage purity of Calcium Carbonate in the sample.

(Molar gas volume at r.t.p = 24 litres, Ca =40, C=12, 0=16) [3mks]

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

White solid J water filter colourless solution L

Calcium Carbonate Process X

Colourless gas K White precipitate M

Give the chemical formulae of: [2mks]

 J……………………………………………………………………………………………

 K…………………………………………………………………………………………..

 L…………………………………………………………………………………………..

 M…………………………………………………………………………………………..

 (b) Name process X……………………………………………………………….. [1mk]

4. (a) Give the systematic names of the following organic compounds. [2mks]

 (i) CH2 = C – CH = CH2

 CH3  ……………………………………………………

 (ii) CH3 CH3

 CH3 C C CH3 ……………………………………………

 CH3 H

 (b) The molecular formula of a certain hydrocarbon is C11H24. The hydrogen can be converted to two other hydrocarbons as shown below

 C11H24 4000 -7000C X + C3H6

Draw and name the structural formula of X. [2mks]

 Structural formula Name

5. The spots in the diagram below represent a paper chromatogram for three brands of sodas M, N and P suspected to contain unwanted food additives.

 M N P

The results showed the presence of unwanted food additives in N and P only. On the chromatogram:

1. Circle the spots which show unwanted food additives. [1mk]
2. Label the base line and solvent front. [2mks]

6. 50cm3 of Carbon iv) Oxide diffuse through a porous plate in 15seconds. Calculate the time taken by 75cm3 of nitrogen (iv) oxide to diffuse through the same plate under similar conditions.

(N = 14, C = 12, O = 16) [3mks]

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7. 0.19 g of metal W reacted with dilute hydrochloric acid forming ion W2y and evolving 180cm3 of hydrogen gas at S.T.P. Calculate the relative atomic mass of W. (Molar gas volume at S.T.P = 22.4dm3)

 [3mks]

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8. Study the table below and answer the questions below.

|  |  |
| --- | --- |
| Element | Atomic number |
| A | 3 |
| B | 17 |
| C | 19 |

1. Which TWO elements have similar chemical properties?

Explain. [2mks]

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1. What is the formula of the compound formed when B reacts with magnesium. [1mk]

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9. Corrosion is a destructive process in which iron is converted into hydrated iron (iii) oxide.

 (a) State

 (i) Two conditions necessary for rusting to occur. [1mk]

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 (ii) One method used to protect iron from rusting. [1mk]

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(b) Explain why it is not advisable to wash iron tools using sea water. [1mk]

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10. 10cm3 of concentrated hydrochloric acid of density 1.18g/cm3 and purity of 3b percent dissolved in 250cm3 of distilled water. Calculate the molarity of the solution. (H=1, Cl = 35.5) [3mks]

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11. When a mixture of iron fillings and sulphur was heated a red glow spreads through the mixture

 and a black solid was formed.

(a) Identify the black solid formed. [1mk]

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(b) Write a chemical equation in which black solid formed during heating [1mk]

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(c) What observation can be made when the black solid reacts with dilute hydrochloric acid. [1mk]

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12. Study the flow chart below and answer the questions that follow.

Ammonia

 Platinum Nitrogen (II)Oxide oxygen Nitrogen (IV) Oxide

 catalyst

Gas X H2O

 Solution Y

(a) Write n equation for reaction between gas X and Ammonia. [1mk]

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(b) Write the formula of the TWO substances present in solution Y. [2mks]

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13. Explain the following observations; very little carbon (IV) oxide is evolved when lead (II) carbonate reacts with dilute hydrochloric acid. [2mks]

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14. 94.5 g of hydrated barium hydroxide, Ba(OH)2.XH2O was heated to constant mass of 51.3g of the anhydrous barium hydroxide, Ba(OH)2. Determine the value of X in the hydrated compound.

(Ba = 138, H =1, O = 16) [3mks]

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15. In an experiment, chlorine gas was passed into moist hydrogen sulphide contained in a boiling tube as shown in the diagram.

Chlorine gas

Hydrogen Sulphide

(a) State and explain what was observed in the boiling tube. [2mks]

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(b) What precaution should be taken in carrying out this experiment? Give a reason. [1mk]

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16. The diagram below shows the position of some chemical bonds in ammonium chloride. Study it and answer the questions that follow.

 H

**+**

 B

 N

C

 A Cl-

 H H H

Name the chemical bonds labeled A, B and C. [3mks]

 A……………………………………………………………………………………….

 B……………………………………………………………………………………….

 C…………………………………………………………………………………………

17. An ion of helium is represented by the formula 2+. Give the number of neutrons, electrons and

 protons it has. [3mks]

(i) Neutrons…………………………………………………………………

(ii) Electrons………………………………………………………………..

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

18. Name the process that take place when

 (i) Crystals of Iron (III) chloride change into solution when exposed to air. [1mk]

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(ii) An alkanol reacts with an organic acid in the presence of concentrated sulphuric (VI) acid to

 form a pleasant/sweet smelling compound. [1mk]

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19. Air was passed through several reagents as shown in the flow chart below

Air Concentrated Excess hot Excess heated

 KOH solution copper turnings magnesium powder

 Escaping gases

(a) What is the role of concentrated KOH solution? [1mk]

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(b) Write an equation for the reaction which takes place in the chamber with magnesium. [1mk]

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(c) Name the major component of the escaping gases. [1mk]

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20. Chlorine is prepared in the laboratory using the reaction shown below.

 2KMnO4(s) + 16HCl(aq) 2KCl(aq) + 2MnCl2(aq) + 8H2O(l) + 5Cl2(g)

(a) Name another chemical substance that is commonly used to prepare chlorine when reacted with

 concentrated hydrochloric acid and write a balanced chemical equation for the reaction.

1. Name………………………………………………………………………… [1mk]

(ii) Equation ……………………………………………………………………… [1mk]

(b) What role is concentrated hydrochloric acid playing in the above reactions. [1mk]

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

21. The ionization energies for three elements A, B and C are shown in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Element | A | B | C |
| Ionization energy Kj/Mole | 519 | 418 | 494 |

(a) What is meant by ionization energy? [1mk]

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

(b) Which element is the most reactive metal? Explain. [2mks]

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22. When a stream of carbon (II) oxide is passed over heated oxide of iron until no further change in mass occurred, the following data was recorded

Mass of crucible = 30.26g

 Mass of crucible + oxide of iron =33.709g

 Mass of crucible + iron = 32.659g

Determine the formula of the oxide of iron. [3mks]

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23. The element structure for a molecule of element Y (not actual chemical symbol) is shown below (only valence electrons are shown)

Y

Y

(a) In which group of the periodic table can you find element Y. [1mk]

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(b) Give the formula of the ion of Y. [1mk]

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(c) Is element Y a metal or a non-metal. Give a reason. [2mks]

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24. (a) What is allotropy [1mk]

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 (b) What are two allotropes of carbon [1mk]

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

1. Give one use of amorphous carbon [1mk]

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25. The graph below shows the changes which take place when a solid is heated.

Temperature (0C)

Y

Z

T2

T1

Time (minutes)

(a) What happens to the molecules between W and X? [1mk]

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

(b) What is the significance of T1 and T2 [1mk] T1…………………………………………………………………………………………………..

 T2……………………………………………………………………………………………………

(c) Is the substance represented in the graph above pure or impure. Explain [1mk]

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26. Starting with Lead (II) oxide, describe how you would prepare Lead(II) Sulphate in the laboratory.

 [3mks]

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27.Gallium exhibits two isotopes, 69Ga and 71Ga in the ratio 3:2. Determine the relative atomic mass of

 Gallium [2mks]

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