Name: …………………………………………………………………………….. Class: ………… Adm.No……………..

School: …………………………………………………………………………… Date: ………………………………………

 Sign:………………………………………..

**233/2**

**CHEMISTRY**

**Paper 2**

**MARCH/APRIL 2018**

**Time: 2 hours**

**M O K A S A J O I N T E X A M I N A T I O N - 2018**

**Kenya Certificate to Secondary Education**

**CHEMISTRY PAPER 2**

**TIME: 2 HOURS**

**INSTRUCTIONS TO CANDIDATES**

* *Write your name, admission number, date and school in the spaces provided.*
* *Answer* ***all*** *the questions in the spaces provided.*
* *All working must be clearly shown where necessary.*
* *Scientific calculators may be used.*

**FOR EXAMINERS’ USE ONLY**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum Score** | **Candidate’s Score** |
| 1 | 12 |  |
| 2 | 12 |  |
| 3 | 10 |  |
| 4 | 10 |  |
| 5 | 13 |  |
| 6 | 13 |  |
| 7 | 10 |  |
| **TOTAL** | **80** |  |

This paper consists of **11** printed pages. Candidates are advised to check and to make sure all pages are as indicated and no question is missing.

1. Below is a grid representing part of the periodic table. The letters do not represent the actual chemical symbols of the elements. Study it and answer the questions that follow.

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

1. Using dots (•) and crosses (×) to represent electrons, show bonding in;
2. Molecule of I **(1 mark)**
3. Compound formed between K and Y. **(1 mark)**
4. Name the types of bonds formed in (a) above. **(1 mark)**

I -

II -

(b) A chloride of M was dissolved in water and the resultant solution tested using litmus papers. State and explain the observations made. **(2 marks)**

 Observations:

 Explanation:

 (c) Compare the atomic radius of K and N. Explain. **(2 marks)**

 (d) Explain why element L is used in overhead electric cables whereas K is not.

 **(1 mark)**

 (e) What is the name of the chemical family to which J belongs? **(1 mark)**

(f) A burning piece of element K was lowered in a gas jar containing carbon (IV) oxide gas.

1. State and explain the observations made. **(2 marks)**
2. Write an equation for the reaction that took place in the gas jar. **(1 mark)**

2. (a) In order to obtain some dilute aqueous ethanol, a solution of sugar and yeast is

made. The mixture is then kept under warm conditions for some time. The sugar is broken down into simpler sugars, glucose by enzymes in the yeast to produce ethanol.

1. What name is given to the process described above?  **(1 mark)**
2. Write the equation for the formation of the dilute aqueous solution of ethanol. **(1 mark)**
3. About 10% by volume of ethanol is produced by the method described. What process would the 95% by volume of ethanol be obtained?**(1mk)**
4. Write the structural formula of ethanol.  **(1mk)**

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

Reagent Z

CH3CH2COOCH2CH3

**S**

 H + / KMnO4

 Na

Substance K and gas W

CH3CH2CH2OH

Excess conc. H2SO4

T

HBr

V

1. Name; S (**4mks**)

 K

 T

 Z

1. Write the equation for the formation of substance V. Give the name of V. (**2mks**)
2. One of the largest users of vegetable oils is the soap industry.
3. Name the process of manufacturing soap. **(1 mark)**
4. Using an equation, explain why the efficiency of soap is reduced when water from Athi River is used. **(1 mark)**

3. (a) Liquid A has a boiling of 560C while liquid B has a boiling point of 1100C. State the

method used to separate the two liquids. Give a reason. **(2 marks)**

(b) Study the flow chart below showing the main stages involved in fractional distillation of liquid air.

Cool to -250C

**C**

Sodium hydroxide

**B**

Filter

**A**

Air

Fractional distillation of liquidair

Compressed to 200atm cooled to

-2000C

-1960C

**R**

-1860C

**Q**

-1830C

**P**

1. Name substances removed through A, B and C. **(1 ½ mark)**

A -

B -

C -

 (ii) What is the role of the compressor? **(1 mark)**

1. Name **one** other substance that can be used in place of sodium hydroxide.

 **(1 mark)**

1. Name the gases P, Q, R. **(1 ½ mark)**

P -

Q -

R -

 (v) What colour is liquid air? **(1 mark)**

(c) Magnesium ribbon is burnt in air. Write two equations for the products formed. **(2 marks)**

4. (a) The table below shows the results obtained when Sammy carried out an

experiment to study how 200cm3 of hydrogen peroxide solution at 200C decomposed when 4.0g of manganese (IV) oxide was added. Volume of oxygen was measured after every 10 seconds.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time(Sec) | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| Volume(cm3) | 0 | 60 | 90 | 105 | 112 | 116 | 118 | 120 | 120 | 120 |

 Plot a graph of volume of gas against time and label it X. **(3 marks)**



 (b) Use your graph to find the;

 (i) Volume of gas produced after 35 seconds. **(1 mark)**

1. Time needed to produce 80cm3 of gas. **(1 mark)**

(c) Explain why the volume of oxygen produced does not exceed 120cm3. **(1 mark)**

(d) Sketch graph Y on the same grid to show the results when hydrogen peroxide at 100C is used. Explain.  **(2 marks)**

 (e) The mass of the solid residue after the experiment was found to be 4.0g. Explain.

**(2 marks)**

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

Liquid S

Air

Oxygen

Product A

Yellow solid R

Liquid D

Dilution chamber

 Oleum

Gas Q

Reaction

chamber

Mixer

Gas T

Burner

(a) Identify the following: **(4 marks)**

1. Gas T -
2. Gas Q -
3. Liquid S –
4. Liquid D –

(b) Which catalyst is most suitable in the reaction chamber? Give a reason for your answer. **(2 mark)**

(c) Write an equation for the reaction between liquid S and gas Q. **(1 mark)**

(d) What would you observe if concentrated sulphuric (VI) acid is added to cane sugar?

 Explain. **(2 marks)**

 (e) State two uses of dilute Sulphur (VI) acid. **(2 marks)**

(f) According to Le’-Chatelier’s principle, what optimum conditions should be adopted in the above large scale manufacture of sulphuric (VI) acid to obtain maximum yield of Sulphur (VI) oxide? (**2 marks**)

6. The diagram below represents a set-up to determine the molar heat of combustion of propanol.

Thermometer

Beaker

Water

Propanol

Lamp

1. What do you understand by the term ‘molar heat of combustion’? (1mk)

 (b) During the experiment, the data given below was recorded.

|  |  |
| --- | --- |
| Mass of water | 200g |
| Initial temperature of water | 20.50C |
| Final temperature of water | 47.00C |
| Initial mass of lamp + propanol | 30.42g |
| Final mass of lamp + propanol | 29.98g |
| Specific heat capacity of water | 4.2kJ/kg/K |

 C =12, H = 1, O = 16

1. Calculate the temperature change. **(1 mark)**
2. Calculate the mass of propanol burnt? **(1 mark)**
3. Calculate the molar heat of combustion of propanol. **(2 marks)**

(c) (i) Write down a thermochemical equation for the complete combustion of propanol. **(1 mark)**

 (ii) Draw an energy level diagram for the reaction in this experiment.

 **(2 marks)** (d) Define the term ‘fuel’. **(1 mark)**

 (e) What is a heating value of a fuel? **(1 mark)**

 (f) Determine the heating value of propanol in this experiment. **(1 mark)**

(g) Other than the heating value of a fuel, state any other two factors that one has to consider when choosing a fuel. **(1 mark)**

(h) It has been suggested that all motor vehicles must be fitted with electronically controlling gadget mixer of air and fuel. Why do you support this suggestion?

**(1 mark)**

7. Study the flow chart below and use it to answer the questions that follow:

 Step 2

Water sample from river M

White precipitate

Excess NaOH

Step 3

Product V + T

NaOH + aluminium foil and boil

Heat

Step 4

White precipitate

Gas W which changes moits litmus blue

Step 1

 (a) Write down two possible cations in the water basing on step 1 only. **(1 mark**

 (b) Give ionic equation for reaction in step 2. **(1 mark)**

 (c) Write the equation for reaction in step 4. **(1 mark)**

 (d) Write the formula of the anion in the water. **(1 mark)**

(e) Name one source of the compound found in river M above. **(1 mark)**

(f) State the effect of the anion in (d) above to the water in the river.

**(1 mark)**

 (g) Study the equation below:

Process

 Y

 O

 (i) Name process Y. **(1 mark)**

 (ii) Give one main difference between salt O and

 **(1 mark)**

(iii) Explain why magnesium chloride should always be kept in a desiccator. **(1 mark)**

(iv) Write a chemical equation to show the effect of heat on lead (II) nitrate.

 **(1 mark)**