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

**School………………………………………… Candidates Signature…………… Date…………………………….**

**233/2**

**CHEMISTRY**

Paper 2

(THEORY)

**TIME 2 HOURS**

**MACHAKOS COUNTY KCSE TRIAL AND PRACTICE EXAM 2015**

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

**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 date of examination in the spaces provided above.
* Answer **ALL** questions in the spaces provided.
* KNEC Mathematical tables and silent electronic calculators may be used.
* All workings **must** be clearly shown where necessary.
* Candidates should answer the questions in English.
* This paper consists of 12 printed pages
* Candidates should check the question paper to ensure that all the papers are printed as indicated and no questions are missing

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

***A special Performance Improvement Project***

***By His Excellency Dr. Alfred Mutua***

***Sponsored by the County Government of Machakos***

1. Study the table below and answer the questions that follow.

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Atomic | Relative Atomic mass | Melting point (Oc) |
| Sodium  Aluminium  Phosphorus  Neon  Calcium  Hydrogen  Carbon | 11  13  \_\_\_  10  20  \_\_\_  6 | 23.0  27.0  31.0  \_\_\_\_  40.0  1.0  \_\_\_\_ | 97.8  \_\_\_\_  44.2(white)590(Red)  -249  850  -259  3730 |

1. Complete the table by filling in the missing atomic numbers and atomic mass. (2 marks)
2. i) Three isotopes of magnesium have mass numbers 24, 25 and 26. What is the mass number of the

most abundant isotope of magnesium? Explain. (2 marks)

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ii) Define the term isotopes (1 mark)

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1. Phosphorous exists in two allotropic forms, white phosphorous and red phosphorous.

i) What are allotropes? (1 mark)

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ii) Name another element that exhibits allotropy. (1 mark)

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iii) Which of the allotropes of phosphorous has a higher density? Explain (1 mark)

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1. Explain the difference in the melting points of sodium and aluminium.

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1. Give the formula of the compound formed between aluminium and carbon.

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1. a) The flow chart below shows the industrial preparation of ammonia and the process used in the

manufacture of Nitric (V) acid

Solution P

Air

Hydrogen

N2

Ammonia

Nitrogen (II) oxide

Nitrogen (IV) oxide

Nitric (V) acid.

Electrolysis

Step 1

Step 2

Step 3

Step 4, excess air

Step 5, low temperature

Step 6

1. Identify solution P (1 mark)

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1. Excess air is used in step 4. What other conditions are necessary in step 4 in order to produce Nitrogen (II) Oxide. (1 mark)

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1. The equation for the reaction in step 5 is:

2NO(g) +O2(g) 2NO2(g)

Explain why low temperatures are used in this step. (1 mark)

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1. Draw a diagram to show how Nitrogen (IV) Oxide can be dissolved in water to form an acid. (1 mark)

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1. The Nitric (V) acid produced is only 50% concentrated. Explain how you can increase the concentration of the acid. (1 mark)

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1. State and explain the observations that would be made if a sample of red hot charcoal is heated with Nitric (V) acid. (1 mark)

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1. Describe the process that takes place in step 2 (1 mark)

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1. Write a chemical equation showing how ammonium nitrate would be produced in the above set up

(1 mark)

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1. State the name of the gas produced when ammonium nitrate is heated. (1 mark)

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

Escaping gas

Concentrated KOH solution

Excess heated copper turnings

Excess heated magnesium powder

Air

1. Write an equation for the reaction that takes place in the chamber with magnesium powder. (1 mark)

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1. Name one gas which escapes from the chamber containing magnesium powder. Give a reason. (1 mark)

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1. In the Haber process, Nitrogen and Hydrogen react according to the following equation at a temperature of 4500c and a pressure of 200 atmospheres.

N2(g) +3H2(g) 2NH3(g)

1. Explain how the yield of ammonia would be affected if the pressure was decreased. (1 mark)

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1. Give one use of ammonia (1 mark)

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1. a) Iron is obtained from haematite using a blast furnace shown below. Study it and answer the questions that follow.

Raw materials (Haematite)

Hot Air

Molten iron

Hot air

Slag

2300 C

4700C

Y 17900C Y

1. Four raw materials are required for the production of iron. Three of these are haematite, hot air and coke. Give the name of the fourth raw material and its use. (1 mark)

I Name……………………………………………………………………………………………….

II Use…………………………………………………………………………………………………

1. Name another Iron ore other than the one shown in the blast furnace. (1 mark)

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1. State one physical property of slag other than density that allows it to be separated from molten Iron as shown in the figure. (1 mark)

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1. Iron from the blast furnace contains about 5% carbon.

I. Describe how the carbon content is reduced. (1 mark)

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II. Why is it necessary to reduce the carbon content? (1 mark)

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1. Explain why temperature in the region marked Y is higher than that of the incoming hot air (1 mark)

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1. Describe the process which led to the formation of iron in the blast furnace (3 mark)

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1. Give a reason why the melting point of the Iron obtained from the blast furnace is 12000C while that of pure iron is 15350C (1 mark)

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1. One of the components of the waste gases is Nitrogen (IV) oxide. Describe the adverse effects it has on the environment. (2 marks)

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1. a) What name is given to a compound that contains carbon and hydrogen only? (1 mark)

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

b) Give the names of the following compounds.

CH3

1. (1 mark)

CH3 CH2 C CH3 ………………………………………………….

CH3

1. CH3  CCH2CH3 …………………………………………………. (1 mark)
2. Describe a chemical test that can be carried out in order to distinguish between substances

represented by structures (i) and (ii) above. (2 marks)

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1. Ethyne, C2H2 is a compound found in crude oil. One mole of ethyne was reacted with one mole of

hydrogen chloride gas and a product P1 was formed. P1 was then reacted with excess hydrogen gas

to form P2. Draw the structures P1 and P2

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

Pentane

M

Prop-1-ene

N

Propanol

Q

Step (II)

Polymerisation

Step 1

Step (III)

Water at 3000C and 60 atmospheres

Step (IV)

Butanoic acid

1. Name the process in step I and the conditions for the reaction in step I

Name of process (1 mark)

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Conditions (1 mark)

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1. Identify substance N (1 mark)

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1. Give
2. One disadvantage of the continued use of substance such as M (1 mark)

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1. The name of the process that takes place in step III (1 mark)

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1. The name and structural formula of the substance Q (1 mark)

Name…………………………………………………………………………………………..

Structural formula………………….………………………………………………………….

1. The flow chart below shows the various stages of water treatment. Study it and answer the questions that follow.

Filtration Unit I

Process X

Water reservoir

Filtration Unit II

Addition of sodium hypochlorite

Tap water

1. What is the purpose of filtration unit I (1 mark)

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1. What is the name of process X (1 mark)

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

1. What is the purpose of
2. Process X (1 mark)

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

1. Addition of sodium hypochlorite (1 mark)

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b) A sample of tap water was found to contain magnesium sulphate.

1. What type of hardness was present in the water? (1 mark)

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1. Explain how the hardness can be removed. (1 mark)

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1. Describe how a solid sample of calcium carbonate can be prepared starting with magnesium oxide. (3 marks)

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1. State one use of calcium carbonate. (1 mark)

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1. a) The reaction between bromine and methanoic acid at 300C proceeds according to the information

given below.

Br2(aq) +HCOOH(aq) 2H+(aq) +2Br-(aq)+CO2(g)

|  |  |
| --- | --- |
| Concentration of Br2 (aq)  Mol dm-3 | Time (minutes) |
| 10.0 x10-3  8.1x 10-3  6.6 x10-3  4.4x10-3  3.0 x10-3  2.0 x10-3  1.3x10-3 | 0  1  2  4  6  8  10 |

1. On the grid below, plot a graph of concentration of bromine (vertical axis) against time. (2 marks)



1. From the graph determine:

I) The concentration of bromine at the end of 3 minutes. (1mark)

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II) The rate of the reaction at the time “t” while t=11/2 minutes. (1 mark)

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1. Explain how the concentration of bromine affects the rate of reaction. (1 marks)

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1. On the the same axes, plot the curve that would be obtained if the reaction was carried out at 200C and label the curve as curve (II). Give a reason for your answer (2 marks)

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1. Copper (II) sulphate reacts with barium chloride according to the equation.

CuSO4(aq) +BaCl2 CuCl2(aq) +BaSO4(s)

Calculate temperature change when 450cm3 of 2M Copper (II) Sulphate were added to 300cm3 of 2M Barium (II) chloride. Assume the heat capacity of solution is and density is (3 marks)

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1. a) The set up below was used during electrolysis of aqueous copper (II) sulphate using inert electrodes.

Aqueous copper (II) Sulphate

1. Name a suitable pair of electrodes for this experiment. (1 mark)

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1. Identify the ions and cations in the solution. (1 mark)

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1. On the diagram label the cathode. ( 1mark)
2. Write ionic equations for the reactions that took place at the anode (1 mark)

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1. Explain the change that occurred to the Copper (II) Sulphate solution during the experiment.

(2 marks)

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

1. During the electrolysis a current of 2 amperes was passed through the solution for 4 hours. Calculate the volume of the gas produced at the anode. (1 Faraday = 96500 coulombs and volume of gas at room temperature is 24000cm3 ) (3 marks)

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b) i) Draw a diagram to show how an impure copper lump can be refined through electrolysis. (3 marks)

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ii) State one other use of electrolysis other than the one shown in b (ii) above. (1 mark)

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