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

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233/1

**CHEMISTRY**

**PAPER 1 (THEORY)**

**JUNE / JULY 2015**

**Time: 2 Hours**

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

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

**CHEMISTRY**

Paper 1

**Time: 2 Hours**

**INSTRUCTIONS TO CANDIDATES:**

* Write your **name** and **index number** in the spaces provided above.
* Sign and write the date of examination in the spaces provided above
* Answer **all** the questions in the spaces provided.
* KNEC Mathematical tables and silent electronic calculators may be used for calculations.
* All workings **must** be clearly shown where necessary
* Candidates must answer all the questions in English
* This paper consists of 12 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

**For Examiner’s Use only:**

|  |  |  |
| --- | --- | --- |
| **QUESTION** | **MAXIMUM SCORE** | **CANDIDATE’S SCORE** |
| 1 – 31 | **80** |  |

***A special Performance Improvement Project***

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

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

1. The electron arrangement of ions Q2- and R3+ are as 2, 8, 8, and 2,8respectively.

(a) Write the electron arrangement of the elements Q and R (2marks)

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(b) Write the formula of the compound that would be formed between Q and R (1mark)

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2. Explain why a high temperature is required for Nitrogen to react with oxygen (1mark)

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3. Give one advantage and one disadvantage of using petrol containing tetraethyl lead in motor vehicles (2marks)

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4. The diagram below is a cross section of a dry cell. Study it and answer the questions that follow.

Brass cap

Sealing material

Zinc can

Carbon rod

Powdered carbon and Manganese (IV) Oxide

Ammonium Chloride and Zinc Chloride paste

(i) Write the equation for the reaction in which electrons are produced. (1mark)

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(ii) The Zinc can is lined with Ammonium Chloride and Zinc Chloride paste. What would happen if the

mixture was to become dry? Give reason. (2marks)

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5. The graph below shows the behavior of a fixed mass of a gas at constant temperature.

Volume (litres)

Pressure

(Atmospheres)

1. What is the relationship between the volume and the pressure of the gas ? (1mark)

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(b) 1500cm3 of nitrogen gas at one atmosphere were compressed to two atmospheres at constant temperature . Calculate the volume occupied by the nitrogen gas. (2marks)

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6. The table below gives some properties of three elements X,Yand Z.

|  |  |  |  |
| --- | --- | --- | --- |
| ELEMENT | Atomic No. | Meeting point(0C) | Boiling Point (0C) |
| X | 53 | 114 | 184 |
| Y | 35 | -7 | 58.8 |
| Z | 17 | -101 | -34.7 |

1. Which element is in liquid form at room temperature? Give reason. (1mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Explain why the boiling point of element X is higher than that of element Z. (2marks)

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7. The diagram below is a set up for the laboratory preparation of dry oxygen gas.

Sodium peroxide

Liquid X

Liquid Y

1. Name:

I. Liquid Y (1 Mark)

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II. Liquid X

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(b) Write an equation for the reaction that took place in the flask. (1mark)

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(c) Complete the diagram to show how dry oxygen can be collected. (1mark)

8. Use the information below and answer the questions that follow .The letters are not the actual symbols of

the elements.

+ 2e

-0.76V

E(s)

+ 3e

-1.66V

F(s)

+ 2e

-0.44V

G(s)

(a) Calculate the Eθ value for the electrochemical cell represented below. (1mark)

F(s)

(b) Arrange the elements in order of reactivity starting with the least reactive. (1mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(c) Explain if it would be advisable to store element G in a solution containing E2+ Ions. (1mark)

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9. The set up below was used to electrolyze molten lead (II) bromide.

Molten Lead (II)

Bromide

1. State the observation that was made at the anode during electrolysis. (1mark)

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1. A current of 2.5A was passed for 30 minutes. Calculate the mass of lead that was deposited

(2marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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10. When wood is burnt a grey powder called ash remains. The ash is stirred with water and filtered to form

a colourless solution.

(a)What is the main component of the colorless solution? Give a reason. (2marks)

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1. State the observation that would be made if methyl orange indicator was passed through the solution of ash. (1mark)

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11. The elements A and B have the following properties

|  |  |  |
| --- | --- | --- |
| Element | Mass No. | Atomic No. |
| A | 37 | 17 |
| B | 37 | 18 |
| C |  |  |

(a) When the isotope A was bombarded with a neutron, an isotope C was formed .Fill in the table to show the properties of element C (1mark)

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(b)Write an equation for the reaction between isotope B and Beta particles (1mark)

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(c) State one use of radioisotopes in medicine. (1mark)

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12. When Carbon (IV) oxide gas was passed through aqueous calcium hydroxide a white suspension was

formed.

(a) Write an equation for the reaction that took place. (1mark)

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(b) State and explain the changes that took place when excess Carbon (IV) Oxide was bubbled through the

white suspension . (2marks)

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13. Excess Carbon (II) Oxide was passed over a heated sample of an oxide of iron as shown in the diagram

below. Study the diagram and the data and use it to answer the questions that follow.

Dry Carbon (II)

Oxide

Oxide of iron

Heat

To fume chamber

Mass of empty dish =6.72g

Mass of empty dish + oxide of iron =9.04g

Mass of empty dish + residue=8.40g

1. Determine the formula of the oxide of iron given that the relative formula mass of oxide of

Iron = 232, Fe = 56.0, O=16.0 (2marks)

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(b) Write an equation for the reaction which took place in the dish (1mark)

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14. The products of a burning candle were passed through a tube containing calcium oxide as shown in

the diagram below.

Funnel

Candle

Calcium Oxide

Gases to suction pump

Tube R

Tube P

1. Write two chemical equations for the reactions that took place in tube P. (2marks)

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1. Name two gases that came out through tube R. (1mark)

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15. Study the scheme below and answer the questions that follow.

Ammonium Chloride Solution + Substance E (Paste)

Step I Warm

Ammonia gas

Step II Pass into Aluminium

Sulphate solution and filter

Solid F

(a)Identify substance E (1mark)

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(b)Write an equation for the reaction in Step (II) that produces solid F (1mark)

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16. The elements nitrogen, phosphorus and potassium are essential for plant growth. Phosphorus in the

fertilizer may be in the form of ammonium phosphate. Calculate the mass of nitrogen present if a 25kg bag contained pure ammonium phosphate.

(NH4)2 HPO4 (N=14.0, H=1.0, P=31.0, O=16.0) (2 Marks)

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17. The flow chart below shows the processes involved in the industrial extraction of zinc metal.

Air

Unit I

Zinc metal

Unit II

Coke

SO2

Gases

Ore

1. Name the ore from which zinc is extracted on the above diagram. (1mark)

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(b)Write the equation of the reaction taking place in Unit I (1mark)

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1. Name two uses of zinc metal. (1mark)

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18. A weighed sample of crystalline sodium carbonate (Na2CO3 .nH2O) was heated in a crucible until there

was no further change in mass .The mass of the sample reduced by 14.5%. Calculate the number of

moles (n) of the water of crystallization. (2marks)

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19. (a) Describe how you would prepare crystals of sodium nitrate starting with 200cm3 of 2M sodium

hydroxide (2marks)

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(b)Write an equation for the reaction that takes place when a solid sample of sodium nitrate is heated.

(1mark)

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20. The structure below represents a sweet smelling compound.

CH3CH2

C

O

CH2CH3

||

⎯

⎯

⎯

O

Give the names of the two organic compounds that can be used to prepare this compound in the

laboratory. (2marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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21. Magnesium reacts with both concentrated and dilute acid. Write the equations for the two reactions.

(2marks)

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22. The graph below shows how the PH value of soil in a farm changed over a period of time.

PH

2

4

6

A

B

C

D

E

Time

1. Describe how the PH of the soil can be determined. (2marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. State one factor that may have been responsible for the change in the soil PH in the time interval AB. (1mark)

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23. A student put calcium carbonate and calcium hydrogen carbonate in separate test tubes and performed

the tests as shown in the table below. Complete the table by giving the expected observations.

|  |  |  |
| --- | --- | --- |
| Salt | Adding water | Heating |
| Calcium Carbonate |  |  |
| Calcium hydrogen carbonate |  |  |

(2marks)

24. A mixture contains Iron (III) Chloride, calcium chloride and iron filings. Describe how one can separate

and recover the substances in the mixture. (3marks)

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25. The structure below represents two cleansing agents A and B. Which cleansing agent would be suitable

for washing in water containing calcium chloride? Give a reason. (2marks)

OSO3-Na+

R

R−COO‑Na+

A

B

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

NH4Cl(s)

Energy

Reaction co-ordinate

ΔH1

ΔH2

ΔH3

NH4 +(g) + Cl-(g)

NH4 +(aq) + Cl-(g)

1. What do ∆H1 and ∆H2 represent. (2marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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(b) Write an expression to show the relationship between ∆H1, ∆H2 and ∆H3.  (1mark)

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27. Study the diagram below and use it to answer the questions that follow.

Carbon (IV) Oxide

+

Carbon (II) Oxide

Conc.

Sodium Hydroxide

Gas P

1. Name two reagents that are reacted to produce both Carbon (IV) Oxide and Carbon (II) Oxide.

(1mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Write the equation for the reactions that took place in the wash bottle. (1mark)

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1. Give a reason why Carbon (II) Oxide is not easily detected. (1mark)

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28. When a few drops of ammonia solution were added to Copper (II) Nitrate solution, a light blue

precipitate was formed. On addition of more aqueous ammonia a deep blue solution was formed. Identify the substances responsible for the:

(a) Light blue precipitate. (1mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) Deep blue solution. (1mark)

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

Excess Ag2O

Solution Q

White

solid

Solid W

Brown gas

+

Gas T

Step II

Heat Strongly

Step I

1. Warm

2. Filter

3. Cool filtrate

a) Identify solution Q. (1mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) Write an equation for the reaction that took place in step II. (1mark)

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c) State one commercial use of gas T. (1mark)

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30. How does pH value of 0.1M potassium hydroxide solution compare with that of 0.1M aqueous Ammonia? Explain (2marks)

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31. During the manufacture of rubber raw rubber is heated with sulphur, carbon, phosphorus and manganese

i) What name is given to this process. (1mark)

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ii) Explain why the process is necessary. (2marks)

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