CHAMPIONS JOINT EXAMINATIONS TEST

Kenya Certificate of Secondary Education

233/1 - CHEMISTRY (Theory) - Paper 1

July. 2024 – 2hours

Name: ……**Index Number:** …..……

Name of the School: …… **Stream** ……..

Candidate's Signature: ……..…**Date:** ……...……

Instruction to candidates

(a) Write your name and index number in the spaces provided above.
(b) Sign and write the date of examination in the spaces provided above.
(c) Answer **ALL** the questions in the spaces provided.
(d) **ALL** working **MUST** be clearly shown.
(e) Non-programmable silent electronic calculators and KNEC mathematical tables may be used.
(f) This paper consists of 11 printed pages.
(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1 – 30	80	

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1. (a) Give the name of the first member of alkene homologous group (1mark)

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(b) Describe a chemical test that can be used to distinguish butanol from butanoic acid (2marks)

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2. Calculate the values of X and Y in the following nuclear equation (2marks)

$^{239}_{92}U \longrightarrow {}^{X}_{Y}Th + 2\alpha + 2\beta$

……...

3. (a) What is an inert electrode?

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…...……

(b) State the products formed when brine is electrolyzed using inert electrodes

Anode…….. (1mark)

Cathode……... (1mark)

4. A mixture contains ammonium chloride, copper (II) oxide and potassium chloride. Describe how each of the substances can be obtained from the mixture (3marks)

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5. State two reasons why hydrogen is not commonly used as a fuel (2marks)

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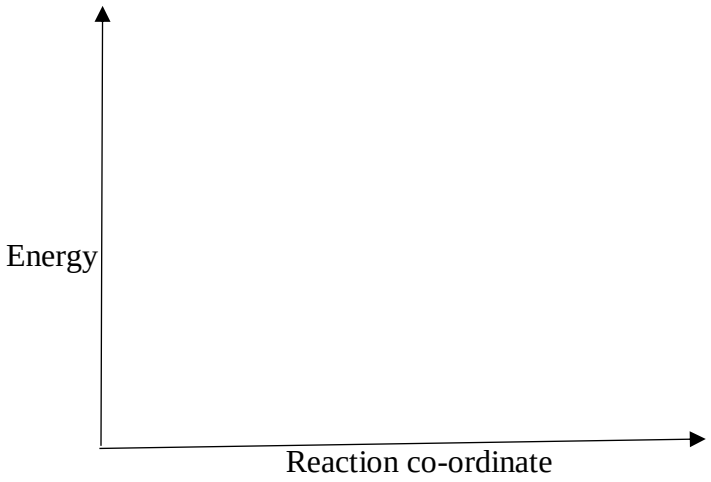
6. The thermochemical reaction between carbon and Sulphur is as shown by the equation below:

$C_{(s)} + 2S_{(s)} \longrightarrow CS_{(l)} \quad \Delta H = +1170kJmol^{-}$

On the grid below, sketch and label the energy level diagram for the reaction (2marks)



7. (a) Using electrons in the outermost energy level, draw the dot (.) and cross (x) diagrams for molecules of H_2O and C_2H_4 (H=1, C=6, O=8)

H_2O (1mark)

C_2H_4 (1mark)

(b) The formula of a complex ion is $[Zn(NH_3)_4]^{2+}$. Name the type of bond likely to exist between zinc and ammonia in the complex (1mark)

……

8. A beaker contained 75.0cm^3 of aqueous copper (II) sulphate at 23.7^oC. When scrap ion metal was added to the solution, the temperature rose to 29.3^oC

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

   ……

   b) State the observation that was made in the experiment (1mark)

   ……

   c) Name the type of reaction that took place in the above experiment (1mark)

   ……

   d) Given that the mass of copper deposited was 5.83g, calculate the molar enthalpy change in $kJmol^{-1}$ (specific heat capacity = $4.2Jg^{-1}k^{-1}$, density of solution = $1gcm^{-3}$) (2marks)

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9. A water trough, aqueous sodium hydroxide, burning candle, watch glass and graduated gas jar were used in an experimental set p to determine the percentage of active part of air. Draw a labelled diagram of the set up at the end of the experiment (3marks)

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10. Describe an experimental procedure that can be used to extract oil from nut seeds (2marks)

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11. Starting with solid sodium chloride, describe how a pure sample of lead (II) chloride can be prepared in the laboratory (3marks)

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12. 100cm^3 of 0.05M sulphuric acid were placed in a flask and a small quantity of anhydrous sodium carbonate added. The mixture was boiled to expel all the carbon (IV) oxide. 25cm^3 of the resulting solution required 18cm^3 of 0.1M sodium hydroxide solution to neutralize it. Calculate the mass of sodium carbonate added (Na=23, O=16, C=12) (3marks)

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13. Cotton is a natural polymer. State **one** advantage and **one** disadvantage of this polymer

Advantage …….. (1mark)

Disadvantage ……. (1mark)

14. Write equations to shoe effect of heat on the following:

a) Sodium hydrogen carbonate (1mark)

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b) Silver nitrate (1mark)

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c) Iron (II) sulphate (1mark)

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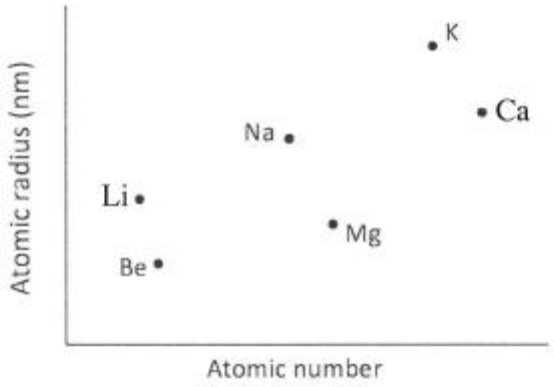
15. The plots below were obtained when atomic number of some elements in group I and II were plotted against atomic numbers



Explain:

a) the trend shown by Li, Na and K. (1 mark)

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b) why the atomic radii of elements Be, Mg and Ca are lower than those of Li, Na and K.(2 marks)

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16. Methane reacts with bromine as shown in the following equation.

$$CH_{4(g)} + Br_{2(g)} \longrightarrow CH_3Br_{(g)} + HBr_{(g)}$$

Using the bond energies in the table below, calculate the enthalpy change ΔH, for the reaction (3marks)

Bond	**Bond energy ($kJmol^{-1}$)**
C-H	412
C-Br	276
Br-Br	193
H-Br	366

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17. Consider the following reaction:

$$H_2S + Cl_2 \longrightarrow 2HCl + S$$

Determine the oxidation numbers of chlorine and Sulphur in the reactants and products (2marks)

	Reactants	**Products**
Sulphur		
Chlorine		

18. Bottles of potassium carbonate, sodium chloride and sugar have lost their labels. A student prepares and tests aqueous solutions of a sample from each bottle. The results obtained are as below.

Bottle	pH	Electrical conductivity	Correct label
1	7	Conducts	
2	7	Does not conduct	
3	10	Conducts	

Complete the table by filling the correct label (3marks)

19. Study the set up in **figure 2** and answer the questions that follow.

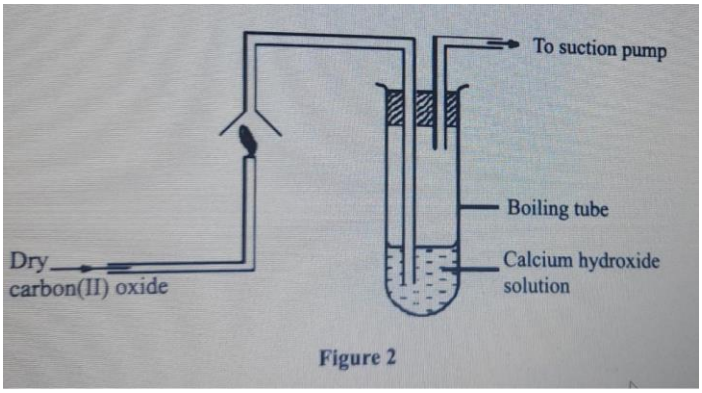

Figure 2

a) State the precaution that should be taken in carrying out the experiment. Give a reason (1mark)

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b) State the observation made in the boiling tube (2marks)

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20. Name a suitable method that can be used to extract potassium from its ore. Explain (1mark)

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21. A current of 0.75A was passed through 300cm^3 of 0.5M copper (II) sulphate solution. Determine the time taken in seconds to deposit all the copper in the solution at the cathode (Cu=63.5, 1F= 96500 coulombs) (3marks)

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22. (a) State Charle's law (1mark)

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(b) A fixed volume of a gas occupies 246 litres at 18^{o}C and 98.13Kpa. What will be its temperature if its volume is reduced to 113 litres at 101.325 Kpa? (2marks)

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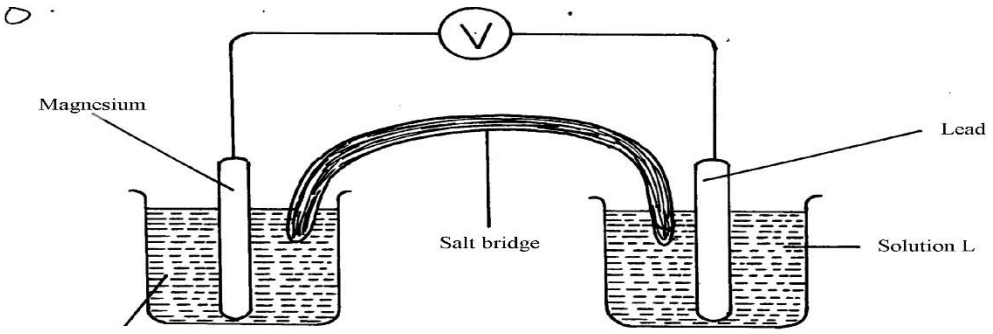
23. The diagram below shows an electrochemical cell.



$MgSO_{4(aq)}$

a) Give the formula of the possible salt **L** **(1mk)**

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b) On the diagram show the direction of movement of electrons (1mk)

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c) Write the cell representation (1mk)

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24. (a) State **one** distinctive feature of dynamic equilibrium (1mark)

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(b) Explain the effect of increase in pressure on the following equilibrium (2marks)

$$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$$

……

……

25. Zinc reacts with both concentrated and dilute sulphuric (VI) acid. Write the equations for the two reactions (2marks)

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26. (a) Name the process that takes place when:

i. Crystals of zin nitrate change into solution when exposed to air (1mark)

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ii. An alcohol reacts with an organic acid in the presence of a catalyst to form a sweet smelling compound (1mark)

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(b) Propane can be changed into methane ad ethane as shown below:

$CH_3CH_2CH_3 \xrightarrow{\text{High temperature}} CH_4 + C_2H_4$

Name the process undergone by propane (1mark)

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27. The table below gives some information about elements I, II, III and IV which are in the same group of the periodic table. Use the information to answer the questions that follow

Element	First Ionization energy ($kJmol^{-1}$)	Atomic radius (nm)
I	520	0.15
II	500	0.19
III	420	0.23
IV	400	0.25

State and explain the relationship between variations in the first ionization energy and the atomic radius (3marks)

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28. State what would be observed when dilute hydrochloric acid is added to products formed when a mixture iron filings and Sulphur is heated (1mark)

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29. The table below shows tests carried out on a sample of water and the results obtained

	Tests	Results
I	Addition of sodium hydroxide solution	White precipitate soluble in excess
II	Addition of excess aqueous ammonia	Colourless solution obtained
III	Addition of dilute hydrochloric acid and barium chloride	White precipitate

a) Identify the anion present in the water (1mark)

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b) Write an ionic equation for the reaction in III (1mark)

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c) Write the formula of the complex ion formed in II (1mark)

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30. Name **two** apparatus used to measure accurate volumes of solutions in the laboratory (2marks)

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