Name _____ **Adm No.** _____

Class _____

CHEMISTRY

233/1

Time: 2 Hours

GIDEONS ELITE BOYS CENTRE OF EXCELLENCE
DECEMBER SELF-ASSESSMENT EXAMINATIONS
FORM THREE

Kenya Certificate of Secondary Education

FORM THREE

COMPOSITE PAPER

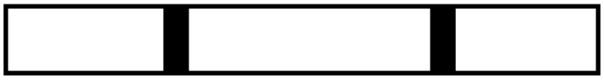
Instructions to candidate

a) Write your name, admission number, and stream in the spaces provided.
b) Answer **ALL** questions in the spaces provided.
c) All working **MUST** be clearly shown where applicable.
d) KNEC mathematical tables and silent non-programmable electronic calculators may be used.
e) This paper consists of ***12 printed pages***.
f) The candidate should check the question paper to ascertain that all the pages are printed as indicated and that no question is missing.

FOR EXAMINERS' USE ONLY

Question	Maximum Score	Candidate's Score
1 – 27	**80**	

1. A wooden splint was slipped through a given region of a Bunsen burner flame in the laboratory. The pattern shown in the diagram below was realised.



a) Name the type of flame involved (1 mark)

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b) Explain the observation made on the splint (2 marks)

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2. **a)** State Gay Lussac's law (1 mark)

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b) $20cm^3$ of a gaseous hydrocarbon, $\mathbf{C_4H_y}$ produced steam and $80cm^3$ of carbon (IV) oxide when burnt in $110cm^3$ of oxygen. Determine the value of **y**. (2 marks)

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3. The electron arrangement of ions $\mathbf{W^+}$ and $\mathbf{Z^{3-}}$ are **2** and **2.8** respectively.

a) In which groups do elements **W** and **Z** belong? (1 mark)

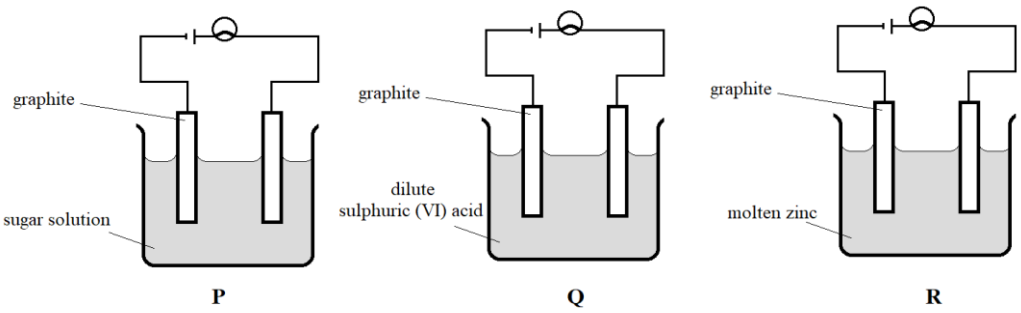
W ……....

Z …….

b) Write the formula of the compound formed between **W** and **Z** (1 mark)

…….

4. Kinuthia arranged three setups as shown in figure below, to investigate the effect of an electric current on three different substances.



Explain the following observations:

a) The bulb in **P** does not light and no electrolysis took place (1 mark)

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b) The bulb in **Q** lit and electrolysis took place (1 mark)

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c) The bulb in **R** lit but no electrolysis took place. (1 mark)

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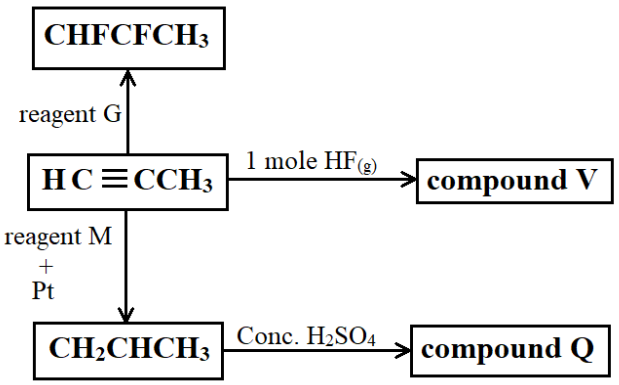
5. The figure below indicates a reaction scheme that starts with propyne. Study it and use it to answer the questions that follow.



a) Name the following: (2 marks)

Compound **V** …….

Compound **Q** …….

Reagent **G** …….

Reagent **M** …….

b) Name the process by which propyne reacts with **reagent G** (1 mark)

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6. A sample of hydrated metal oxide $\mathbf{V_2O_3 \cdot 3H_2O}$ has a mass of 11.7g. The substance was heated until all its water of crystallisation was lost. If the final mass of the residue was 7.65g, determine the atomic mass of **element V**. (3 marks)

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7. A **solid D** was subjected to heat and yielded a gas that forms a white precipitate when bubbled through calcium hydroxide solution. The resultant residue forms a colourless **solution J** when dissolved in nitric (V) acid. When dilute hydrochloric acid was added to **solution J**, a white precipitate that dissolves when warmed, to form a colourless solution is observed.

a) Write the formulae of:

The cation in **solid D** (1 mark)

…….....

The anion in **solid D** (1 mark)

…….

b) Write the equation for the reaction between the residue and dilute nitric (V) acid that forms **solution J** (1 mark)

……..

8. Equal masses of calcium granules were heated and crushed alternately in separate crucibles **I** and **II** containing pure oxygen and air, respectively until there was no more change in mass.

a) Comment on the final masses of the contents of crucibles **I** and **II**. (1 mark)

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b) Write the equations for the reactions in the crucible with greater mass (2 marks)

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9. You are provided with crystals of potassium chloride and lead (II) nitrate. If water is available in a wash bottle, describe how one can obtain a solid sample of lead (II) chloride. (3 marks)

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10. Determine the volume of oxygen produced when 11.05g of silver nitrate undergoes thermal decomposition at r.t.p. (Ag = 108, N = 14, O = 16, Molar gas volume at r.t.p. = 24.0 L) (3 marks)

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11. Oxygen and sulphur are both group VI elements. However, the melting point of oxygen is -216^{o}C while that of sulphur is 44^{o}C. Explain this large difference in melting points (2 marks)

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12.

a) Describe an experiment that could be used to distinguish a gas jar of carbon (IV) oxide from of carbon (II) oxide. (2 marks)

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b) Explain the role of carbon (IV) oxide in fire extinguishing (1 mark)

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13. A spatula of zinc granules was added to a beaker containing distilled water.

a) State **two** observations that were made during the reaction (2 marks)

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b) State the observation made when two drops of methyl orange indicator is added to the resultant solution (1 mark)

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14. 150cm^3 of a **gas A** diffuses through a porous plug in 12.5 seconds while 150cm^3 of oxygen gas diffuses through the same plug in in 7.5 seconds. Calculate the relative molecular mass of **gas A**. (2 marks)

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15. Methods **A** and **B** are used in protecting iron metal from rusting. **Method A** involves coating the iron surface with a layer of copper while in **Method B**, a thin layer of Zinc is sprayed onto the iron surface.

a) Name the methods used in protecting the iron surface from rusting: (1 mark)

Method A …….

Method B …….

b) Which method is the most suitable? Explain (2 marks)

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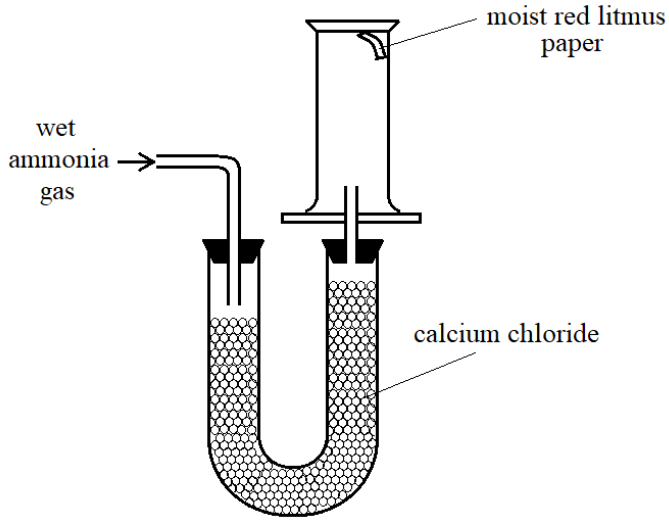
16. A setup was arranged as shown in the diagram below to collect a dry sample of ammonia gas.



a) The moist red litmus paper remained red. Explain this observation. (2 marks)

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b) Name the method of gas collection demonstrated by the setup (1 mark)

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17.

a) A volume of concentrated sulphuric (VI) acid was added to a sample of sugar crystals. State and explain the observation made. (2 marks)

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b) State **one** application of this process in the laboratory. (1 mark)

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18. The grid below shows part of the periodic table

						J	**L**	**M**
D	**G**					**R**		**T**
E								

a) Identify the least reactive non-metal. Explain your answer. (2 marks)

……

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b) How do the atomic radii of **D** and **R** compare? Explain. (2 marks)

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19. When a student was stung by a nettle plant their teacher applied an aqueous solution of ammonia to the affected area of the skin and the student was relieved of pain.

a) Explain this observation (2 marks)

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b) Sodium hydroxide is not preferred for this procedure. Explain. (2 marks)

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20. When **solid W** is heated strongly in a combustion tube, a blue residue and droplets of a colourless liquid are observed on the cooler parts of the combustion tube.

a) Name the process described in the combustion tube (1 mark)

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b) Identify **solid W** (1 mark)

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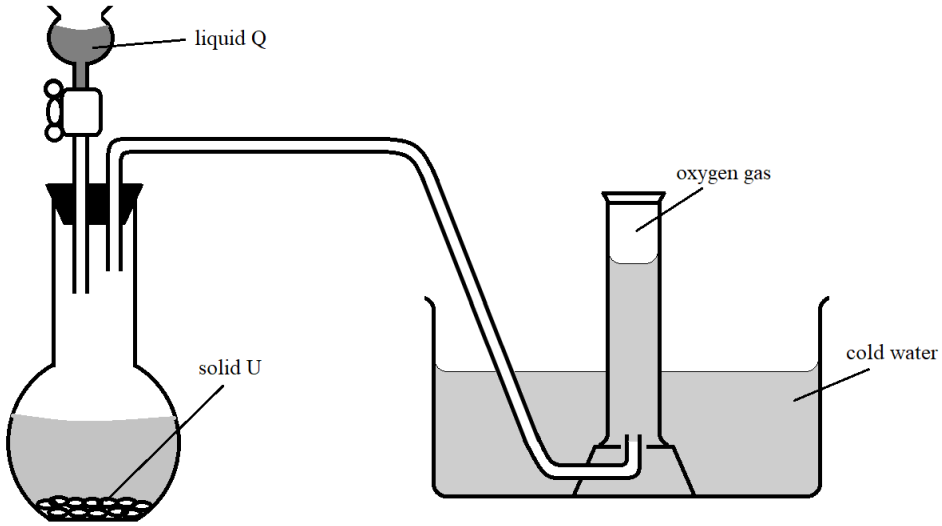
21. The setup below was used for the preparation of oxygen gas in the laboratory.



a) If **liquid Q** is water, identify **solid U** and write an equation for the reaction that occurs in the flask. (2 marks)

Identity of **solid B**

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Equation for reaction

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b) Apart from density, state any **one** property of oxygen that allows it to be collected as shown in the diagram. (1 mark)

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22. Atomic representations of elements **U**, **V**, **W** and **X** are:

$$^{33}_{16}\mathbf{U},\ ^{12}_{5}\mathbf{V},\ ^{22}_{11}\mathbf{W}\text{, and }^{38}_{18}\mathbf{X}$$

Select the element which forms

a) An insoluble carbonate (1 mark)

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b) A double charged anion (1 mark)

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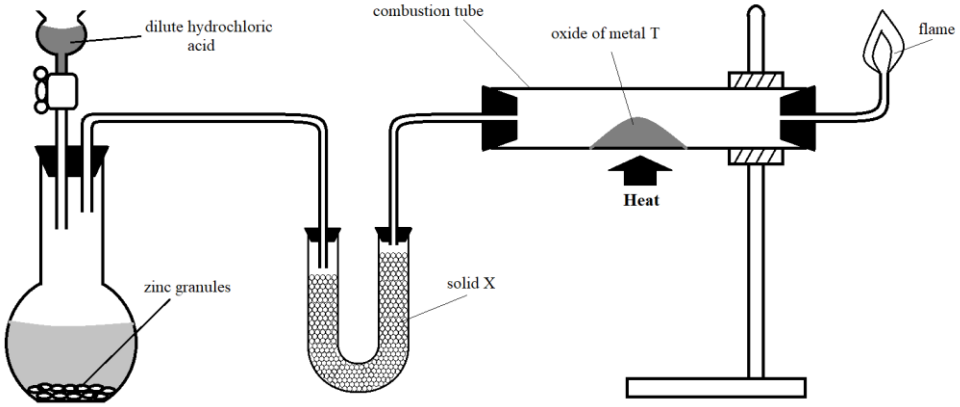
c) The largest atomic radius (1 mark)

……..

23. The apparatus arranged as shown in the diagram below was used to prepare hydrogen gas and to investigate its properties. **Metal T** is copper.



a) State an observation that would be made in the setup if nitric (V) acid was used in the place of the dilute hydrochloric acid. (1 mark)

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b) Identify **solid X** in the setup and state its function. (1 mark)

Identity X ……

Function ……

c) State the role of the flame at the end of the combustion tube. (1 mark)

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24. Hexane, butanol, and water are all liquids at room temperature. A mixture of water and hexane forms layers, while a mixture of butanol and water forms a homogenous solution. Explain this observation (3 marks)

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25. The label on a bottle of hydrochloric acid in the laboratory has the following information printed on it

Density: 1.134g/cm^3 **Percentage purity: 37%**

a) Determine the mass of hydrochloric acid in 10cm^3 of the stock solution (2 marks)

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b) Calculate the concentration of this stock solution in moles per litre. (2 marks)

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26. Diamond and graphite both have giant atomic structures with strong covalent bonds. However, diamond is hard while graphite is soft. Explain this observation. (3 marks)

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27. A hibiscus plant has red petals and is used to prepare simple acid-base indicator. Describe how:

a) A solution containing the red pigment may be prepared (1 mark)

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b) The solution may be demonstrated to be an acid-base indicator (2 marks)

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