



# MARANDA HIGH SCHOOL

## Kenya Certificate of Secondary Education MOCK EXAMINATIONS 2021

233/1

CHEMISTRY

Paper 1

DECEMBER 2021 – TIME: 2Hours

Name: ..... Adm No: .....

Class: ..... Candidate's Signature: ..... Date: ...../12/2021

### Instructions to candidates

- (a) Write your name, admission number and sign in the spaces provided above.
- (b) Sign and write the date of the examination in the spaces provided
- (c) Answer **ALL** the questions in the spaces provided
- (d) All working **MUST** be clearly shown.
- (e) KNEC mathematical tables and silent non programmable electronic calculators may be used.
- (f) This paper consists of 13 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 – 27	80	

1. (a) Give two reasons why luminous flame is not used for heating purposes in the laboratory.

(2marks)

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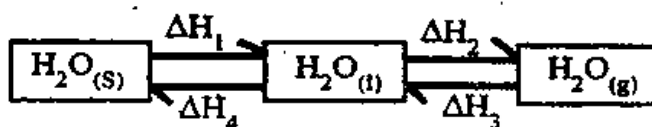
- (b) Explain how the hotness of a Bunsen burner flame can be increased.

(1mark)

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2. The scheme below shows the energy changes that are involved between ice, water and steam. Study it and answer the questions that follow



- (a) What name is given to the process represented by energy change  $\Delta H_4$ ?

(1 mark)

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- (b) What is the sign of  $\Delta H_3$ ? Give a reason

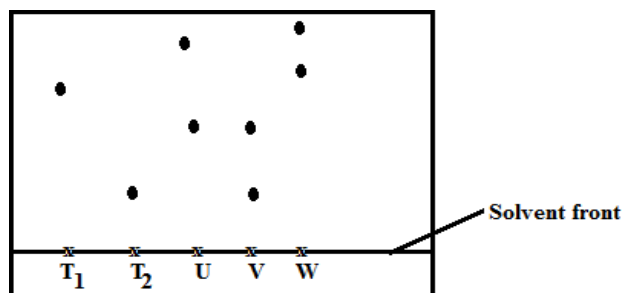
(2 marks)

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3. Samples of urine from three participants U, V and W at an international sport meeting were spotted onto chromatography paper alongside two from illegal drugs T1 and T2. A chromatogram was run using methanol. The figure below shows the chromatogram.



- (a) Identify the athlete who had used an illegal drug.

(1mark)

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(b) Which drug is more soluble in methanol?

(1 mark)

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(c) Identify a mistake made on the chromatogram.

(1 mark)

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4. The grid below is part of the periodic table. Study it and answer the questions that follow. The letters are not actual symbols of elements.

A				D	E			H	I
B	C			M		F	G		J

a) What is the name given to the chemical family of element **C**?

(1 mark)

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b) Would element **B** react with **J**? Explain.

(1 mark)

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c) Compare the melting points of **B** and **M**.

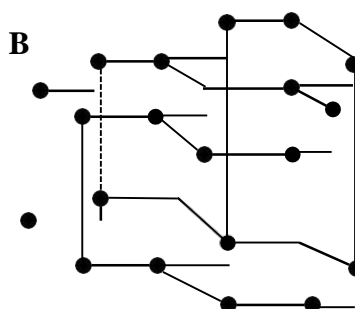
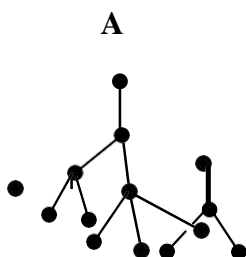
(1 mark)

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5. The following diagrams show the structure of two allotropes of carbon. Study them and answer the questions that follow.



(a) Name the allotropes. A and B

(1 mark)

A: .....

B: .....

(b) Give **one** use of **A**.

(½ mark)

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(c) Which allotrope conducts electricity? Explain.

(1½ marks)

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6. (a) A few drops of freshly prepared Iron (II) Sulphate solution were added to Potassium nitrate solution in a test-tube. Concentrated sulphuric (VI) acid was then carefully added to the mixture. State the observations that were made. (1mark)

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(b) Write an equation for the reaction that occurs when solid potassium nitrate is strongly heated.

(1mark)

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(c) What is the role of the test shown in (a) above.

(1mark)

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7. (a) Using electrons in the outermost energy level, draw the dot (•) and cross (X) diagrams to represent bonding in:

(i)  $C_2H_6$

(1 mark)

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(ii) Magnesium nitride

(1 mark)

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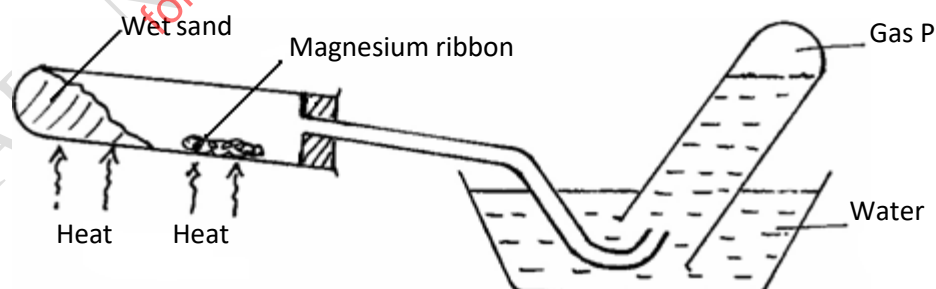
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- (b) The formula of a complex ion is  $[Cu(NH_3)_4]^{2+}$ . Name the type of bond that is likely to exist between copper and ammonia in the complex. (1 mark)

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8. The set-up below can be used to study the reaction of magnesium and steam



- (a) Name gas **P**. (1 mark)

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- (b) Explain the observation made when copper is used instead of magnesium in the set up above? (1 mark)

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- (c) Write the equation for the reaction between magnesium and steam. (1mark)

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9. 280cm<sup>3</sup> of nitrogen gas diffuse through a porous plug in 70 seconds. How long will it take 400cm<sup>3</sup> of carbon (IV) oxide gas to diffuse through the same porous plug? (C = 12, O = 16, N = 7).(3mks)

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10. State two factors that accelerate rusting. (2 marks)

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11. (a) Define the term ionization energy. (1mark)

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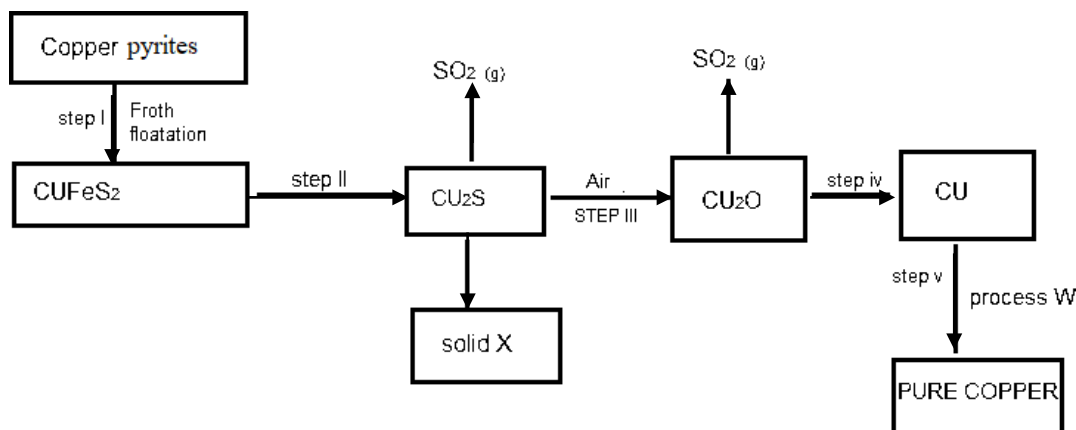
- (b) State and explain a factor that determine the value of ionization energy of a given element. (2marks)

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



a. Identify

i. Solid X

(½ mark)

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ii. Process W

(½ mark)

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b. Write an equation for the reaction in step II.

(1mark)

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c. Explain why Copper is suitable in making soldering equipment.

(1mark)

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13. The table below shows the solubility of a salt at various temperatures.

Temperature °C	Solubility (g/100g water)
0	36
40	30
80	25
100	22
120	20

- (a) Define the term Fractional Crystallization. (1 mark)

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- (b) Calculate the mass of salt formed when 20g of a saturated solution of the salt at  $0^{\circ}\text{C}$  is placed in a water bath maintained at  $100^{\circ}\text{C}$ . (2 marks)

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14. The table below shows properties of some elements A,B,C and D which belong to the same period of the periodic table. The letters do not represent the actual symbols of the elements.

Element	A	B	C	D
M.P. $^{\circ}\text{C}$	1410	98	-101	660
Atomic radii(nm)	0.117	0.186	0.099	0.143
Electrical conductivity	Poor	Good	Non Conductor	Good

- (a) Arrange the elements in the order they would appear in the period. Give a reason. (2 marks)

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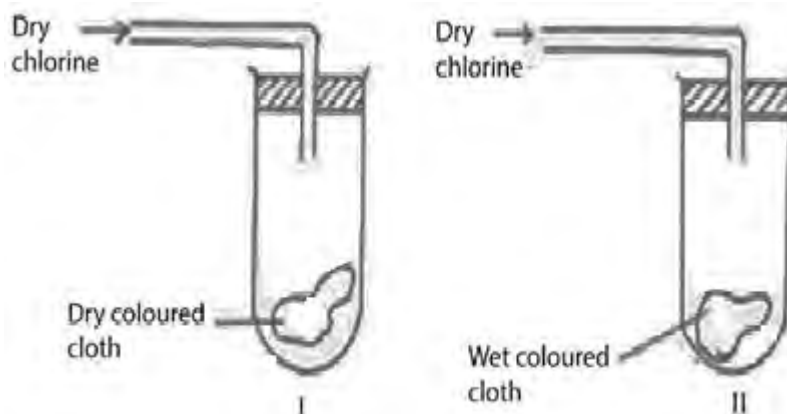
- (b) Select the metallic element which is better conductor of electricity. Give a reason. (1 mark)

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15. Study the diagrams below.





- (a) State the observations made at I and II. (1mark)

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- (b) Write the equations to show the reaction in II if dry sulphur (IV) oxide was used in place of dry chlorine. (2marks)

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- 16.** A radioactive substance weighing **M** kg took 1900 years for the original mass to reduce to 15kg. Given that half-life of the radioactive substance is 380 years;

- (a) Determine the original mass of the radioactive substance. (2 marks)

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- (b) State two uses of radioactivity in medicine. (1 mark)

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- 17.** 20cm<sup>3</sup> of a dibasic acid required 25cm<sup>3</sup> of 0.1M NaOH for complete neutralization.

- (a) How many moles of sodium hydroxide reacted with the dibasic acid? (1mark)

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- (b) Calculate the concentration of the dibasic acid in moles per litre. (2mks)

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18. The table below shows the standard reduction potentials for four half-cells. Study it and answer the questions that follow (letter are not the actual symbols for the elements)

			$E^\theta$ (Volts)	
$F_{2(aq)}$	+	$2 e$	$\longrightarrow 2F^-_{(aq)}$	+0.54
$G^{2+}_{(aq)}$	+	$2e$	$\longrightarrow G_{(s)}$	-0.44
$H^{2+}_{(aq)}$	+	$2e$	$\longrightarrow H_{(s)}$	+0.34
$2J^+_{(aq)}$	+	$2e$	$\longrightarrow J_{2(g)}$	0.00

- i. Identify the strongest reducing agent. Explain (1mark)

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- ii. Write the equation for the reaction which takes place when solid G is added to a solution containing  $H^{2+}$  ions. (1 mark)

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- iii. Calculate the  $E^0$  value for the reaction in (ii) above. (1mark)

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19. Starting with solid lead (II) carbonate, briefly describe how a sample of lead (II) chloride can be prepared. (3marks)

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20. Chlorine and iodine are elements in the same group in the periodic table.

- (a) What observation would be made if chlorine gas is bubbled through aqueous sodium iodide? Explain using an ionic equation. (2 marks)

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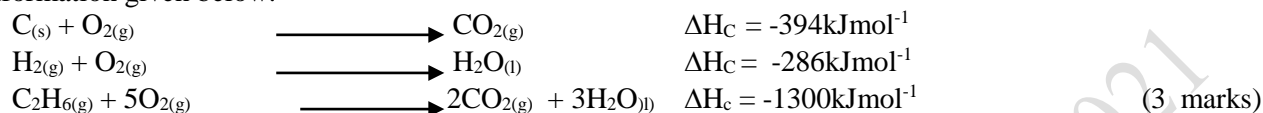
(b) Using the equation in (a) above, identify and explain the reducing agent. (1 mark)

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21. Using energy cycle diagram, calculate the enthalpy of formation of ethane from the information given below.



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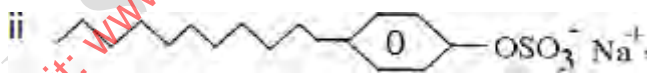
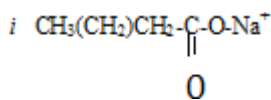
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22. (a). Identify the following cleansing agents. (2 mark)



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(b). State one disadvantage of using the cleansing agent in (a) (ii) above. (1mark)

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23. The empirical formula of a hydrocarbon is  $\text{C}_2\text{H}_3$ . The hydrocarbon has a relative molecular mass of 54. (H=1.0, C=12.0).

(a) Determine the molecular formula of the hydrocarbon. (1mark)

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(b) Draw the structural formula of the hydrocarbon. (1mark)

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(c) To which homologous series does the hydrocarbon drawn in (b) above belong? (1mark)

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24. (a) State the Boyle's law. (1mark)

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(b) A gas occupies  $300\text{cm}^3$  at  $23^\circ\text{C}$  and  $100,000\text{ Pa}$ . What will be its volume at  $0^\circ\text{C}$  and  $101325\text{Pa}$ ?

(2marks)

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25. In the laboratory, hydrogen sulphide gas is prepared by action of dilute hydrochloric acid on metal sulphides.

(a) Name the metal sulphide that can be used in preparing the gas. (1mark)

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(b) Write down the equation for the reaction in (a) above. (1mark)

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(c) Give one chemical test for hydrogen sulphide gas. (1mark)

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26. Some crystals of sugar cane were placed in a test-tube and a few drops of concentrated sulphuric (VI) acid added to it.

(i) State what was observed. (1mark)

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(ii) What name is given to the property of concentrated sulphuric (VI) acid in (i) above? (1mark)

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(iii) Write an equation for the reaction between glucose,  $C_6H_{12}O_6$  and  $H_2SO_4(l)$ . (1mark)

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27. The following equation shows a reversible reaction.



(a). **State** and explain the observation that can be made when:-

(i). Temperature is increased. (1½marks)

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(ii). Pressure is reduced (1½marks)

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