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)

……

……

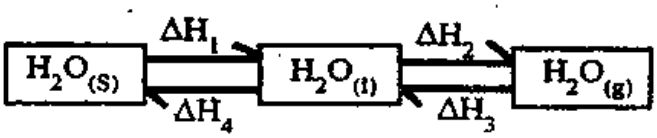
……

(b) Explain how the hotness of a Bunsen burner flame can be increased. (1mark)

……

……

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 ΔH_4? (1 mark)

……

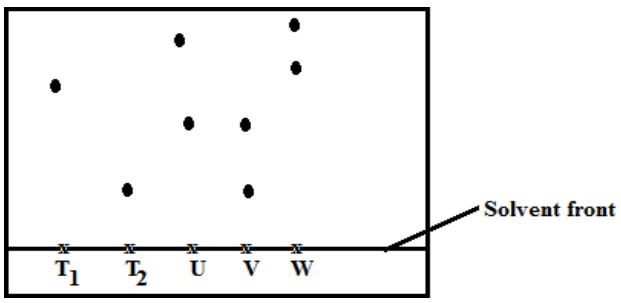
(b) What is the sign of ΔH_3? Give a reason (2 marks)

……

……

……

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 chromatogramwas run using methanol. The figure below shows the chromatogram.



(a) Identify the athlete who had used an illegal drug. (1mark)

……

……

(b) Which drug is more soluble in methanol? (1mark)

……

(c) Identify a mistake made on the chromatogram. (1mark)

……

……

……

4. The grid below is part of the periodic table. Study it and answer the questions that follow. Theletters 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**? (1mark)

……

b) Would element **B** reacts with **J**? Explain. (1mark)

……

……

……

c) Compare the melting points of **B** and **M**. (1mark)

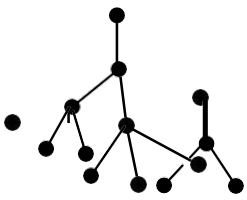
……

……

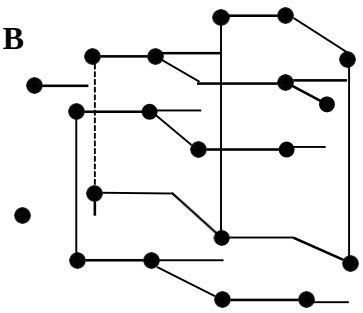
……

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

A



B



(a) Name the allotropes. A and B (1 mark)

A: ……

B: ……..

(b) Give **one** use of **A**. (½ mark)

……

……

(c) Which allotrope conducts electricity? Explain. (1½ marks)

……

……

……

……

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)

……

……

……

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

(1mark)

……

……

(c) What is the role of the test shown in (a) above. (1mark)

……

……

……

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

(i) C_2H_6 (1mark)

……

……

……

……

……

(ii) Magnesium nitride (1mark)

……

……

……

……

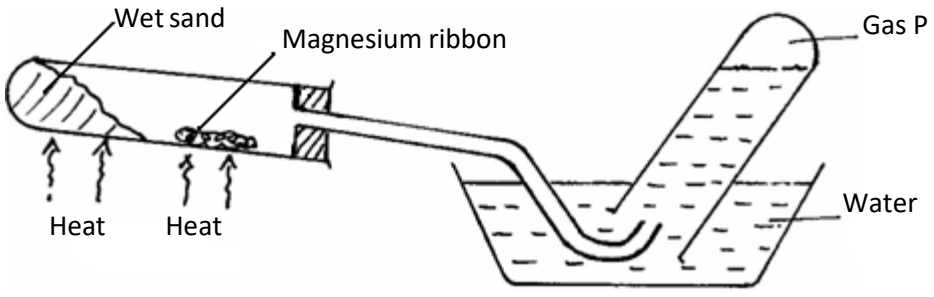
……

(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)

……

……

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



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

……

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

……

……

……

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

……

9. 280cm³ of nitrogen gas diffuse through a porous plug in 70 seconds. How long will it take 400cm³ of carbon (IV) oxide gas to diffuse through the same porous plug? (C = 12, O = 16, N = 7).(3mks)

……

……

……

……

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

……

……

……

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

……

……

……

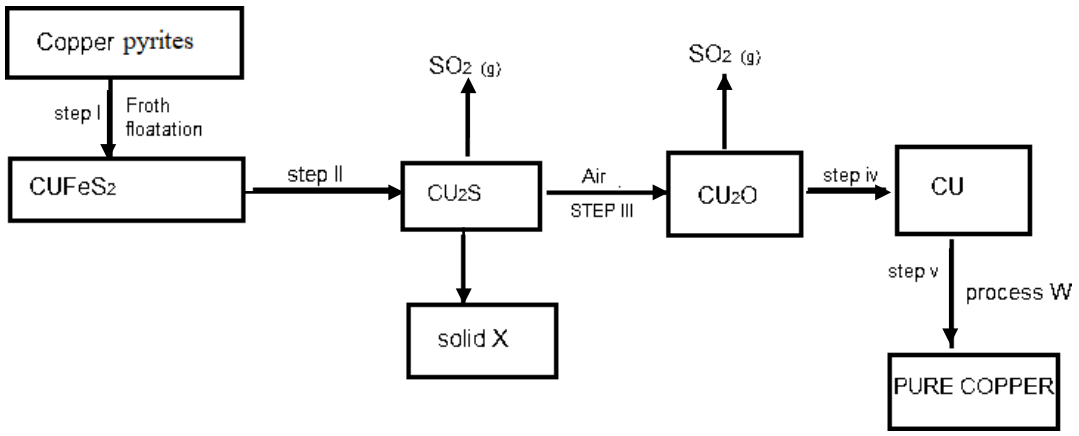
(b) State and explain a factor that determine the value of ionization energy of a given element. (2marks)

……

……

……

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



a. Identify

i. Solid X (½ mark)

……

……

ii. Process W (½ mark)

……

……

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

……

……

c. Explain why Copper is suitable in making soldering equipment. (1mark)

……

……

……

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

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

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

……

……

……

(b) Calculate the mass of salt formed when 20g of a saturated solution of the salt at 0^0C is place in a water bath maintained at 100^0C. (2 marks)

……

……

……

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. ^{o}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)

……

……

……

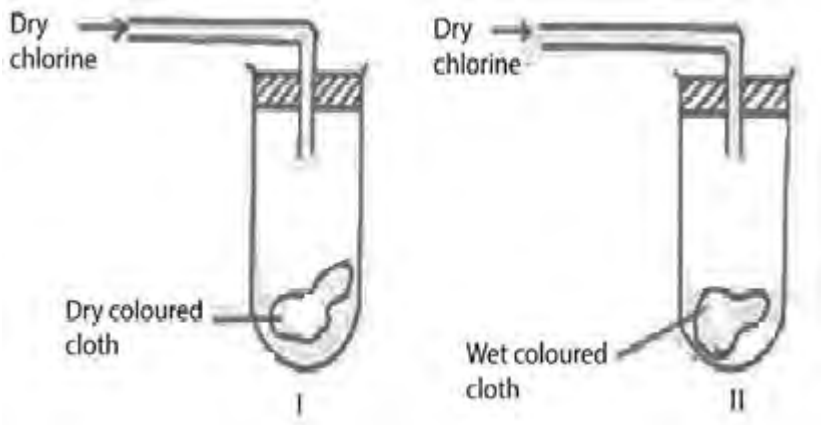
(b) Select the metallic element which is better conductor of electricity. Give a reason. (1 mark)

……

……

……

15. Study the diagrams below.



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

……

……

……

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

……

……

……

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)

……

……

……

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

……

……

……

17. 20cm³ of a dibasic acid required 25cm³ of 0.1M NaOH for complete neutralization.

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

……

……

……

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

……

……

……

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^{θ} (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)

……

……

……

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

……

……

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

……

……

……

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

……

……

……

……

……

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 iodine? Explain using an ionic equation. (2 marks)

……

……

……

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

……

……

……

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

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ $\Delta H_C = -394 kJmol^{-1}$

$H_{2(g)} + O_{2(g)} \longrightarrow H_2O_{(l)}$ $\Delta H_C = -286 kJmol^{-1}$

$C_2H_{6(g)} + 5O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{l)}$ $\Delta H_c = -1300 kJmol^{-1}$ (3 marks)

……

……

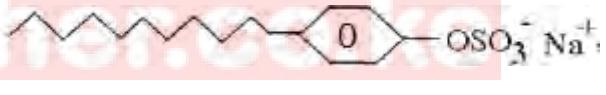
……

……

……

……

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

i $CH_3(CH_2)CH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}O\text{-}Na^+$ ii 

…… ……

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

……

……

23. The empirical formula of a hydrocarbon is C_2H_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)

……

……

……

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

……

……

……

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

……

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

……

……

……

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

(2marks)

……

……

……

……

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)

……

……

……

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

……

……

……

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

……

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)

……

……

……

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

……

……

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

……

……

27. The following equation shows a reversible reaction.

$$H_{2(g)} + Br_{2(g)} \rightleftharpoons 2HBr_{(g)} \qquad \Delta H = -74.4kJ$$

brown *colourless*

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

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

……

……

……

(ii).Pressure is reduced (1½marks)

……

……

……

THIS IS THE LAST PRINTED PAGE