THE ELITES JET

233/2 CHEMISTRY Paper 2

(Theory)

PRE-MOCK

March 2025 – Time: 2 hours

Name ……..…. Adm No……..…….. Class……..…

School……..…Date……....….Sign……..……..….

Instructions.

a) Write your name and index number in the spaces provided.
b) Write the name of your school, date and sign in the spaces provided
*c) Answer **all** questions in the spaces provided*
*d) Mathematical tables and silent electronic calculators **may** be used for calculations.*
*e) All workings **must** be clearly shown where necessary.*
f) Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.

For Examiners Use Only

Questions	Maximum Score	Score
1	13	
2	8	
3	14	
4	14	
5	11	
6	13	
7	7	
TOTAL	**80**	

1. (a) The grid below represents part of the periodic table. Study the information and answer the questions that follow. The letters do not represent the actual symbol of the elements.

C								
H		W		T		R	Y	F
	E		S				Z	
M	I							

(i) Which element would form a trivalent cation? (1 mark)

……

……

(ii) Write the equation for the reaction that would occur between E and Y. (1 mark)

……

……

(iii) Which elements belong to the region labelled W (1 mark)

……

……

(iv) Which is the most reactive non-metallic element in the table above? Explain (2 marks)

……

……

(v) How does the atomic radius of T compare with that of Y (2 marks)

……

……

(b) The table shows some properties and electron arrangements of common ions of elements represented by letters D to K. Study the information and answer the questions that follow.

Element	Formula of ion	Ionic electron arrangement	Atomic radius (nm)	Ionic radius (nm)
D	D^-	2.8	0.072	0.136
E	E^+	2.8.8	0.231	0.133
F	F^{3+}	2.8	0.143	0.050
G	G^{2+}	2.8.8	0.133	0.074
H	H^{2+}	2.8	0.160	0.064
I	I^+	2.8	0.186	0.095
J	J^{3-}	2.8.8	0.110	0.190
K	K^-	2.8.8	0.099	0.181

(i) State the atomic numbers of elements F and G (1 mark)

F

……

G

……

(ii) Select two metals that belong to period 3. (1 mark)

……

……

(iii) Element I reacts violently with water. Write the equation for the reaction. (1 mark)

……

……

(iv) Why is the ionic radius of G smaller than its atomic radius (1 mark)

……

……

(v) Compare and explain the reactivity of G and H (2 marks)

……

……

……

2. In an experiment ammonia gas was prepared by heating an ammonium salt with an alkali. After drying 120cm^3 of ammonia gas were collected at room temperature and pressure. All the ammonia gas was then reacted completely with 250cm^3 solution of phosphoric acid.

(a) What is meant by the term alkali (1 mark)

……

……

(b) Explain using physical properties of the gas why ammonia was not collected over water. (1 mark)

……

……

(c) Ammonia turns red litmus paper blue. Which ion is responsible for the reaction. (1 mark)

……

.

(d) The equation below shows the reaction between ammonia and phosphoric acid.

$3NH_{3\,(g)} + H_3PO_{4(aq)} \longrightarrow (NH_4)_3PO_{4\,(aq)}$

(i)Explain how crystals of ammonium phosphate could be obtained in the experiment

(2 marks)

……

……

……

(e)Calculate the maximum mass of ammonium phosphate that could be obtained in the experiment

(3 marks)

(N = 14.0, O= 16.0, P = 31.0, H=1.0)

Molar gas volume $24dm^3$ at R.T.P

……

……

……

……

……

……

3. a) You are provided with the following reagents; dilute nitric acid, dilute sulphuric acid, and lead (II) oxide. Describe how you would prepare a sample of lead (II) sulphate. (3 marks)

……

……

……

……

……

b) Given a mixture of lead (II) chloride, iodine, ammonium chloride and sodium chloride crystals. Describe how you would separate all he four solids using methyl benzene, a source of heat and water. **(Hint; Step one involves addition of methyl benzene)** (3 marks)

……

……

……

……

……

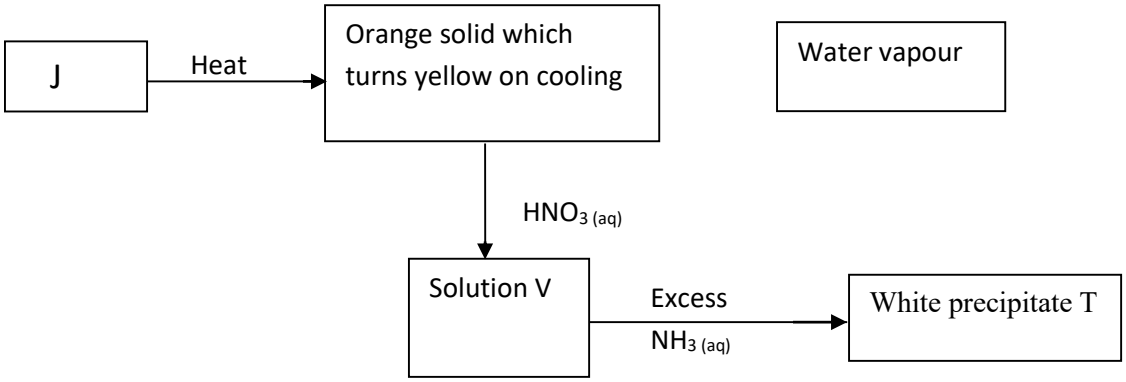
……

c) 8.4g of anhydrous sodium hydrogen carbonate is completely decomposed by heat. Calculate;

i) Mass of residue produced. (2 marks)

ii) Volume of carbon (IV) oxide produced at s.t.p (2 marks)
(H =1, C = 12, O = 16, Na = 23, Molar gas volume = 22.4dm^3)

d) Study the reaction scheme below and answer the questions that follow.



I) Identify (2 marks)

i) Solution V

.....

ii) White precipitate T

……

II) Write an equation for the reaction forming solution V (1 mark)

……

……...

III) Write an ionic equation to show how the white precipitate T is formed. (1 mark)

……

4. (a) In order to obtain some dilute aqueous ethanol, a solution of sugar and yeast is made. The mixture is then kept under warm conditions for some time. The sugar is broken down into simpler sugars, glucose by enzymes in the yeast to produce ethanol.

(i) What name is given to the process described above? (1 mark)

……

(ii) Draw the structural formula of ethanol. (1 mark)

(iii) About 10% by volume of ethanol is produced by the method described. What process would the 95% by volume of ethanol be obtained? (1 mark)

……

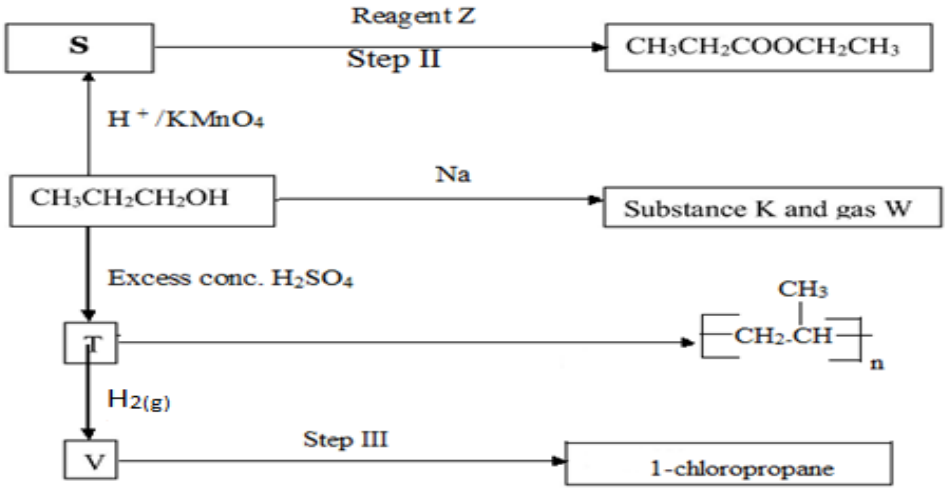
……

IV) State how the presence of Ethanol can be confirmed in the process above.
(1 mark)

……

……

b) Study the flow chart below and answer the questions that follow.



i) Name the type of reaction, reagent needed and conditions for the reaction in steps;

(3 marks)

	Type of reaction	Reagent(s)	Condition(s)
Step II			
Step III			

ii) Write the equation for the formation of substance V. Give the name of V. (2 marks)

……

c) One of the largest uses of vegetable oils is in the soap industry. Give the other use.
(1 mark)

……..

(i) Name the process of manufacturing soap. (1 mark)

……

(ii) Using an equation, explain why the efficiency of soap is reduced when water from Athi River is used. (1 mark)

……

d) Identify substances (2 marks)

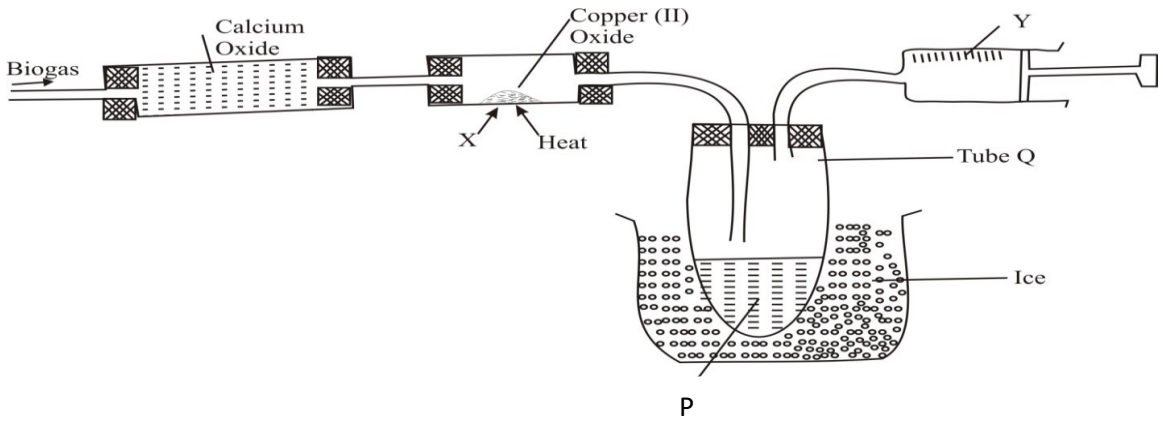
K ……..

S ……

V ……..

W ……

5. Biogas is made from natural organic waste. A from four student set –up the apparatus below to investigate the composition of the gas. He passed it over heated copper (II) oxide. After that he obtained two products. One was cooled in a boiling tube while the other was collected using a syringe.



a) What is the function of calcium oxide (1 mark)

.....

.....

b) Name products (2 marks)

i) P.....

ii) **Y**.....

c) Give the two observations made in tube **X** (2 marks)

.....

.....

d) (i) Name the type of reaction taking place in tube **X** (1 mark)

.....

ii) Write the equation for the reaction above in (d)(i) (1 mark)

.....

e) What elements are present in biogas (2 marks)

.....

f) Explain why one tube in boiling tube **Q** is longer than the other (2 marks)

.....

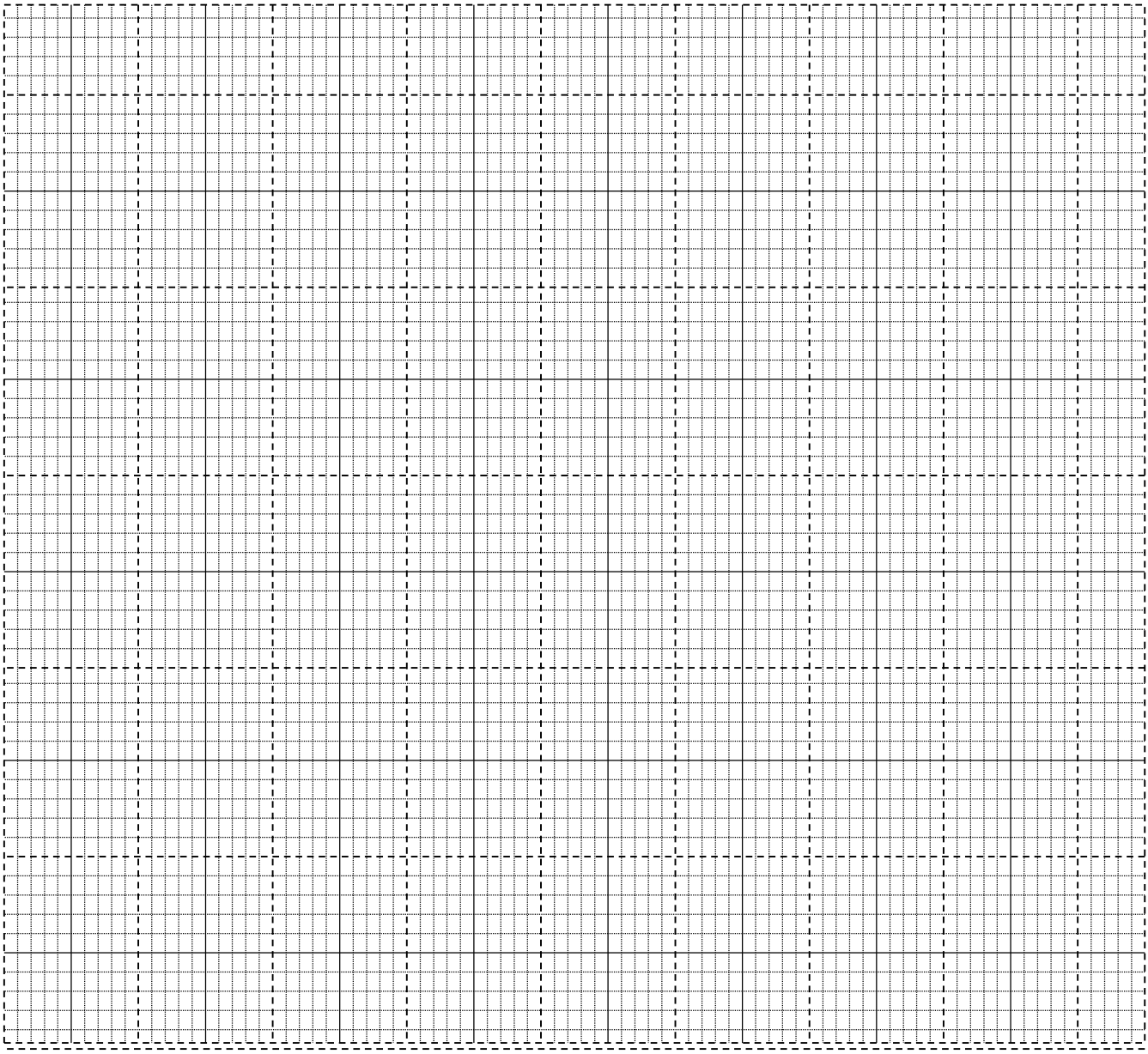
.....

.....

6. Solubility of potassium nitrate and copper (II) sulphate were determined at different temperatures. The following data was obtained.

Temperature ^0C		0	20	40	60	80	100
Solubility of 100g of water	KNO_3	12	30	75	125	185	250
	$CuSO_4$	15	20	35	45	65	80

(a) On the graph provided plot solubility curves for both salts. (3 marks)



(b) Determine from the graph the solubilities of each salt at 50^0C. (2 marks)

I. KNO_3

……

……

II. $CuSO_4$

……

……

……

III. At what temperature was the solubility of both salts equal? (1 mark)

……

IV. Saturated solution of potassium nitrate at 70^0C was cooled to 20^0C.
What mass of the crystals will be deposited? (1 mark)

……

……

(c) Calculate the concentration of copper (II) sulphate in moles per litre at 45ºC. (3 marks)

(Cu=64.0, O=16.0, S=32.0, density of water =1g/cm^3)

(b) (i) Define hard water (1 mark)

……

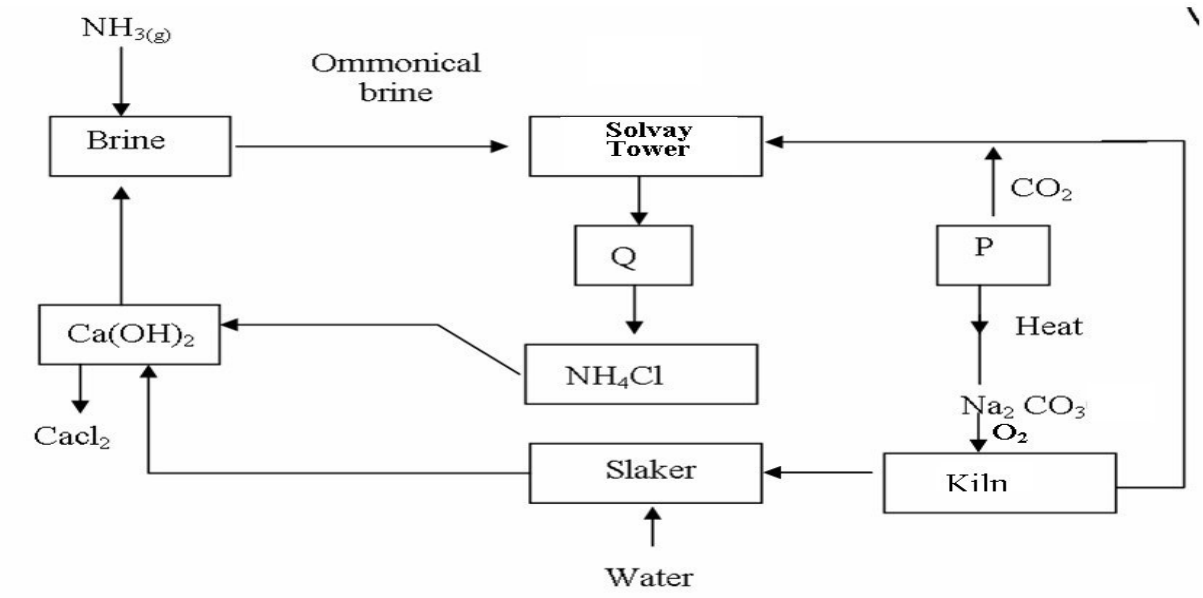
……

(ii) State two advantages of hard water. (2 marks)

……

……

7. The flow chart below shows the manufacture of sodium carbonate. Study it carefully and answer the questions that follow.



(a)(i). What is ammoniacal brine? (1 mark)

……

……

(ii). Ammoniacal brine reacts with carbon (IV) oxide to form a mixture of two salts which produce Q. Write an equation to show formation of Q. (1 mark)

……

……

(iii). Name two processes that are used to separate Q into NH_4Cl and P. (1 mark)

……

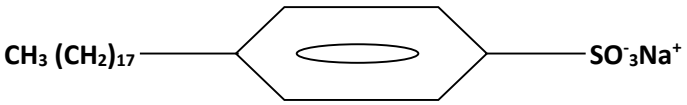
……

(b) Give two uses of sodium carbonate produced in the process. (1 mark)

……

……

c) A compound whose structure is shown below is found in a detergent.



i) State the type of detergent above. (1 mark)

……

ii) State two advantages of the above detergent. (2 marks)

……

……

BLANK PAGE.