FORM FOUR CLUSTER KCSE MODEL13

CHEMISTRY PAPER 3 QUESTIONS

1. You are provided with: Solution M containing 39.2g per litre of $(NH_4)_2SO_4.FeSO_4.6H_2O$. which is acidified with Sulphuric (VI) acid. Solution N containing 3.20g of potassium manganate (VII) in a litre of solution. You are required to determine the ratio of reaction of manganate (VII) ion (VII) ion (MnO_4^-) with iron (II)

Procedure i)

Fill the burette with solution N.

ii) Using a pipette and pipette filler, pipette 25cm3 of solution M and place it in a clean conical flask

iii) Titrate solution M using solution: M while shaking the content of the conical flask until the pink colour persists.

iv) Record the results in the table below.

v) Repeat the titration two more times and complete the table below.

vi) Retain the remaining solution N for question 3b (IV).

Table I

	I	II	II
Final burette reading			
Initial burette reading			
Volume of solution N (cm^3)			

(4marks)

a) Calculate the average volume of solution N used. (1mark)

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b) Calculate the concentration of potassium manganate (VII) in moles per litre. (K=39.0, Mn=55.0 and O=16.0) (3marks)
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c) Calculate the molarity of hydrated ammonium iron (II) sulphate given that it's RFM is 392. (2marks) .....
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d) Calculate the number of moles of potassium manganate (VII) used in titration. (2marks)
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e) Calculate the number of moles of iron (II) Ions that reacts with one mole of manganate (VII) ions. (3marks) .....
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2. You are provided with solid P in a test tube.

You are required to determine the freezing point of solid P. Procedure

i. Place 150cm3 of tap water in a 250ml or 200ml beaker. Heat the water to near boiling.

ii. Using a test tube holder, immerse the test tube containing solid P into the hot water (ensure that half of the test tube is immersed. Continue heating the water until the solid starts to melt).

iii. Insert a thermometer into the liquid being formed in the test tube and note the temperature when all the solid has just melted. Record the temperature in the table II.

iv. Remove the test tube from the water and immediately start a stop watch / clock and record the temperature of the content of the test tube after every half- minute and complete the table below. Dip the thermometer into the hot bath to clean it with tissue paper.

Time (min)	0	½	1	1 ½	2	2 ½	3	3 ½
Temperature (^{0}C)								

On the grid provided plot a graph of time (horizontal axis) against temperature (5marks

3. You are provided with solid Q. Carry out the test below and record your observations and inferences in the spaces provided.

a) Put all solid Q provided in a boiling tube. Add about 12cm3 of distilled water and shake.

Observation	Inferences
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(1mark) (1mark)

b) Divide the above solution into four portions for tests (i) to (iv)

i) To the first portion add sodium hydroxide solution.

Observation	Inferences

ii) To the second portion add three drops of lead (II) nitrate (Retain the content of the test tube for test (iii) below).

Observation	Inferences

(1mark) (1mark)

iii) To the contents in test tube in (ii) above add 5 drops of nitric (v) acid.

Observation	Inferences

iv) To the third portion add 3 drops of acidified potassium manganate (VII) solution **N**.

Observation	Inferences

(1mark) (1mark)

c) You are provided with;

Solution R containing barium ions, solution S containing sodium ions, solution T containing potassium ions.

Carry out the tests on solution R, S, T and Q in order to identify the cation present in solution Q.

Procedure Clean one end of a glass rod thoroughly. Dip the clean end of the glass rod in solution R. Remove the end and heat it in the non luminous part of a Bunsen burner flame.

Note the colour of the flame and record it in the table below. Allow the glass rod to cool for about 2 minutes. Repeat for procedure with solutions S, T and Q and complete table III below.

Solution	Colour of the flame
R	
S	
T	
Q	

ii) Identify the cation present in solution Q. (1mark)

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