BSJE JOINT EXAMINATION -2024-

Kenya Certificate of Secondary Education

233/3	**Chemistry**	**Paper 3**
July, 2024	**TIME: 2 hours 15 minutes**	

Name: ……………………………….……..… Admission No: ……………

School: …………………………Signature: ………....

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233/3 - Chemistry
Wednesday , 17TH July, 2024
8.00am-10.15am
(1ST session)

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INSTRUCTIONS TO CANDIDATES

a) *Write your name and Index number in the spaces provided.*
b) *Sign and write the date of examination in the spaces provided.*
c) *Answer **all** the questions in the spaces provided in the question paper.*
d) *You are not allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time is to enable you to read through the question paper and make sure you have all the chemicals and apparatus that you may need.*
e) *This paper consists of **10** printed pages*
f) *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*
g) *Candidates should answer the questions in **English**.*

FOR EXAMINER'S USE

Question	Maximum score	Candidate's Score
1	19	
2	7	
3	14	

TOTAL SCORE	40	

1. You are provided with;
   - 4.5g of solid **T** in a boiling tube**.**
   - Solution **N**, 0.06M acidified potassium manganate (VII)**.**

You are required to determine;

   - ✓ The solubility of of solid **T** at different temperatures.
   - ✓ The number of moles of water of crystalisation in solid **T**.

PROCEDURE I

   i. Using a burette, add $4cm^3$ of distilled water to solid **T** in the boiling tube. Heat the mixture while stirring with the thermometer to about 85°C for the solid to dissolve; allow the solution the solution to cool while stirring. Note the temperature at which crystals of solid **T** first appear. Record the temperature in **table 1**.
   ii. Using a burette ,add $2cm^3$ of distilled water to the contents of the boiling tube . warm the mixture while stirring with the thermometer until all the solid dissolve. Allow the mixture to cool while stirring. Note and record the temperature at which crystals of solid **T** first appear.
   iii. Repeat procedure (ii) two more times and record the temperature in **table 1.**

Retain the contents of the boiling tube for use in procedure II.

Table 1.

Total volume of water in in the boiling tube (cm^3)	4	6	8	10
Temperature at which crystals of T first appear (°C)				
Solubility of solid **T** (g/100g of water)				

(a) Complete the table 1 by calculating solubility of solid **T** at different temperatures. (3mks)

(b) On the grid provided , plot a graph of solubility against temperature. (2mks)
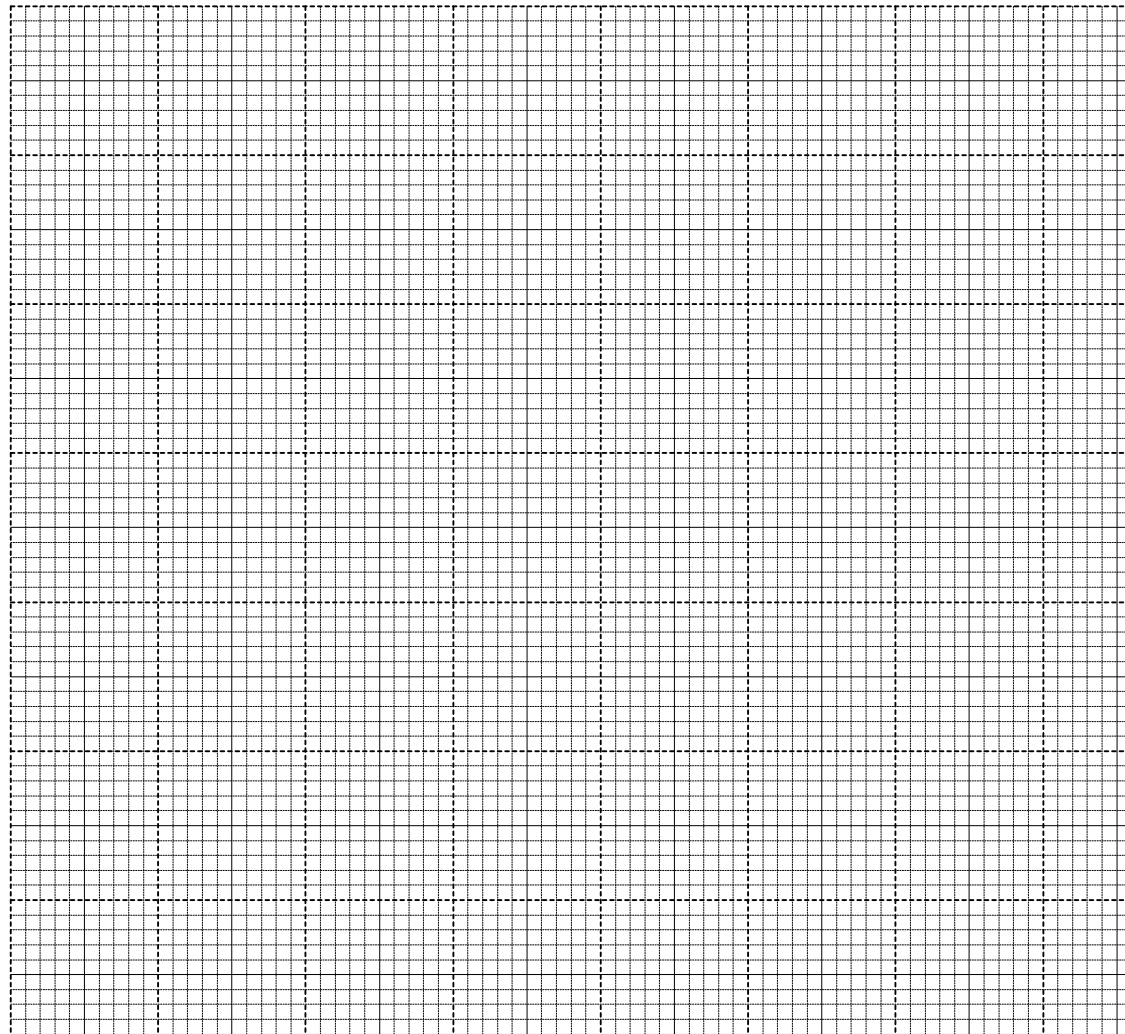
(c) Use your graph to find the temperature at which the first crystal will appear if 100g of solid **T** is dissolved in 100cm^3 of distilled water at 68℃ then the solution is allowed to cool. (1mk)

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Procedure 2
Transfer all the contents of the boiling tube into a 250ml volumetric flask. Rinse the boiling tube with distilled water and transfer the rinses to the volumetric flask. Add more distilled water to the flask to top it to the mark. **Label this as solution T**. Pipette 25cm^3 of solution **T** into a 250ml conical flask. Fill the burette with solution **N**. Titrate solution **T** with solution **N** from the burette until the contents of the conical flask first become pink. Repeat the titration two more times and complete the table 2 below.

(5mks)

Table 2

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

Calculate ;

(a) The average volume of solution **N** used. (1mk)

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(b) The number of moles of **N** that reacted. (1mk)

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(c) The number of moles of **T** that reacted with solution **N**. (mole ratio of N:T is 2:5)(1mk)

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(d) The number of moles of **T** in $10cm^3$ of the original solution (in procedure 1).   (2mks)

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(e) If solid **T** was $C_2H_2O_4.XH_2O$, determine the value of X. (C=12,H=1,O=16)   (2mks)

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2. You are provided with substance **S**. Use it to carry out the tests that follow. Record your observations and inferences in the spaces provided.

(a) Describe the appearance of substance **S**.   (½ mark)

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(b) Scoop a little of substance **S** using a clean metallic spatula and ignite it in a Bunsen burner flame.

Observations	Inferences
(½ mark)	(½ mark)

(c) Place about 2cm^3 of substance **S** in a clean test tube and add solid **P**, sodium hydrogen carbonate provided.

Observations	Inferences
(1mark)	(½ mark)

(b) Place about 2cm^3 of substance **S** in a test tube and add 2cm^3 of acidified potassium dichromate(VI) and warm the mixture.

Observations	Inferences
(1mark)	(1mark)

(e) Place about 2cm^3 of substance **S** and add 2cm^3 of distilled water.

Observations	Inferences
(1mark)	(1mark)

3. You are provided with solid **Q**. Carry out the following tests and write your observations and inferences in the spaces provided.

    (a) Place about a half of solid **Q** in a test tube and heat strongly. Test any gases produced with both red and blue litmus papers.

Observations	Inferences
(2mks)	(1mark)

    (b) Place the rest of solid **Q** in a boiling tube and add about $10cm^3$ of distilled water. Shake well.

To a $2cm^3$ portion of the solution, add about $1cm^3$ of hydrogen peroxide and shake well. To the resulting mixture, add aqueous sodium hydroxide drop wise until in excess.

Observations	Inferences
(1 ½ marks)	(½ mark)

(c) You are provided with solution **R**. Carry out the following tests and write your observations in the spaces provided. Divide solution **R** into two portions.

(i) To the first portion, of solution **R**, add three drops of barium nitrate solution. Retain the mixture for use in test (ii) below.

Observations	Inferences
(1mark)	(1mark)

(ii) To the mixture obtained in (c(i) above, add about 2cm^3 of 2M nitric V acid.

Observations	Inferences
(1mark)	(1mark)

(iii) To the second portion of solution **R**, add two drops of acidified potassium dichromate(VI) and warm the mixture.

Observations	Inferences
(1mark)	(1mark)

d).To 2cm^3 of solution **R$_1$** in a test –tube add 5 drops of aqueous sodium hydroxide. Add a piece of aluminium foil provided to the mixture and shake. Warm the mixture and test for any gas produced with both red and blue litmus papers.

Observation	Inference
(2mks)	(1mk)