Name:…….. Index No.

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CHEMISTRY

PAPER 3

INSTRUCTIONS TO CANDIDATES

- Answer **ALL q**uestions in the spaces provided in the question paper.
- 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 read through the question paper and make sure you have all the chemicals and apparatus that you may need.
- All the working **must** be clearly shown where necessary.
- Electronic calculators and mathematical tables may be used.

For Examiners use only

Questions	Maximum score	Candidates score
1	15 ½	
2	15	
3	9 ½	
TOTAL	**40**	

1. You are provided with the following:

   - Hydrogen Peroxide labelled solution J.
   - Dilute sulphuric acid labelled solution K.
   - Sodium thiosulphate labelled solution L.
   - Potassium Iodide labelled solution M.
   - Starch solution labelled solution N.
   - Distilled water in a wash bottle.

   You are required to determine how the rate of reaction of hydrogen peroxide with potassium iodide varies with the concentration of hydrogen peroxide.

   PROCEDURE.

   Experiment I

   Label two 200ml or 250ml beakers as beaker 1 and beaker 2. Using a burette, place 25.0cm^3 of solution J into beaker 1.Into the same beaker, add 20cm^3 of solution K using a 50ml or 100ml measuring cylinder. Shake the contents of beaker 1.

   Using a 10ml measuring cylinder, place 5cm^3 of solution L into beaker 2 followed by 5cm3 of solution M then 2cm^3 of solution N. Shake the contents of beaker 2. Pour the contents of beaker 2 into beaker 1 and start a stop clock /watch **IMMEDIATELY.**

   Swirl the mixture and let it stand. Note the time taken for the blue colour to appear. Record the time in the space provided for experiment 1 in the table below. Clean beaker 1. Repeat the procedure with volumes of water, solutions J,K,L,M and N as shown in the table for experiments 2 to 5. Complete the table by computing $\frac{1}{time}\ \sec^{-1}$

   a) TABLE I

Experiment	Beaker1			Beaker 2				
	Volume of water (cm^3)	Volume of hydrogen peroxide, solution J (cm^3)	Volume of dilute sulphuric acid, solution K (cm^3)	Volume of sodium thiosulphate, solution L(cm^3)	Volume of potassium Iodide, solution M (cm^3)	Volume of starch solution, solution N	Time (sec)	$\frac{1}{time}\ \sec^{-1}$
1	0	25	20	5	5	2		
2	5	20	20	5	5	2		
3	10	15	20	5	5	2		
4	15	10	20	5	5	2		
5	20	5	20	5	5	2		

(7 ½ mks)

b) Plot a graph of $\frac{1}{time}\ \sec^{-1}$ (y-axis) against volume of hydrogen peroxide. (4mks)

GRid

c) From your graph ,determine the time that would be taken if the contents of beaker 1 were $17.5cm^3$ water,, $7.5cm^3$ solution J and $20cm^3$ solution K. (2mks)

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_____

d) How does the rate of reaction of hydrogen peroxide with potassium iodide vary with the concentration of hydrogen peroxide? (2mks)

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2. a) You are provided with solution Q. Carry out the tests below. Record your observations and inferences in the spaces provided. Place $3cm^3$ of solution Q in a boiling tube. Add $12cm^3$ of distilled water and shake.

RETAIN THE REMAINDER OF SOLUTION Q FOR USE IN 2(b)

i) Use about 2cm^3 portions of diluted solution Q for tests I and II.

I) To the first portion, add drop wise about 1cm^3 of sodium hydroxide.

OBSERVATION	INFERENCES
(1mk)	(1mk)

II) To the second portion, add 2 to 3 drops of barium chloride solution.

OBSERVATION	INFERENCES
(1mk)	(1mk)

ii) To 3cm^3 of the diluted solution Q, add dropwise the chlorine water.

OBSERVATION	INFERENCES
(1mk)	(1mk)

iii) To 2cm^3 of diluted solution Q, add drop wise the bromine water provided.

OBSERVATION	INFERENCES
(1mk)	(1mk)

iv) To 2cm^3 of the diluted solution Q, add 2or 3 drops of lead (II)nitrate solution.

OBSERVATION	INFERENCES
(1mk)	(1mk)

b) You are provided with;

Solution P containing barium ions,

Solution R containing potassium ions.

Solution S containing sodium ions.

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

PROCEDURE

Clean one end of the glass rod thoroughly. Dip the clean end of the glass rod in solution P. 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 table 2. Allow the glass rod to cool for about TWO minutes. Repeat the procedure with solutions R,S and Q and complete 2.

TABLE 2

Solution	Colour flame
P	
R	
S	
Q	

(4mks)

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

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_____

3. You are provided with solid T. Carry out the tests below and write your observations and inferences in the spaces provided.

a) Using a metallic spatula, heat about one half of solid T in a Bunsen burner flame.

OBSERVATION	INFERENCES

(1 ½ mk)	(1mk)

b) Dissolve the remaining portion of solid T into about $10cm^3$ of distilled water. Label this solution as solution T. Use this solution for the following tests.

i)To about $2cm^3$ of solution T, add 3drops of acidified potassium manganate (VII) and warm.

OBSERVATION	INFERENCES
(1mk)	(1mk)

ii) To about $2cm^3$ of solution T, add 2drops of bromine water.

OBSERVATION	INFERENCES
(½mk)	(1mk)

iii) Place $2cm^3$ of solution T in a test-tube and add solid carbonate.

OBSERVATION	INFERENCES
(1mk)	(1mk)

iv) To the remaining portion of solution T, test using litmus papers.

OBSERVATION	INFERENCES

(1mk)	(1mk)