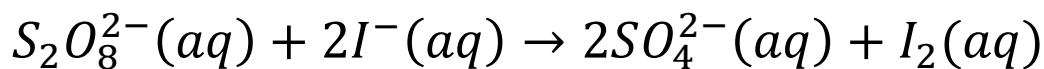


Answers to 2015 O level Chemistry 5074 Paper 3

In the first question, students were given two solutions, P and Q. P was ammonium peroxodisulphate and Q contained iodide ions and another unknown substance. P and Q reacted with each other according to the following equation.



Students were asked to add a 10cm³ portion of P from a burette into a conical flask. They then had to add 2cm³ of starch solution to the conical flask. Finally, they had to add various concentrations of Q to the conical flask and were asked to start timing immediately. When the colourless solution turned dark blue, the students had to stop timing. The table below details the results obtained.

Expt	Volume of P/ cm ³	Volume of starch solution/ cm ³	Volume of Q/ cm ³	Volume of water/ cm ³	Time taken for solution to turn dark blue/s
1	10	2	25	0	17
2	10	2	20	5	23
3	10	2	15	10	33
4	10	2	10	15	53
5	10	2	5	20	124

Common Error!

For expt 5, some students wrote 2 min 4 sec instead of 124 sec.

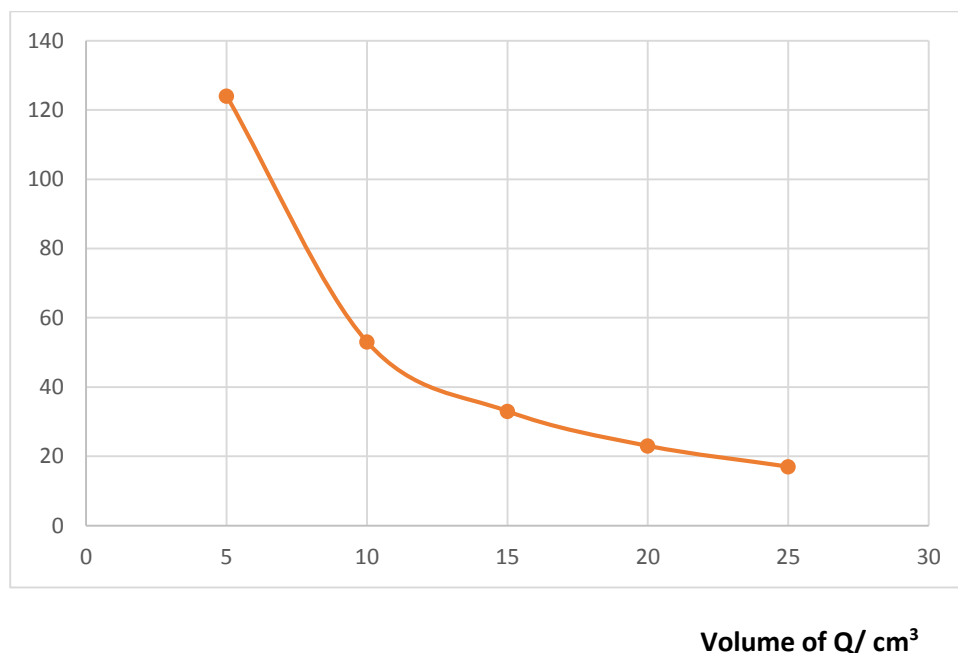
Question 1: Compare the concentration of Q in expt 2 with the conc in expt 4. _____ [1 mark]

ANS: The concentration of Q in expt. 2 is twice that of its concentration in expt.4

Students were then asked to plot a graph of time taken against volume of Q.

ANS:

**Time taken for
solution to turn
dark blue/s**



Question 2: Explain in terms of the particle collision theory the shape of the graph. [3 marks]

ANS: As volume of Q decreases, so does its concentration, which leads to a decrease in the number of activated/effective collisions between P and Q. Thus, the rate of reaction will consequently decrease, which would lead to an increase in the time taken for the product (I_2) to be formed and the solution to turn dark blue.

In the second part, two unknowns R and S were given. The tests on these two substances were as follows:

Test	Observation	Teacher's Comment
Add 1 cm ³ of aq. silver nitrate to R. Add 1 cm ³ of dil. nitric acid.	A yellow ppt forms.	The yellow ppt is silver iodide. R contains iodide (I ⁻) ions.
To 1 cm ³ of iron (III) chloride in a test tube, add 1 cm ³ of R. Now add S to the test tube.	The solution changes from a yellow to a red-brown colour. Orange solution with black ppt	The iodide in R is being oxidised by FeCl ₃ to aq. iodine, which results in the red-brown solution. S precipitates the iodine (black ppt)
EXPT 4a To 1 cm ³ of iron (II) sulphate in a test tube, add S.	Red-brown ppt.	S is an oxidizing agent which oxidizes Fe ²⁺ into Fe ³⁺ (red-brown ppt)
EXPT 5 Add aq. KMnO ₄ to S	KMnO ₄ decolorises	S is a reducing agent.
Add powdered Cu metal to S. Add dilute acid.	No visible change Effervescence and colourless solution turns blue. Gas evolved relights a glowing splint.	Cu is an unreactive metal where most oxidizing agents cannot oxidize it to Cu ²⁺ (blue solution). However S is able to oxidize Cu and oxygen gas is given off as a by-product.

Since S is both a reducing agent and an oxidizing agent, which liberates oxygen gas, it is most probably hydrogen peroxide.

Answers

Anion in R is **iodide**

In Expt. 4a) S is a/an **oxidizing agent**

In Expt. 5) S is a/an **reducing agent**