Concentration and the rate of reaction

Chemistry required practical | AQA Combined Science 8464 and AQA GCSE Chemistry 8462 | 14 questions, 35 marks

GCSE science required practicals

This practical online

Name: _____ **Date:** _____ **Score:** _____ / 35

Aim: To find out how the concentration of sodium thiosulfate solution affects the rate of its reaction with dilute hydrochloric acid, by timing how long a cross takes to disappear.

Equipment: sodium thiosulfate solution (40 g/dm^3); dilute hydrochloric acid; distilled water; 50 cm^3 measuring cylinder and 10 cm^3 measuring cylinder; conical flask (100 cm^3); piece of white paper with a bold black cross drawn on it; stopwatch; safety goggles.

Results

Callum and Mei timed how long the cross took to disappear at five concentrations of sodium thiosulfate, with three trials at each.

Volume of sodium thiosulfate in cm^3	Volume of water in cm^3	Concentration in g/dm^3	Time trial 1 in s	Time trial 2 in s	Time trial 3 in s
50	0	40	31	29	30
40	10	32	38	37	36
30	20	24	49	68	51
20	30	16	74	77	75
10	40	8	148	155	151

Questions

1 State the independent variable and the dependent variable in this investigation. (2 marks)

2 Explain why water is added so that the total volume in the flask is always 50 cm^3 (before the acid). (2 marks)

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3 This reaction gives off sulfur dioxide. Describe the risk and how to reduce it. (2 marks)

4 Explain why the cross disappears during the reaction. (2 marks)

5 Identify the anomalous result in the table and say what should be done with it. (2 marks)

6 Calculate the mean time for 24 g/dm^3, leaving out the anomalous result. (2 marks)

7 Use your answer to question 6 to calculate the rate of reaction at 24 g/dm^3, using rate = 1 / time. Give the unit. (2 marks)

8 Calculate the mean time for 40 g/dm^3 and the rate at this concentration. Give the rate to 2 significant figures. Show your working. (3 marks)

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9 Describe the effect of concentration on the rate of reaction and explain it using collision theory.

(3 marks)

10 **Higher tier**

The mean times at 16 g/dm^3 and 32 g/dm^3 are 75.3 s and 37.0 s. What does this suggest about the relationship between concentration and rate? Use the numbers.

(2 marks)

11 **Higher tier**

In a different experiment, Mei collected hydrogen from magnesium and acid and plotted volume of gas against time. She drew a tangent to the curve at 25 s. The tangent passes through (10 s, 12 cm^3) and (40 s, 51 cm^3). Calculate the rate of reaction at 25 s. Show your working.

(3 marks)

12 Callum and Mei got slightly different times when they each judged the same flask. Suggest one way to make the end point less dependent on the person watching, and explain why it helps.

(2 marks)

13 Explain the difference between results being repeatable and results being reproducible, using this investigation.

(2 marks)

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14 Plan an investigation to find out how the concentration of hydrochloric acid affects the rate of its reaction with magnesium ribbon, by measuring the volume of gas produced. (6 marks)

End of questions | Total 35 marks | The answers sheet has the full method as revision notes.

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