

# AQA Chemistry GCSE Exam-style questions

## C8 Rates and equilibrium

Name ..... Class ..... Date .....

GCSE Chemistry only

Higher

0 1

This question is about factors affecting the rate of a chemical reaction.

Draw one line connecting each factor that increases the rate of a reaction with the **most complete** explanation. (3 marks)

### Factor

increasing solution temperature

adding a catalyst

increasing gas pressure

### Explanation

greater surface area

more collisions every second **and**  
more collisions with enough energy to break bonds

particles have less energy

more collisions every second

more collisions every second with enough energy to break bonds

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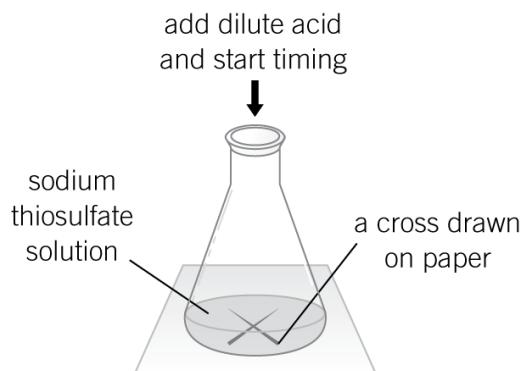
Higher

0 2

This question is about the effect of concentration on the rate of a reaction.

When hydrochloric acid is added to sodium thiosulfate solution, it slowly becomes cloudy. The time taken for a cross under the solution to disappear can be used to monitor the rate of the reaction.

Figure 1



A student:

- 1 Measured 50 cm<sup>3</sup> of sodium thiosulfate into a flask.
- 2 Added 10 cm<sup>3</sup> of dilute hydrochloric acid and started a stopwatch.
- 3 Stopped the clock when the cross disappeared and recorded the time taken.
- 4 Repeated the experiment using different concentrations of sodium thiosulfate.

The results are shown in Table 1.

Table 1

Concentration of sodium thiosulfate solution in g/dm <sup>3</sup>	Time taken for cross to disappear in s
5	85
10	45
15	29
20	21
25	13
30	15
35	14

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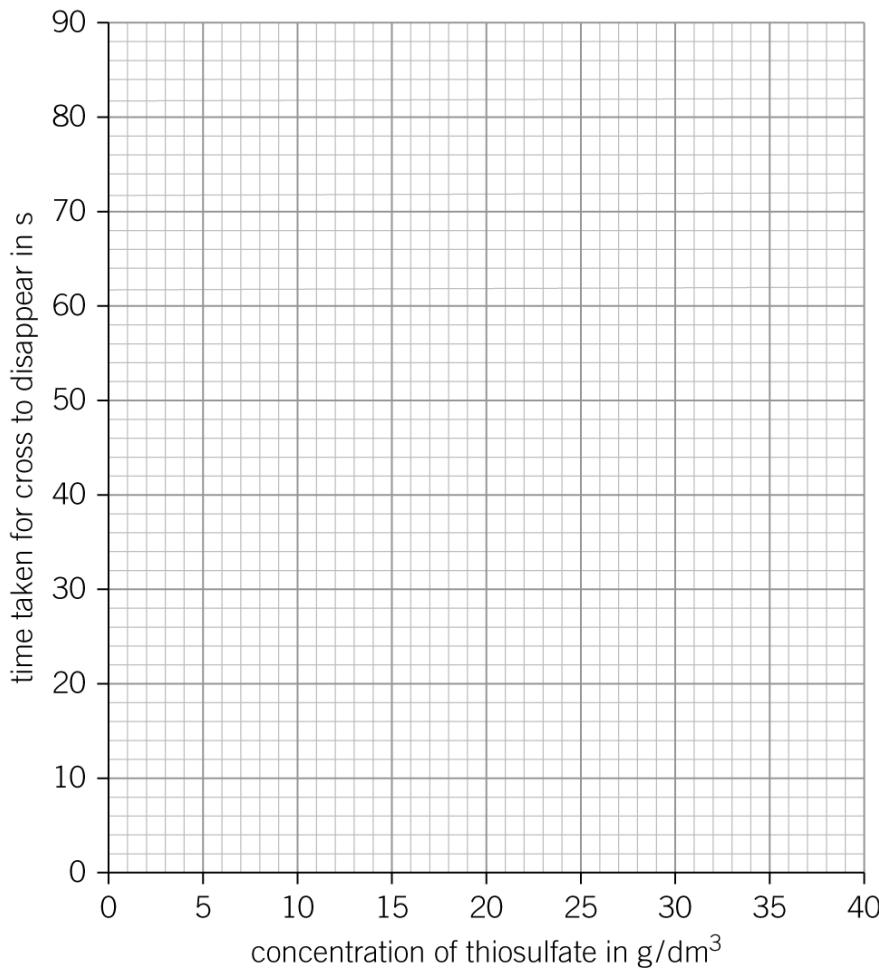
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0 2 . 1 Plot these results on the grid below. Draw a line of best fit. (3 marks)



0 2 . 2 One of the points is anomalous.

Describe an error in the experiment which could have caused this anomalous result.

(1 mark)

0 2 . 3 Describe and explain, in terms of particles, the pattern in the results obtained.

(3 marks)

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0 | 3

Hydrated copper(II) sulfate is a blue solid. When it is heated, water is given off as steam and the crystals turn white. The reaction is reversible.

Describe an experiment to investigate this chemical change. You should outline the method you would use, name any apparatus required, and describe two pieces of evidence that the reaction is reversible.

(6 marks)

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0 4

A student investigates the rate of reaction between marble chips (calcium carbonate) and dilute hydrochloric acid.

The equation for the reaction is:



Their results are shown in **Table 2**.

**Table 2**

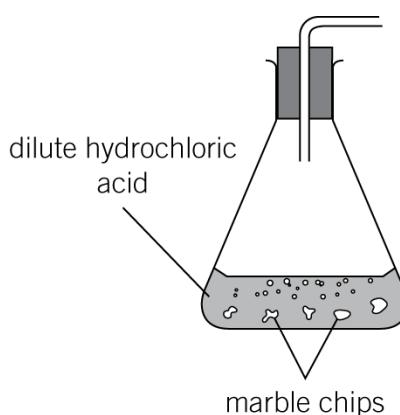
Time in s	Volume of carbon dioxide in cm <sup>3</sup>
0	0.0
20	45.0
40	62.0
60	70.5
80	75.0
100	78.0
120	79.5
140	80.0
160	80.0
180	80.0

0 4 . 1

Complete the diagram below to show how the carbon dioxide is collected.

Label the apparatus the gas is collected in with its name.

(2 marks)



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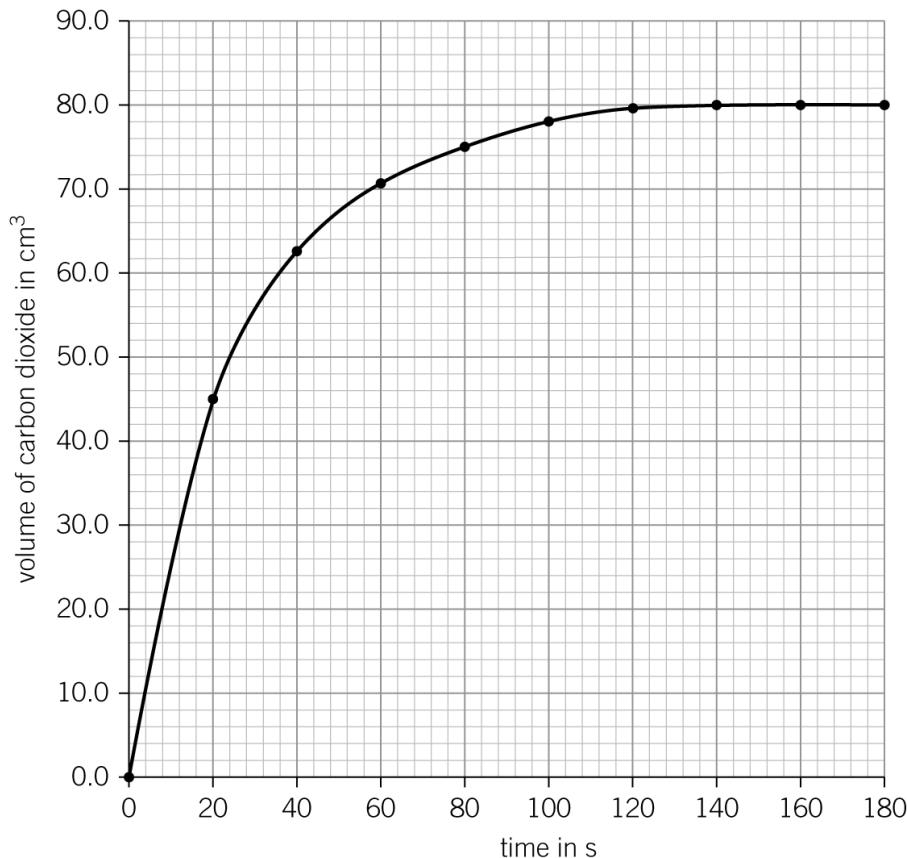
Name ..... Class ..... Date .....

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**0 4 . 2** The results were plotted as a line graph in **Figure 2**.

**Figure 2**



Use **Figure 2** to identify the 20-second time interval at which the rate of reaction is fastest.

..... (1 mark)

**0 4 . 3** Calculate the mean rate of reaction during this 20-second time interval.

.....  
.....  
.....

(2 marks)

**0 4 . 4** On **Figure 2**, sketch the results the student would obtain if they used the same mass of powdered marble instead of marble chips.

(2 marks)

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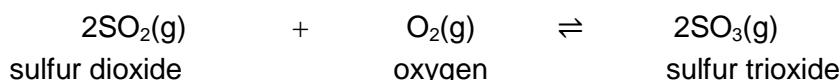
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0 | 5

The Contact process is an industrial method for making sulfuric acid from sulfur, oxygen, and water.

One important reaction in the Contact process is:



The reaction is exothermic in the forwards direction.

**0 5 . 1** Give the meaning of the symbol  $\rightleftharpoons$ .

(1 mark)

**0 5 . 2** Describe and explain the effect of increasing pressure on the amount of sulfur trioxide at equilibrium.

(2 marks)

**0** **5** . **3** The reaction is carried out at a temperature of 450 °C.

Describe **and** explain the effect of raising the temperature above 450 °C on the amount of sulfur trioxide at equilibrium.

..... (2 marks)

**0 5 . 4** A vanadium pentoxide catalyst is used.

Explain how the use of a catalyst increases the rate of the reaction.

*(2 marks)*