# Rates of reaction and equilibrium

Chemistry Paper 2 | 5 questions, 6 marks each

**GCSE science 6-mark questions**

This topic online

**Name:** _____ **Date:** _____ **Score:** _____ **/ 30**

Plan before you write: jot down the 6 or more ideas you need, then put them in a sensible order. For compare questions give both sides of each point; for evaluate questions use the information and finish with a conclusion.

**1** Limescale is calcium carbonate. It builds up inside kettles in hard-water areas. Descaler is an acid solution that reacts with limescale, giving off bubbles of carbon dioxide.

Ruby notices two things:

- a more concentrated descaler removes the limescale faster
- thin flakes of limescale disappear faster than one thick lump of the same mass

Use collision theory to explain both observations. (6 marks)


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**2** **Higher tier**

Callum reacted zinc granules with excess dilute sulfuric acid and collected the hydrogen in a gas syringe.

| Time in s | 0 | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| Volume of hydrogen in $cm^3$ | 0 | 24 | 40 | 51 | 57 | 60 | 60 |

Calculate the mean rate of reaction over the first 30 seconds. Explain how Callum could find the rate of reaction at exactly 20 seconds, and explain why the rate changes during the reaction.

(6 marks)


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**3** Flour is made of tiny particles and can burn in air. A sack of flour is hard to set alight. However, if a cloud of fine flour dust in a mill meets a spark, it can cause a violent explosion.

Suggest why a dust cloud of flour reacts so much faster than flour in a sack. Suggest two ways the mill could reduce the risk of an explosion, and explain each one.

(6 marks)


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**4** **Higher tier**

A factory makes a gas Z from gases X and Y in a reversible reaction:

$X(g) + 2Y(g) \rightleftharpoons Z(g)$ The forward reaction is exothermic.

| Temperature in °C | Yield of Z at 50 atm in % | Yield of Z at 150 atm in % | Time to reach equilibrium at 150 atm |
|---|---|---|---|
| 200 | 62 | 81 | 9 hours |
| 300 | 38 | 60 | 40 minutes |
| 400 | 18 | 35 | 5 minutes |

Use the data and your knowledge of equilibrium to evaluate which conditions the factory should use.

(6 marks)


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**5** A chemical company wants to speed up a slow reaction. Engineer Nadia suggests heating the reactants to a higher temperature. Engineer Sanjay suggests adding a catalyst instead.

Compare how the two methods increase the rate of reaction, and compare their advantages and disadvantages for the company.

(6 marks)

End of questions | Total 30 marks


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