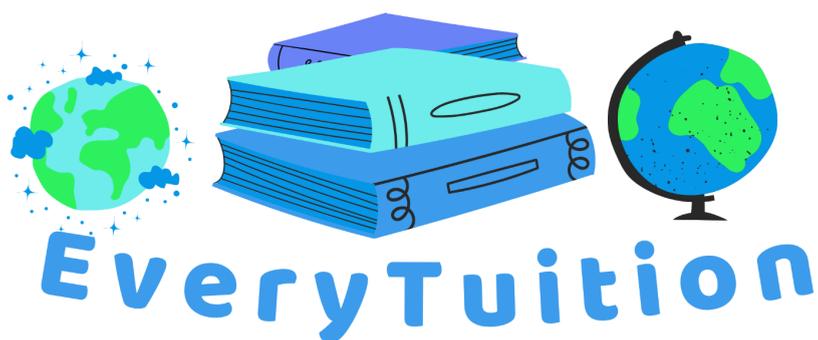


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## **GCSE Chemistry Topic 6 AQA: Rate and extent of chemical change**

### **Exam Questions/Mock Exam Questions**



**Questions For Foundation, Higher, and Triple Science ([scroll down for questions for higher and triple science only](#)):**

(It would still be recommended to answer the foundation tier questions for triple science and higher tier to ensure you have good understanding).

**Q1.**

Jack adds magnesium ribbon to hydrochloric acid and measures the rate of reaction.

(a) State two things Jack could measure to find the rate of the reaction.

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---

[2]

(b) How would increasing the concentration of the acid affect the rate of reaction?

---

[1]

[Total: 3 marks]

**Q2.**

Tom reacts calcium carbonate with hydrochloric acid.

(a) Write the word equation for this reaction.

---

[2]

(b) State the gas produced in this reaction.

---

[1]

[Total: 3 marks]

**Q3.**

Harry investigates the effect of surface area on reaction rate.

(a) Explain why powdered calcium carbonate reacts faster than large lumps.

---

---

[2]

(b) State the factor that has changed between powder and lumps.

---

[1]

[Total: 3 marks]

**Q4.**

Ben measures how quickly a reaction takes place.

(a) State the formula used to calculate the mean rate of reaction.

---

[1]

(b) The reaction makes 120 cm<sup>3</sup> of gas in 60 seconds. Calculate the mean rate of reaction.

---

[2]

[Total: 3 marks]

**Q5.**

Daniel looks at temperature and reaction rate.

(a) Explain why increasing the temperature increases the rate of reaction.

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[2]

(b) Suggest one everyday example of a reaction that happens faster at a higher temperature.

---

[1]

[Total: 3 marks]

**Q6.**

Oliver investigates the effect of catalysts.

(a) State what a catalyst does.

---

[1]

(b) Explain why catalysts are useful in industry.

---

---

[2]

[Total: 3 marks]

**Q7.**

Ethan records results for a reaction that produces gas.

(a) Suggest one way Ethan could collect the gas.

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[1]

(b) State one way to make sure the experiment is accurate.

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[1]

[Total: 2 marks]

**Q8.**

Sam investigates concentration and rate.

(a) Explain why a higher concentration of acid makes particles react more quickly.

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---

[2]

(b) State one way Sam could increase the concentration of hydrochloric acid.

---

[1]

[Total: 3 marks]

---

**Q9.**

Charlie studies reversible reactions.

(a) What does the term reversible reaction mean?

---

[1]

(b) Give one example of a reversible reaction.

---

[1]

[Total: 2 marks]

**Q10.**

Noah learns about equilibrium.

(a) State what is meant by the term equilibrium.

---

[2]

(b) At equilibrium, what happens to the concentrations of reactants and products?

---

[1]

[Total: 3 marks]

**Q11.**

William investigates the effect of temperature on equilibrium.

(a) If the forward reaction is exothermic, explain what happens to the position of equilibrium when temperature is increased.

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---

[2]

(b) Explain what happens if the temperature is decreased.

---

---

[2]

[Total: 4 marks]

**Q12.**

Alex looks at pressure and equilibrium.

(a) What happens to the position of equilibrium if the pressure is increased in a reaction that produces fewer molecules of gas?

---

[2]

(b) Explain why this happens.

---

---

[2]

[Total: 4 marks]

**Q13.**

Jacob learns about catalysts in reversible reactions.

(a) How does a catalyst affect the rate of reaction?

---

[1]

(b) How does a catalyst affect the position of equilibrium?

---

[1]

[Total: 2 marks]

**Q14.**

James investigates the Haber process.

(a) Write the word equation for the Haber process.

---

[2]

(b) State the two raw materials needed for the Haber process.

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[2]

[Total: 4 marks]

**Q15.**

Luke designs an experiment to investigate how temperature affects the rate of reaction between sodium thiosulfate and hydrochloric acid.

In your answer include:

- apparatus he would use
- how he would carry out the experiment

- the measurements he would take

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[6]

[Total: 6 marks]

## Higher Tier

### Q16.

Jack reacts magnesium with hydrochloric acid and measures the gas produced.

- (a) State the equation for mean rate of reaction.

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[1]

- (b) The reaction produces  $240 \text{ cm}^3$  of gas in 120 seconds. Calculate the mean rate of reaction.

---

---

[2]

[Total: 3 marks]

### Q17.

Tom investigates how surface area affects the rate of reaction of calcium carbonate with hydrochloric acid.

- (a) Explain why powdered calcium carbonate reacts faster than lumps.

---

---

[2]

(b) Sketch a graph to show the difference in gas volume over time for powder and lumps.

---

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[2]

[Total: 4 marks]

**Q18.**

Harry looks at collision theory.

(a) State two factors that increase the frequency of collisions between reacting particles.

---

---

[2]

(b) State one factor that increases the energy of collisions.

---

[1]

[Total: 3 marks]

**Q19.**

Ben heats hydrochloric acid and reacts it with magnesium.

(a) Explain why increasing the temperature increases the rate of reaction.

---

---

[2]

(b) State one piece of evidence that a reaction is faster at a higher temperature.

---

[1]

[Total: 3 marks]

**Q20.**

Daniel investigates catalysts.

(a) Explain how a catalyst speeds up a reaction.

---

---

[2]

(b) State one advantage of using catalysts in industry.

---

[1]

[Total: 3 marks]

**Q21.**

Oliver records data for a reaction.

(a) Describe how the gradient of a graph shows the rate of reaction.

---

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[2]

(b) On a rate of reaction graph, explain what it means if the curve becomes horizontal.

---

---

[2]

[Total: 4 marks]

**Q22.**

Ethan investigates how concentration affects the rate of reaction.

(a) Explain, using collision theory, why higher concentration increases the rate of reaction.

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[2]

(b) Sketch a graph of volume of gas against time for a low and high concentration.

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[2]

[Total: 4 marks]

**Q23.**

Sam measures the rate of reaction with a gas syringe.

(a) Give one advantage of using a gas syringe instead of an upturned measuring cylinder.

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[2]

(b) Suggest one source of error when using a gas syringe.

---

[1]

[Total: 3 marks]

**Q24.**

Charlie is revising reversible reactions.

(a) Define a reversible reaction.

---

[1]

(b) State one everyday example of a reversible reaction.

---

[1]

(c) In a reversible reaction, how do the forward and reverse processes differ in energy change?

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[2]

[Total: 4 marks]

**Q25.**

Noah looks at dynamic equilibrium.

(a) Explain what is meant by dynamic equilibrium.

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[2]

(b) At equilibrium, why do the concentrations of reactants and products remain constant?

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[2]

[Total: 4 marks]

**Q26.**

William studies Le Chatelier's principle.

(a) State Le Chatelier's principle.

---

[2]

(b) Explain what happens to the equilibrium position when the pressure is increased in a reaction with fewer gas molecules on the product side.

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[2]

[Total: 4 marks]

**Q27.**

Alex looks at temperature changes on equilibrium.

(a) If the forward reaction is exothermic, explain what happens to the equilibrium position when temperature increases.

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[2]

(b) Explain what happens when the temperature decreases.

---

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[2]

[Total: 4 marks]

**Q28.**

Jacob revises catalysts in equilibrium.

(a) Explain how a catalyst affects the rate of a reversible reaction.

---

---

[2]

(b) Explain why a catalyst does not affect the position of equilibrium.

---

---

[2]

[Total: 4 marks]

**Q29.**

James investigates the Haber process.

(a) Write the balanced symbol equation for the Haber process.

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[2]

(b) State the temperature and pressure used in industry for the Haber process.

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[2]

(c) State the catalyst used.

---

[1]

[Total: 5 marks]

**Q30.**

Luke evaluates the Haber process.

Discuss why the conditions used are a compromise between rate, yield, and cost.

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[6]

[Total: 6 marks]

**Q31.**

Jack studies pressure changes.

If the forward reaction produces more molecules of gas, explain what happens to the position of equilibrium when pressure is increased.

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[2]

[Total: 2 marks]

**Q32.**

Tom looks at reaction rate graphs.

(a) Describe how you can tell which line on a graph shows the fastest reaction.

---

[1]

(b) Explain why that reaction is faster.

---

---

[2]

[Total: 3 marks]

**Q33.**

Harry studies temperature and collision theory.

(a) Explain why more particles react when temperature increases.

---

---

[2]

(b) Sketch a diagram to show the distribution of particle energies at low and high temperatures.

---

---

[2]

[Total: 4 marks]

**Q34.**

Ben investigates concentration.

(a) Explain, using collision theory, why increasing concentration increases the frequency of successful collisions.

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---

[2]

(b) State one way of increasing concentration in solution.

---

[1]

[Total: 3 marks]

**Q35.**

Daniel compares catalysts and temperature.

Explain why using a catalyst is often preferred to increasing temperature in industrial reactions.

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[4]

[Total: 4 marks]

**Q36.**

Oliver studies rates of reaction graphs.

(a) State what the steepest part of the curve shows.

---

[1]

(b) Explain why the curve levels off.

---

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[2]

[Total: 3 marks]

**Q37.**

Ethan investigates collision theory.

(a) Define activation energy.

---

[2]

(b) Explain how catalysts lower activation energy.

---

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[2]

[Total: 4 marks]

**Q38.**

Sam investigates equilibrium in the Haber process.

(a) Explain why high pressure increases the yield of ammonia.

---

---

[2]

(b) Explain why high temperatures are not used even though they increase the rate.

---

---

[2]

[Total: 4 marks]

**Q39.**

Charlie compares reversible and irreversible reactions.

(a) Give one example of a reversible reaction.

---

[1]

(b) Give one example of an irreversible reaction.

---

[1]

(c) Explain the difference between them.

---

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[2]

[Total: 4 marks]

**Q40.**

Noah plans an experiment to investigate the effect of concentration on the rate of reaction between hydrochloric acid and sodium thiosulfate.

Include:

- the apparatus used
- the method
- the measurements taken
- how to improve accuracy

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[6]

[Total: 6 marks]

## Triple Science

### Q41.

William measures reaction rates using initial rate methods.

(a) State what is meant by initial rate of reaction.

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[2]

(b) Explain how William could calculate the initial rate from a graph.

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[2]

[Total: 4 marks]

### Q42.

Alex looks at Maxwell–Boltzmann distributions.

Draw a Maxwell–Boltzmann distribution curve for particles at two different temperatures on the same set of axes. Label:

- activation energy
- low temperature curve
- high temperature curve

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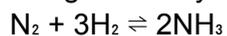
[4]

[Total: 4 marks]

**Q43.**

Jacob investigates pressure and equilibrium.

Nitrogen and hydrogen react to form ammonia:



(a) State the effect of increasing pressure on the yield of ammonia.

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[1]

(b) Explain this effect in terms of Le Chatelier's principle.

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[2]

[Total: 3 marks]

**Q44.**

James studies exothermic reversible reactions.

(a) If the forward reaction is exothermic, explain what happens to the equilibrium position when temperature decreases.

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[2]

(b) Sketch a reaction profile for an exothermic reaction showing activation energy.

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[2]

[Total: 4 marks]

**Q45.**

Luke studies catalysts.

(a) Explain why catalysts provide an alternative reaction pathway.

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---

[2]

(b) State why this lowers activation energy.

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[1]

[Total: 3 marks]

**Q46.**

Jack investigates rate equations.

For the reaction:  $A + B \rightarrow \text{products}$ , the rate equation is:

$$\text{rate} = k[A][B]$$

(a) State the order of reaction with respect to A.

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[1]

(b) State the order of reaction with respect to B.

---

[1]

(c) What is the overall order of reaction?

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[1]

[Total: 3 marks]

**Q47.**

Tom works with catalysts in equilibrium reactions.

(a) Explain why a catalyst increases the rate but not the yield of a reversible reaction.

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[2]

(b) Give one industrial example of where this is important.

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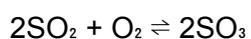
[1]

[Total: 3 marks]

**Q48.**

Harry studies concentration and equilibrium.

In the reaction:



(a) State the effect of increasing  $\text{SO}_2$  concentration.

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[1]

(b) Explain why this happens in terms of Le Chatelier's principle.

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[2]

[Total: 3 marks]

**Q49.**

Ben calculates rates.

A reaction produces 100 cm<sup>3</sup> of gas in 25 seconds.

(a) Calculate the mean rate of reaction.

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[2]

(b) State the units.

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[1]

[Total: 3 marks]

**Q50.**

Daniel evaluates the Haber process.

Discuss why the conditions used in the Haber process represent a compromise between rate, yield, and cost.

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[6]

[Total: 6 marks]

**Q51.**

Oliver studies equilibrium shifts.

The forward reaction is endothermic. Explain the effect on yield of:

(a) increasing the temperature.

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[2]

(b) decreasing the temperature.

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[2]

[Total: 4 marks]

**Q52.**

Ethan analyses energy diagrams.

Draw and label an energy diagram to show how a catalyst lowers activation energy.

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[3]

[Total: 3 marks]

**Q53.**

Sam investigates particle collisions.

(a) Define activation energy.

---

[2]

(b) Explain why only some collisions lead to a successful reaction.

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[2]

[Total: 4 marks]

**Q54.**

Charlie looks at reversible reactions.

(a) Explain why reversible reactions are described as dynamic.

---

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[2]

(b) State why equilibrium is reached in a closed system.

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[2]

[Total: 4 marks]

**Q55.**

Noah plans an experiment to investigate the effect of temperature on the rate of reaction between sodium thiosulfate and hydrochloric acid.

Include:

- apparatus used
- how to measure rate of reaction
- variables to control
- safety precautions

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[6]

[Total: 6 marks]