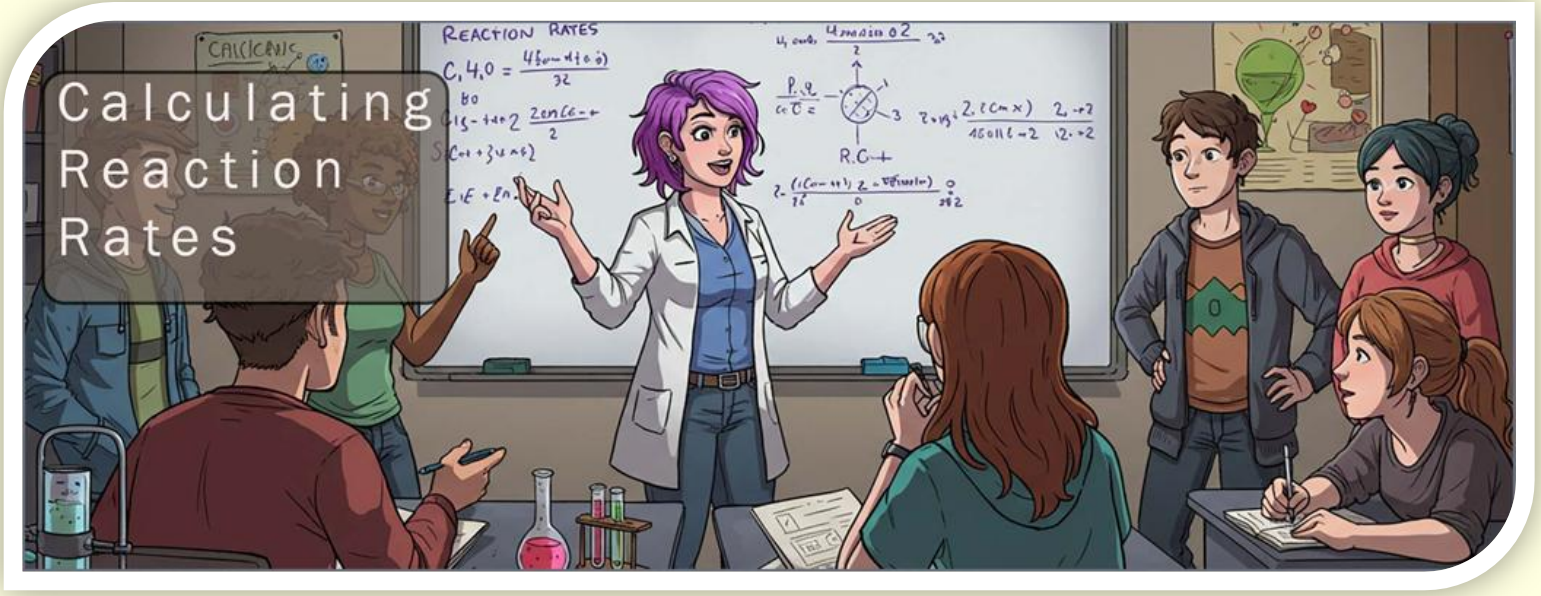


Answer all the questions below and then check your answers

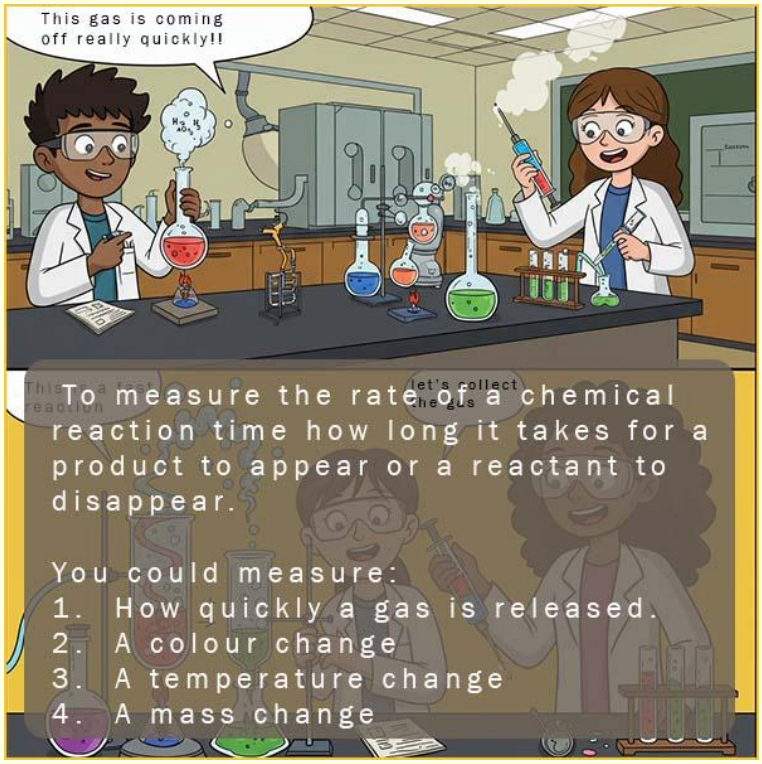
1. What is the correct equation for the reaction between magnesium and hydrochloric acid?

a) $Mg + HCl \rightarrow MgH + Cl_2$

b) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

c) $MgCl_2 + H_2 \rightarrow Mg + 2HCl$

d) $Mg + H_2O \rightarrow Mg(OH)_2 + H_2$



2. What is the best method to measure the rate of this reaction?

a) Measure the temperature change

b) Measure the decrease in mass

c) Measure the volume of gas produced

d) Observe the colour change

3. What happens to the rate of reaction as the magnesium is used up?

a) It increases

b) It stays the same

c) It decreases

d) It stops immediately

4. Describe why the reaction slows down over time.

5. Explain why a gas syringe is used instead of an upturned measuring cylinder in this experiment.

6. Calculate the average rate of reaction over the first 60 seconds using the data provided.

Volume of gas released at 60s = 25 ml

Time = 60s

a. What was the average rate of reaction between 90s and 150s?

Volume at 90s = 32 ml

Volume at 150s = 39 ml

Time = 150s - 90s = 60s

7. Explain why a graph to show the rate of production of hydrogen gas with magnesium ribbon will eventually level off.

8. A student wants to find the rate of reaction at exactly time. Describe how they should do this using a graph.

9. A student suggests that doubling the concentration of hydrochloric acid will double the rate of reaction.
a) Explain why this might be true.
b) Explain why the increase might not be exactly double.

Answers

1. What is the correct equation for the reaction between magnesium and hydrochloric acid?

a) $Mg + HCl \rightarrow MgH + Cl_2$

b) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

c) $MgCl_2 + H_2 \rightarrow Mg + 2HCl$

d) $Mg + H_2O \rightarrow Mg(OH)_2 + H_2$

Answer: b) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

2. What is the best method to measure the rate of this reaction?

a) Measure the temperature change

b) Measure the decrease in mass

c) Measure the volume of gas produced

d) Observe the colour change

Answer: c) Measure the volume of gas produced

3. What happens to the rate of reaction as the magnesium is used up?

a) It increases

b) It stays the same

c) It decreases

d) It stops immediately

Answer: c) It decreases

4. Describe why the reaction slows down over time.

Answer: As the reaction progresses, the amount of magnesium decreases. With fewer magnesium particles available, the frequency of successful collisions between reactant particles decreases, slowing the reaction.

5. Explain why a gas syringe is used instead of an upturned measuring cylinder in this experiment.

Answer: A gas syringe provides a more accurate measurement of gas volume, prevents gas from escaping, and avoids water displacement errors that can occur with an upturned measuring cylinder.

6. Calculate the average rate of reaction over the first 60 seconds using the data provided.

Volume of gas released at 60s = 25 ml

Time = 60s

Answer:

Rate = Volume of gas ÷ Time

Rate = 25 ml ÷ 60 s = 0.42 ml/s

a. What was the average rate of reaction between 90s and 150s?

Volume at 90s = 32 ml

Volume at 150s = 39 ml

Time = 150s - 90s = 60s

Answer:

Rate = (39 ml - 32 ml) ÷ (150s - 90s)

Rate = 7 ml ÷ 60 s = 0.12 ml/s

7. Explain why a graph to show the rate of production of hydrogen gas with magnesium ribbon will eventually level off.

Answer: A flat graph will indicate that the reaction has stopped because all the magnesium has reacted, meaning no more hydrogen gas is being produced or all the acid has reacted.

8. A student wants to find the rate of reaction at exactly time. Describe how they should do this using a graph.

Answer: They should draw a tangent to the curve at this exact time and calculate the gradient by selecting two points on the tangent and using the formula:
Gradient = change in y ÷ change in x

9. A student suggests that doubling the concentration of hydrochloric acid will double the rate of reaction.

a) Explain why this might be true.

b) Explain why the increase might not be exactly double.

Answer:

a) Increasing the concentration of hydrochloric acid increases the number of acid particles per unit volume. This leads to more frequent successful collisions between reactant particles, increasing the rate of reaction.

b) The increase might not be exactly double because other factors such as temperature, surface area of magnesium, and experimental limitations could influence the reaction rate. Additionally, as the reaction proceeds, the availability of magnesium becomes a limiting factor.