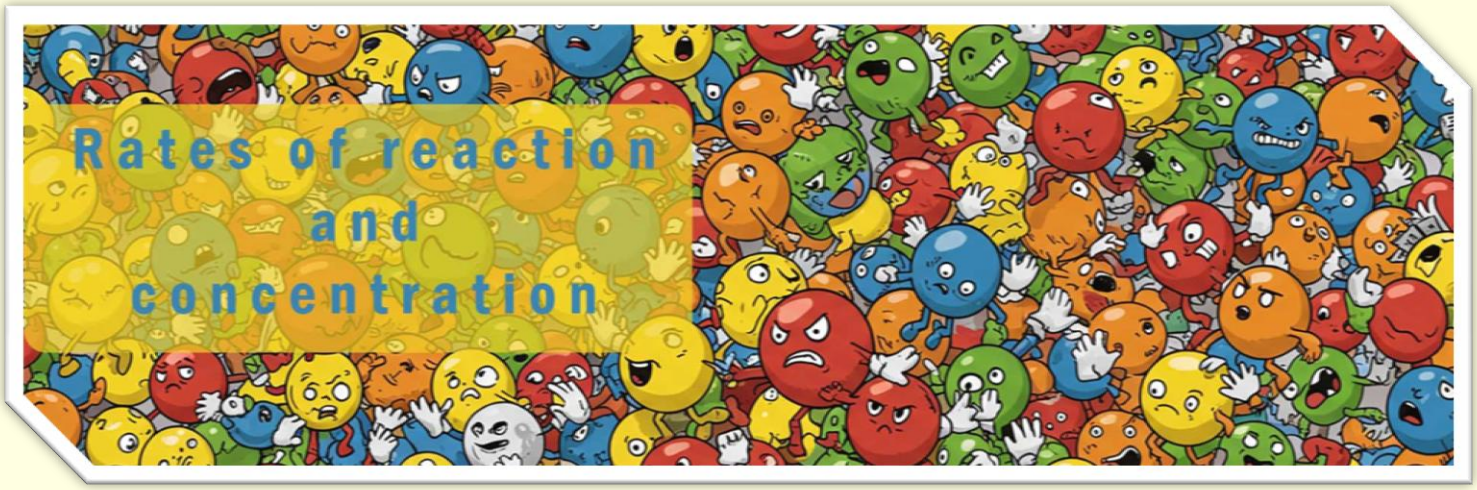


Answer all the questions then check your answers

1. What effect does increasing the concentration of a reactant have on the rate of reaction?

a) Decreases the rate b) Has no effect

c) Increases the rate d) Stops the reaction

2. A student carried out an investigation into how concentration affects the rate of the reaction between hydrochloric acid and marble chips. Which of the following is NOT a control variable in this experiment?

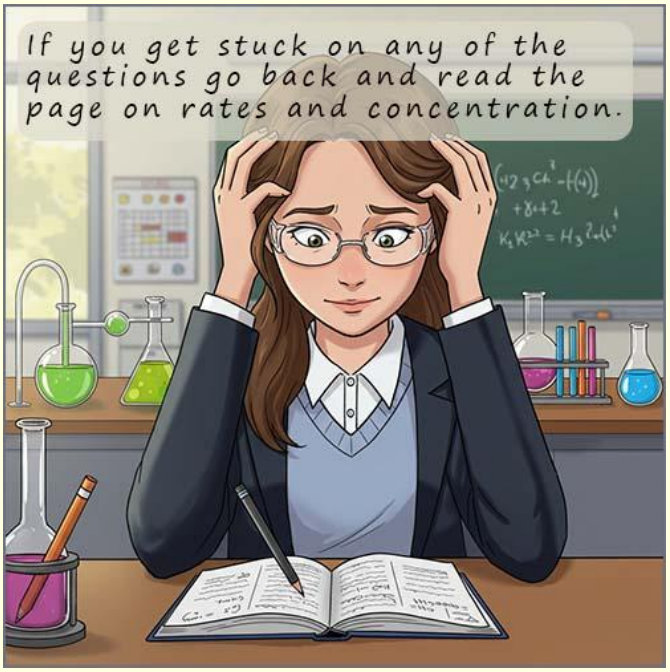
a) Volume of hydrochloric acid b) Temperature of hydrochloric acid

c) Surface area of marble chips d) Concentration of hydrochloric acid

3. What gas is released when hydrochloric acid reacts with calcium carbonate?

a) Oxygen b) Hydrogen c) Carbon dioxide d) Nitrogen

4. Explain why increasing the concentration of hydrochloric acid increases the rate of reaction with marble chips.



5. Name two different methods to measure the rate of the reaction between hydrochloric acid and calcium carbonate.

6. What is the independent variable in the experiment investigating the effect of concentration on reaction rate?

True or False Questions

7. The dependent variable in the experiment could be the volume of carbon dioxide gas released.

b. Increasing the concentration of a solution decreases the number of successful collisions between particles.

c. Increasing the pressure of a gas is similar to increasing the concentration of a solution because both increase the number of particles in a given volume.

8. A student conducts an experiment using different concentrations of hydrochloric acid and measures the volume of carbon dioxide gas collected every 10 seconds. The data is recorded below:

Time (seconds)	Volume of CO_2 (cm^{-3}) for 1M HCl	Volume of CO_2 (cm^{-3}) for 2M HCl
10	5	10
20	10	22
30	15	35
40	18	45

a. What conclusion can be drawn from the data about the effect of concentration on reaction rate

b. Why does the reaction eventually slow down?

9. Describe how you would carry out an experiment to investigate the effect of acid concentration on the rate of reaction between hydrochloric acid and marble chips. Include details about the variables involved.

Answer

1. What effect does increasing the concentration of a reactant have on the rate of reaction?

a) Decreases the rate b) Has no effect

c) Increases the rate d) Stops the reaction

Answer: c) Increases the rate

2. A student carried out an investigation into how concentration affects the rate of the reaction between hydrochloric acid and marble chips. Which of the following is NOT a control variable in this experiment?

a) Volume of hydrochloric acid b) Temperature of hydrochloric acid

c) Surface area of marble chips d) Concentration of hydrochloric acid

Answer: d) Concentration of hydrochloric acid

3. What gas is released when hydrochloric acid reacts with calcium carbonate?

a) Oxygen b) Hydrogen c) Carbon dioxide d) Nitrogen

Answer: c) Carbon dioxide

4. Explain why increasing the concentration of hydrochloric acid increases the rate of reaction with marble chips.

Answer: Increasing the concentration increases the number of acid particles in a given volume. This leads to a higher frequency of successful collisions between the acid particles and the marble chips, resulting in a faster reaction.

5. Name two different methods to measure the rate of the reaction between hydrochloric acid and calcium carbonate.

Answer:

Measuring the loss in mass as carbon dioxide gas escapes.

Measuring the volume of carbon dioxide gas collected using a gas syringe.

6. What is the independent variable in the experiment investigating the effect of concentration on reaction rate?

Answer: The concentration of hydrochloric acid.

True or False Questions

7. The dependent variable in the experiment could be the volume of carbon dioxide gas released.
Answer: True

b. Increasing the concentration of a solution decreases the number of successful collisions between particles.
Answer: False

c. Increasing the pressure of a gas is similar to increasing the concentration of a solution because both increase the number of particles in a given volume.
Answer: True

8. A student conducts an experiment using different concentrations of hydrochloric acid and measures the volume of carbon dioxide gas collected every 10 seconds. The data is recorded below:

Time (seconds)	Volume of CO_2 (cm^{-3}) for 1M HCl	Volume of CO_2 (cm^{-3}) for 2M HCl
10	5	10
20	10	22
30	15	35
40	18	45

a. What conclusion can be drawn from the data about the effect of concentration on reaction rate?

Answer: The higher concentration (2M HCl) produces carbon dioxide at a faster rate, showing that increasing concentration increases the rate of reaction.

b. Why does the reaction eventually slow down?

Answer: As the reaction progresses, the concentration of reactants decreases because they are used up, leading to fewer successful collisions and a slower reaction rate.

9. Describe how you would carry out an experiment to investigate the effect of acid concentration on the rate of reaction between hydrochloric acid and marble chips. Include details about the variables involved.

Answer:

Set up a conical flask containing a known mass of marble chips and connect it to a gas syringe.

Add a measured volume of hydrochloric acid at a specific concentration and start a stopwatch.

Measure the volume of carbon dioxide gas collected in the gas syringe every 10 seconds.

Repeat the experiment using different concentrations of hydrochloric acid while keeping control variables the same (volume of acid, temperature, surface area of marble chips).

Compare the rate of gas production for different acid concentrations to determine the effect on reaction rate.