Lesson 5- The effect of surface area

Chemistry- Key Stage 3

Energetics

Miss Charlton

If there is a smaller surface area...

A

This increases the speed of the particles so they collide more.

B

There are less frequent collisions and a slower rate of reaction

C

This increases the frequency of collisions and speeds up the rate of reaction

D

Increases the number of the particles so they collide less.

If there is a larger surface area…

A

This decreases the speed of the particles so they collide more.

B

There are less frequent collisions and a slower rate of reaction

C

This increases the frequency of collisions and speeds up the rate of reaction

D

Increases the number of the particles so they collide less.

Calculating surface area

Try this one:

A   B   C

0.5 cm

1 cm

SA= 6cm^2   **SA= 8cm^2**

0.5 cm

0.5 cm

SA= 10cm^2

Area for C

Area for front/back surfaces= 0.5cm x 0.5cm = 0.25cm^2

Area for other surfaces= 0.5cm x 1cm = 0.5cm^2

                                                       x4= **10cm^2**

(4 x 0.5cm^2) + (2 x 0.25cm^2)= 2cm^2 +0.5cm^2 = 2.5cm^2

What is the surface area of this cube?

A

27cm^2

B

12cm^2

C

54cm^2

D

9cm^2

3 cm

3 cm

3 cm

Complete the task

In terms of particles, what happens to the rate of reaction when increasing surface area?
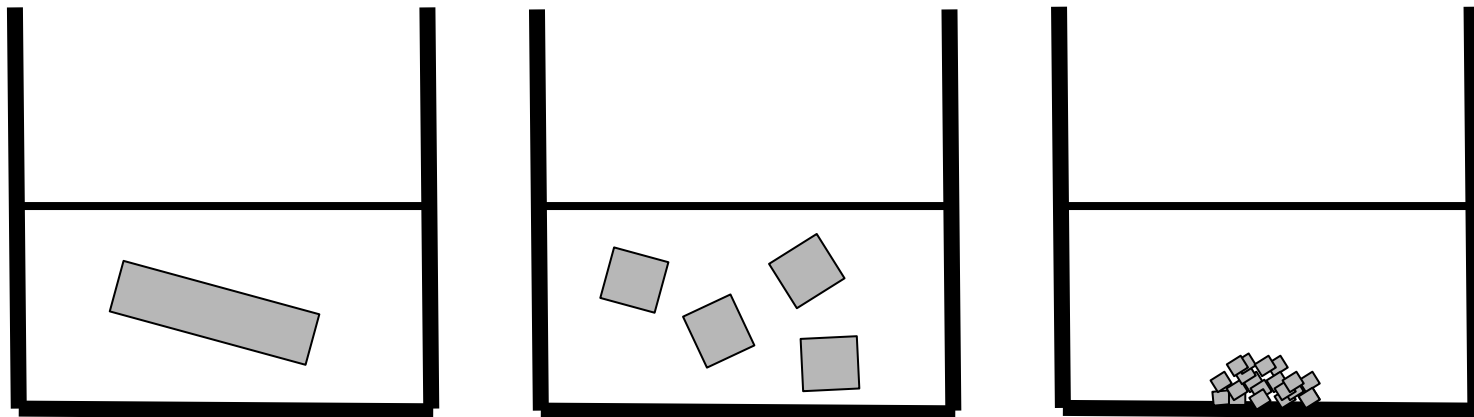
Key words:
Particles, frequency, rate, increases, collisions.
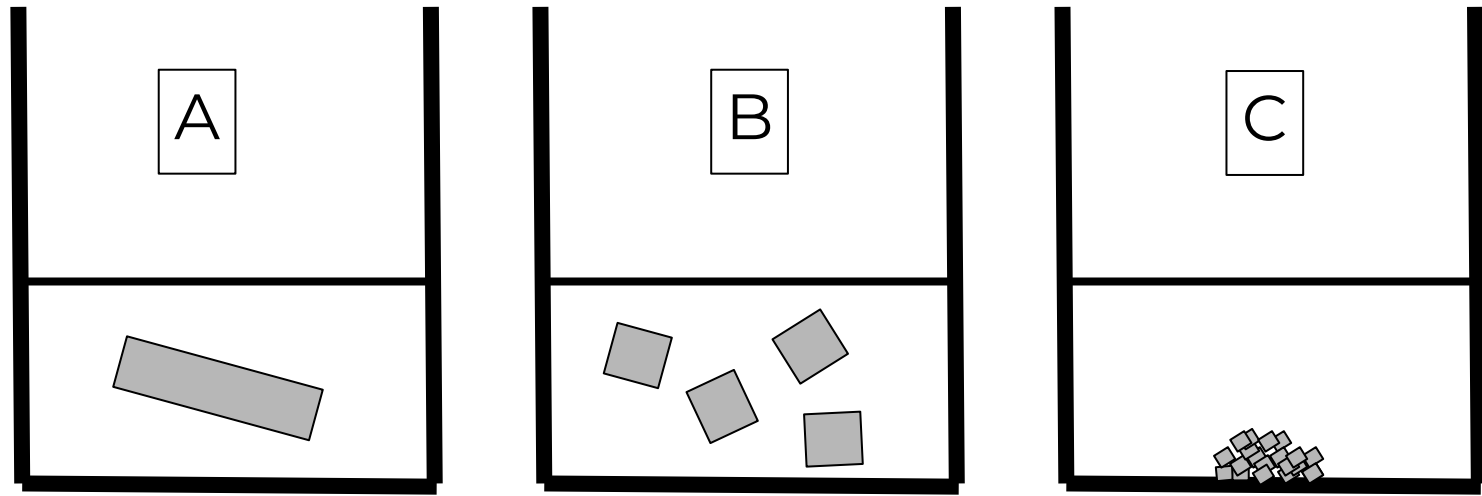
Complete the task

A student investigated the effect of the size of magnesium pieces on the rate of reaction with hydrochloric acid. She timed how long it took for the reaction to be complete.

Identify the independent, dependent and

2 control variables of this practical.

Complete the task

1. How will they know the reaction is finished?
2. In which conical flask will you see the fastest reaction and why?

Answers

If there is a smaller surface area...

A

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B

There are less frequent collisions and a slower rate of reaction

C

This increases the frequency of collisions and speeds up the rate of reaction

D

Increases the number of the particles so they collide less.

If there is a larger surface area…

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This decreases the speed of the particles so they collide more.

B

There are less frequent collisions and a slower rate of reaction

C

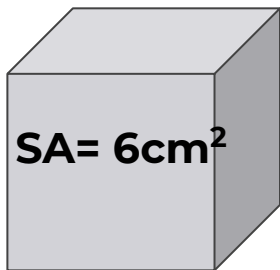This increases the frequency of collisions and speeds up the rate of reaction

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Increases the number of the particles so they collide less.
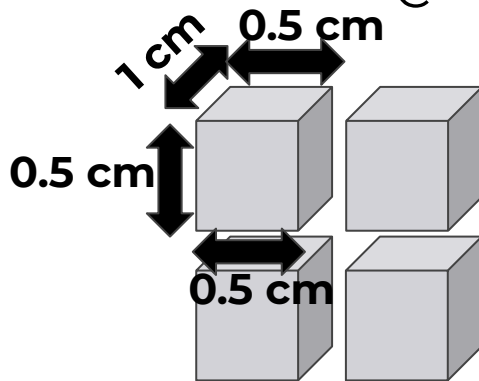
Calculating surface area

Try this one:

A   B   C

SA= 6cm^2

SA= 8cm^2

1 cm   **0.5 cm**

0.5 cm

0.5 cm

SA= 10cm^2

Area for C

Area for front/back surfaces= 0.5cm x 0.5cm = 0.25cm^2

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(4 x 0.5cm^2) + (2 x 0.25cm^2)= 2cm^2 +0.5cm^2 = 2.5cm^2

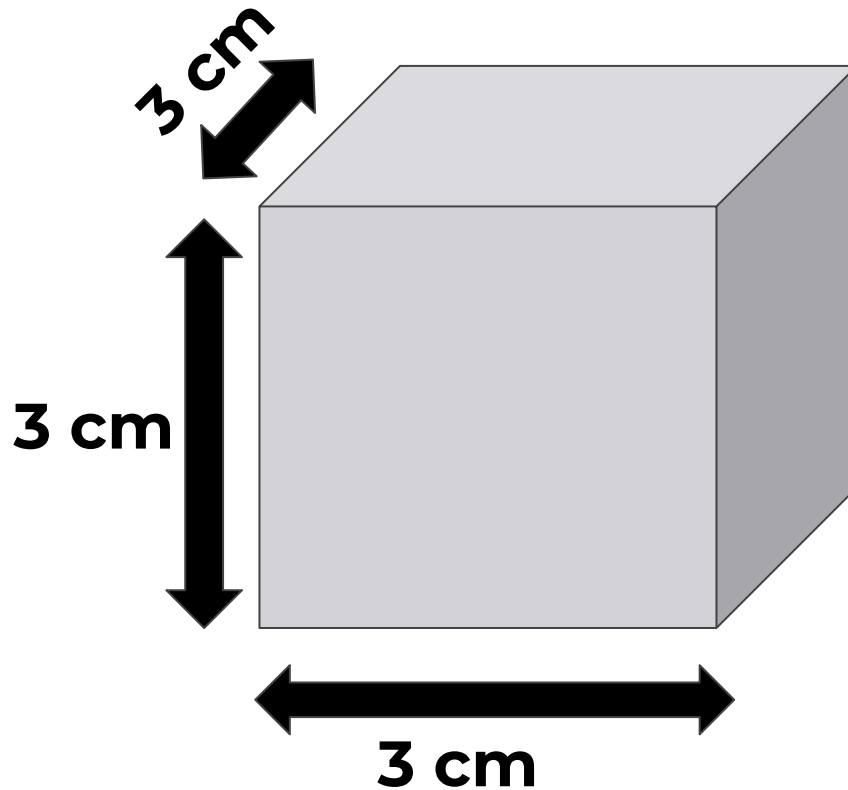**What is the surface area of this cube?**

A

27cm^2

B

12cm^2

C

54cm^2

D

9cm^2

3 cm

3 cm

3 cm

What happens to the rate of reaction when increasing surface area?

Increasing the surface area increases the number of particles exposed, this means the frequency of collisions will increase the rate of reaction.

Variables

IV: Surface area of magnesium.

DV: Time for the reaction to finish.

CV: Volume of acid, mass of magnesium, concentration of acid, type of acid, type of metal.

How will they know the reaction is finished?

When the bubbling has stopped or when the magnesium has disappeared.

In which conical flask will you see the fastest reaction and why?

Flask **C**, because the pieces of magnesium are the smallest so have the largest surface area. This means there is the largest surface for particles to react with, which increases the frequency of collisions, making this reaction the fastest.