

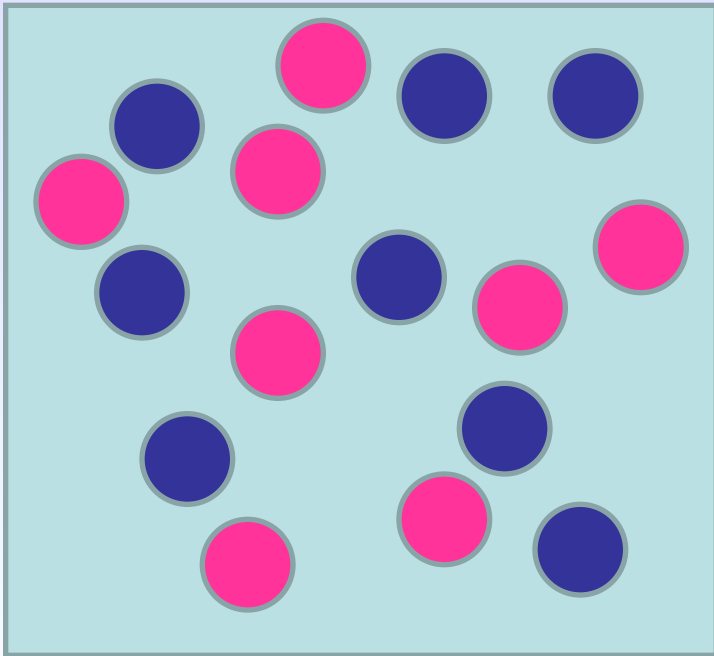
# Concentration and collision theory

WALT : investigating how concentration effects the number of collisions



# Concentration and collision theory

Question 1 - If the concentration of the sample on the left is 1 Mol what would the diagram look like for



1. 0.5 Mol
2. 0.25 Mol
3. 0.75 Mol
4. 2.0 Mol
5. 3.0 Mol

**DRAW 5 DIAGRAMS**

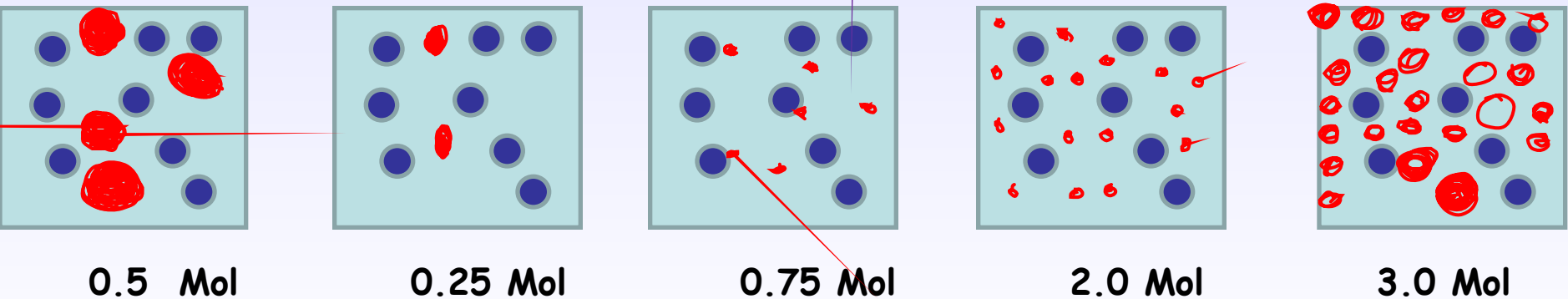
# Concentration and collision theory

Question 1 - If the concentration of the sample on the left is 1Mol what would the diagram look like for

1. 0.5 Mol
2. 0.25 Mol
3. 0.75 Mol
4. 2.0 Mol
5. 3.0 Mol

⊙ - water  
⊙ - HCl.

☺



# Concentration and rate

- ✓ Grade C - Describe concentration in terms of particles
- ✓ Grade B - Explain the effect of changing concentration on rates of reaction
- ✓ Grade A/A\* - Apply knowledge to explain effect of pressure on reaction rate

# Concentrating?

The more concentrated a liquid the more particles of it there is per  $\text{cm}^3$

Most concentrated =  
most Vimto particles /  $\text{cm}^3$

Least concentrated =  
fewest Vimto particles/ $\text{cm}^3$



How will this  
affect rate of  
reaction

# Making predictions

We will investigate the rate of reaction between sodium thiosulphate and different concentrations of hydrochloric acid

What do you think will happen : make a prediction

\*\*\*\*Remember For a reaction to happen particles have to collide and collide with enough energy to react \*\*\*\*

# Wear goggles to stay safe

## Method

1. Record results in table
2. Place the flask on top of the cross
3. Looking down the top of the flask stop the stopwatch when the cross disappears
4. **Using the new** measuring cylinder measure out 20 cm<sup>3</sup> of **0.5M HCl**
5. Repeat steps 2-7 for **0.1, 0.2, 0.3 and 0.4M HCl**
6. Add the HCl to the flask and start the stopwatch
7. Measure 20 cm<sup>3</sup> of **sodium thiosulphate** into each flask

# Wear goggles to stay safe

## Method

1. Measure  $20\text{ cm}^3$  of **sodium thiosulphate** into each flask
2. Place the flask on top of the cross
3. **Using the new** measuring cylinder measure out  $20\text{ cm}^3$  of **0.5M HCl**
4. Add the HCl to the flask and start the stopwatch
5. Looking down the top of the flask stop the stopwatch when the cross disappears
6. Record results in table
7. Repeat steps 2-7 for **0.1, 0.2, 0.3 and 0.4M HCl**



# Results table

Volume of acid (cm <sup>3</sup> )	Volume of water (cm <sup>3</sup> )	Concentration of acid (Mol)	Volume of thiosulphate (cm <sup>3</sup> )	Concentration of Thiosulphate ( mol )	Time for reaction to complete (sec)

LO: Understand how to use the Periodic Table of Elements.

# Explain your results

- Stick in your completed table
- Use the results from your table to complete the following.

My results showed that as the concentration increased the rate of reaction .....

This is because.....

# Animation concentration

..\..\..\..\BOARDWORK RESOURCES\GCSE  
ADDITIONAL SCIENCE\GCSE Additional Science\GCSE  
Additional Science Chemistry v1.1\8. Rates of Reaction  
v1.0.ppt

The more particles per  $\text{cm}^3$  the higher the collision frequency (the more often collisions happen)  
More collisions per second = faster rate of reaction (the reaction takes less time!)

# Pressure (pushing down on me)

The higher the pressure of a gas the more particles of it there is per  $\text{cm}^3$

Animation on pressure (double click to increase pressure)

The higher the pressure = the faster the reaction (the reaction takes less time!)  
More collisions = faster rate of reaction (the reaction takes less time!)  
Higher pressure = faster reaction

# Concentration and rate

- ✓ Grade C - Describe concentration in terms of particles
- ✓ Grade B - Explain the effect of changing concentration on rates of reaction
- ✓ Grade A/A\* - Apply knowledge to explain effect of pressure on reaction rate

1. Describe what would happen to the rate of reaction involving gases when the pressure is decreased.

2. You repeated the experiment the results are here.

	0.5 M	1 M	1.5 M	2 M
Reaction time	135s	98s	142s	43s

a) Which is the anomalous result?

b) What could have caused this result?

c) How could you improve the reliability of your results?

3. Explain why companies who make money from reactions between gasses carry these reactions out at high pressures even though this cost more to do.

E

C

A

\*

# Concentration and rate

- ✓ Grade C - Describe concentration in terms of particles
- ✓ Grade B - Explain the effect of changing concentration on rates of reaction
- ✓ Grade A/A\* - Apply knowledge to explain effect of pressure on reaction rate

1 It decreases

2 a) 142s at 1.5 M

b) NOT HUMAN ERROR ...so Keystage3!!

Incorrect measuring of: concentration of HCl,  
volume of sodium thiosulphate or HCl, change  
in temperature (got colder)

c) repeat the experiment

take an average of the results

Leaving out anomalous results

3 Higher pressure, more particles per  $\text{cm}^3$   
more collisions, faster rate of reaction, more  
product faster = MORE money



# Concentration and rate

- ✓ Grade C - Describe concentration in terms of particles
- ✓ Grade B - Explain the effect of changing concentration on rates of reaction
- ✓ Grade A/A\* - Apply knowledge to explain effect of pressure on reaction rate