11–14 years

Particle model: Frayer models

ROYAL SOCIETY OF CHEMISTRY

Education
Inspiring your teaching and learning

How to use Frayer models

Frayer models are a simple but effective way to develop learners' understanding of a new piece of vocabulary. You will see what your learners already know and identify any misconceptions they have.

There are four stages learners can work through, but you can adapt this model to best suit your learners. You can guide learners through all quadrants, but particularly quadrant 2 works best as a teacher-led discussion.

1. Explore Link to science capital and draw on learners' experience.	**2. Break down** Look at the composite parts of the word to help unpack its meaning.
4. Consolidate Learners apply their knowledge.	**3. Explain** Introduce the definition.

Key term

Find more guidance including tips, adaptations and further reading, in the teacher notes: rsc.li/4cmvSbS

Concentration

1. What does the word concentration mean to you? Where have you come across this word (or parts of this word) before?

2. Break down concentration

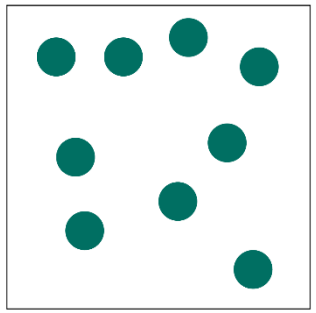
Con

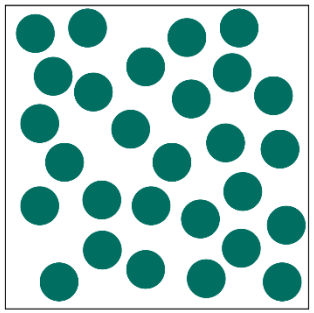
centr

ation

3. Write down what you think concentration means

4. Which of the following diagrams shows the more concentrated solution?





Copy the definition from the key terms sheet

Dissolve

1. What does the word dissolve mean to you? Where have you come across this word (or parts of this word) before?

2. Break down dissolve

Dis

solve

3. Write down what you think dissolve means

4. How is dissolving different from melting?

Melting	Dissolving

Copy the definition from the key terms sheet

Sublime

1. What does the word sublime mean to you? Where have you come across this word (or parts of this word) before?

2. What do we know about sublime?

It's from a latin word 'sublimare', which means to 'lift up' or 'raise'.

You could picture the solid being lifted 'above' the liquid phase and straight to being a gas.

3. Write down what you think sublime means

4. Give an example of a chemical which often sublimes

Copy the definition from the key terms sheet

Diffusion

1. What does the word diffusion mean to you? Where have you come across this word (or parts of this word) before?

2. What do we know about diffusion?

From Latin, ‘diffundere’ meaning ‘to scatter or pour out in all directions’.

Diffusion is how a smell spreads across a room, like when someone sprays perfume.

Gases and liquids can diffuse.

Diffusion involves particles spreading out.

4. Name one factor which can affect the rate (speed) of diffusion

3. Write down what you think diffusion means

Copy the definition from the key terms sheet

Exothermic

1. What does the word exothermic mean to you? Where have you come across this word (or parts of this word) before?

2. Break down exothermic

Exo

thermic

3. Write down what you think exothermic means

4. Circle which of the following reactions are exothermic

You may find it useful to fill in the temperature difference column.

Reaction	Temperature before (°C)	Temperature after (°C)	Temperature difference
A + B	23	56	
F + M	22	10	
T + Q	10	78	

Copy the definition from the key terms list

Endothermic

1. What does the word endothermic mean to you? Where have you come across this word (or parts of this word) before?

2. Break down endothermic

Endo

thermic

3. Write down what you think endothermic means

4. Circle which of the following reactions are endothermic

You may find it useful to fill in the temperature difference column.

Reaction	Temperature before (°C)	Temperature after (°C)	Temperature difference
A + B	23	56	
F + M	22	10	
T + Q	10	78	

Copy the definition from the key terms list

Concentration

1. What does the word concentration mean to you? Where have you come across this word (or parts of this word) before?

2. Break down concentration

Con

With, together, collecting

centr

Central point, the middle

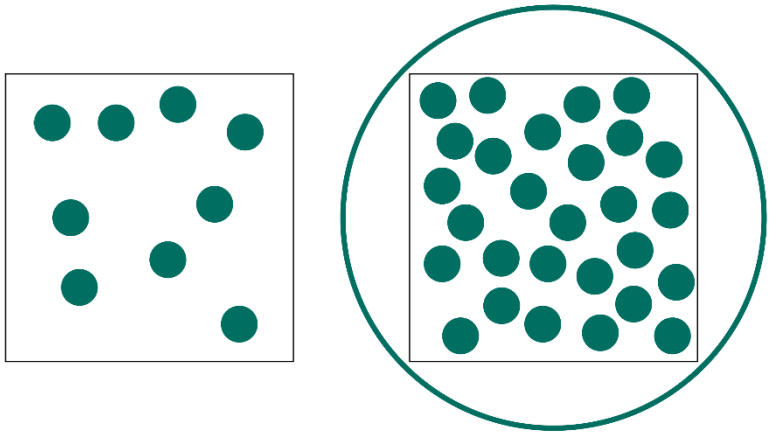
ation

The action or process of doing something

3. Define concentration, in a chemistry context

The amount of solute present in a known amount of solution.

4. Which of the following diagrams shows the more concentrated solution?



Dissolve

1. What does the word dissolve mean to you? Where have you come across this word (or parts of this word) before?

2. Break down dissolve

Dis

From Latin, 'dis' = apart

solve

From Latin, 'solvere' = loosen

3. Define dissolve

When a solute is added to a solvent and the solute breaks into much smaller particles and spreads out.

4. How is dissolving different from melting?

Melting	Dissolving
• Melting is when a solid is heated, gains energy and turns into a liquid, at its melting point.	• Dissolving is when a solute is added to a solvent and the solute breaks into much smaller particles and spreads out.
• When a solid melts, it's still the same substance as before it melted.	• When a solid dissolves in a liquid, this makes a solution.
• You need to heat something for it to melt.	• Dissolving may be exothermic or endothermic.
• If you cool the liquid enough, it will become a solid again (freeze).	• If you have dissolved a solid in a solvent (e.g. water), you can get the dissolved substance out of the solution by evaporating the solvent.

Sublimation

1. What does the word sublimation mean to you? Where have you come across this word (or parts of this word) before?

2. What do we know about sublimation?

Sublimation

From Latin, 'sublimare',
meaning 'to lift up' or 'to raise'.

Related to 'sublime', also from Latin meaning 'high up'.

3. Define sublimation

The change of state from solid to gas without turning into a liquid first.

4. Give an example of a chemical which often sublimes

Carbon dioxide (dry ice)
Iodine

Diffusion

1. What does the word diffusion mean to you? Where have you come across this word (or parts of this word) before?

2. What do we know about diffusion?

Diffusion

From Latin, 'diffundere' meaning 'to scatter or pour out in all directions'.

From Latin prefix dis = 'apart' and
fundere = 'to pour'

4. Name one factor which can affect the rate (speed) of diffusion

Temperature
Surface area
Concentration gradient

3. Define diffusion

The movement of a substance from an area of high concentration to an area of low concentration.

Exothermic

1. What does the word exothermic mean to you? Where have you come across this word (or parts of this word) before?

2. Break down exothermic

Exo

Out, for example the exit is where you go out.

thermic

Heat

3. Define exothermic

A physical change or chemical reaction which transfers energy to its surroundings, causing the surroundings to get hotter.

4. Circle which of the following reactions are exothermic

You may find it useful to fill in the temperature difference column.

Reaction	Temperature before (°C)	Temperature after (°C)	Temperature difference
A + B	23	56	+33
F + M	22	10	-12
T + Q	10	78	+68

Endothermic

1. What does the word endothermic mean to you? Where have you come across this word (or parts of this word) before?

2. Break down endothermic

Endo

In

thermic

Heat

3. Define endothermic

A physical change or chemical reaction which absorbs energy from its surroundings, causing the surroundings to get cooler.

4. Circle which of the following reactions are endothermic

You may find it useful to fill in the temperature difference column.

Reaction	Temperature before (°C)	Temperature after (°C)	Temperature difference
A + B	23	56	+33
F + M	22	10	-12
T + Q	10	78	+68

1. Explore

Link to science capital and draw on learners' experience.

2. Break down/'what do we know about X?'

Look at composite parts of the word to help unpack its meaning.

Or invite learners to suggest what, as a class, they already know about the key term (with the help of a few bullet points).

<Select your key term>

4. Consolidate

Learners apply their knowledge.

3. Explain

Introduce the definition.

Example layout