14–16 years

Crude oil: Frayer models

ROYAL SOCIETY OF CHEMISTRY

Education
Inspiring your teaching and learning

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. Quadrant 3 might also need/benefit from some 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/3Ys0jYi

1. What does the word 'flammability' mean to you?

Where have you come across this word (or parts of this word) before?

2. Break down the word 'flammability'.

flam-

able

-ity

The suffix -ity means 'state of having (a particular quality)'.
For example, oddity means something has the quality of being odd.

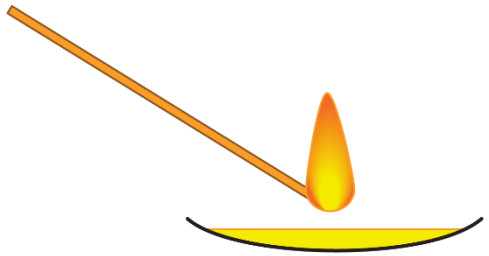
flammability

3. Write down what you think 'flammability' means.

4. A teacher places a few drops of two fractions obtained from the fractional distillation of crude oil in different watch glasses and tries to make them catch fire by using a flame.

Fraction A – catches fire easily
Fraction B – does not catch fire

Which fraction has the highest flammability?



Compare what you wrote with the definition (slide 7).

polymer

1. What does the word ‘polymer’ mean to you?

Where have you come across this word (or parts of this word) before?

2. Break down the word ‘polymer’.

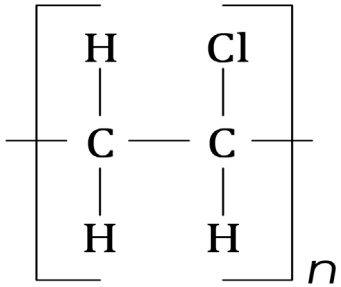
poly-

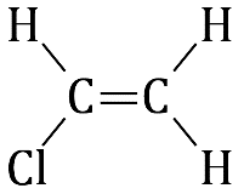
-mer

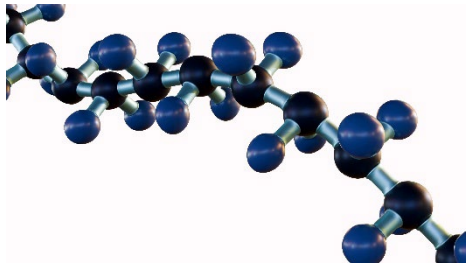
3. Write down what you think a ‘polymer’ is.

4. Two of the images below represent polymers.

Which two?







Compare what you wrote with the definition (slide 8).

homologous series

1. What does the term homologous mean to you?

Where have you come across this term (or parts of this term) before?

2. Break down the term 'homologous series'.

homo-

-logous

From Greek *logos*: 'relation, reasoning, computation'

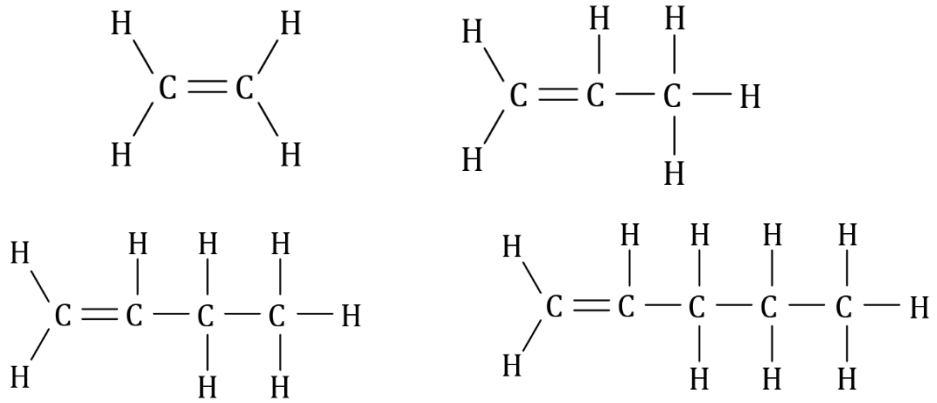
series

A number of discrete things of one kind.

3. Write down what you think a 'homologous series' is.

4. The four molecules below all belong to the homologous series called 'alkenes'.

a) Fill in the blank to complete their general formula: $C_nH\_\_$



b) Predict the formula of the alkene with 23 carbon atoms.

Compare what you wrote with the definition (slide 9).

non-biodegradable

1. What does the term ‘non-biodegradable’ mean to you?

Where have you come across this term (or parts of this term) before?

2. Break down the term ‘non-biodegradable’.

non-

bio-

degrade

-able

3. Write down what you think ‘non-biodegradable’ means.

4. A student buries two carrier bags in the ground.
Carrier bag A is non-biodegradable.
Carrier bag B is biodegradable.

The student digs up the two carrier bags five years later. What do they find?

Compare what you wrote with the definition (slide 10).

1. What does the word 'flammability' mean to you?

Where have you come across this word (or parts of this word) before?

2. Break down the word 'flammability'.

flam-

From Latin 'flamma' – a flame.

able

Having the means, capacity or qualifications to do something

-ity

The suffix -ity means 'state of having (a particular quality).'
For example, oddity means something has the quality of being odd.

flammability

Having the capacity to catch fire.

flammability

4. A teacher places a few drops of two fractions obtained from the fractional distillation of crude oil in different watch glasses and tries to make them catch fire by using a flame.

Fraction A – catches fire easily
Fraction B – does not catch fire

Which fraction has the highest flammability?

Fraction A, because it catches fire the most easily

3. Write down what you think 'flammability' means (below is the definition from the key terms list).

How easy it is to ignite a substance (in other words, to cause a substance to catch fire using a flame).

Encourage learners to compare their attempted definition with this one.

1. What does the word 'polymer' mean to you?

Where have you come across this word (or parts of this word) before?

2. Break down the word 'polymer'.

poly-

From the Greek word poly, meaning 'many'

-mer

From the Greek word meros, meaning 'part' or 'segment'

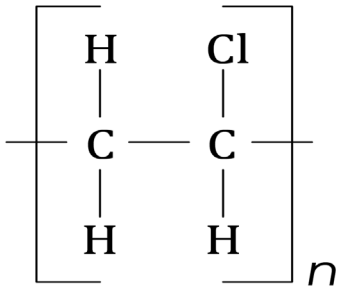
polymer

A molecule made from many parts.

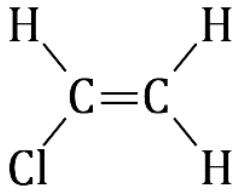
polymer

4. Two of the images below represent polymers.

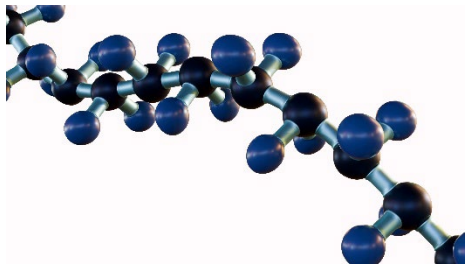
Which two?



polymer



monomer



polymer

3. Write down what you think a 'polymer' is (below is the definition from the key terms list).

A very large molecule made by joining together lots of small molecules.

Encourage learners to compare their attempted definition with this one.

homologous series

1. What does the term 'homologous' mean to you?

Where have you come across this term (or parts of this term) before?

2. Break down the term 'homologous series'.

homo-

From Greek homos: 'one and the same'

-logous

From Greek *logos*: 'relation, reasoning, computation'

series

A number of discrete things of one kind.

homologous series

A series of related molecules with the same reactivity.

3. Write down what you think a 'homologous series' is (below is the definition from the key terms list).

A series of organic compounds with the same general formula, which react in a similar way, such as alkanes.

Encourage learners to compare their attempted definition with this one.

4. The four molecules below all belong to the homologous series called 'alkenes'.

a) What is their general formula?

C_nH_{2n}

b) Predict the formula of the alkene with 23 carbon atoms.

$C_{23}H_{46}$

1. What does the term 'non-biodegradable' mean to you?

Where have you come across this term (or parts of this term) before?

2. Break down the term 'non-biodegradable'.

non-

'Not'

bio-

Indicating or involving life or living organisms

degrade

To break down or deteriorate chemically

-able

Having the means, capacity or qualifications to do something

non-biodegradable

Not able to be broken down by living organisms.

non-biodegradable

4. A student buries two carrier bags in the ground. Carrier bag A is non-biodegradable.

Carrier bag B is biodegradable.

The student digs up the two carrier bags five years later. What do they find?

Carrier bag A will still be there.
Carrier bag B may no longer be there. It will have degraded.

3. Write down what you think 'non-biodegradable' means (below is the definition from the key terms list).

Not able to be broken down by living organisms in the natural environment.

Encourage learners to compare their attempted definition with this one.

Example layout

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.