

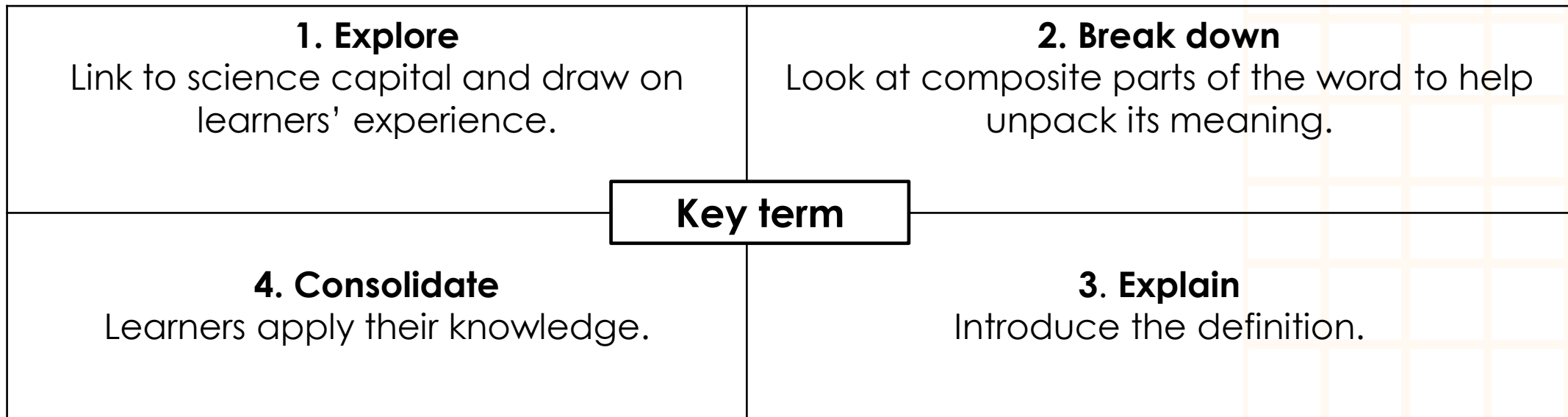
14–16 years 

Atomic model: Frayer models

Frayer models

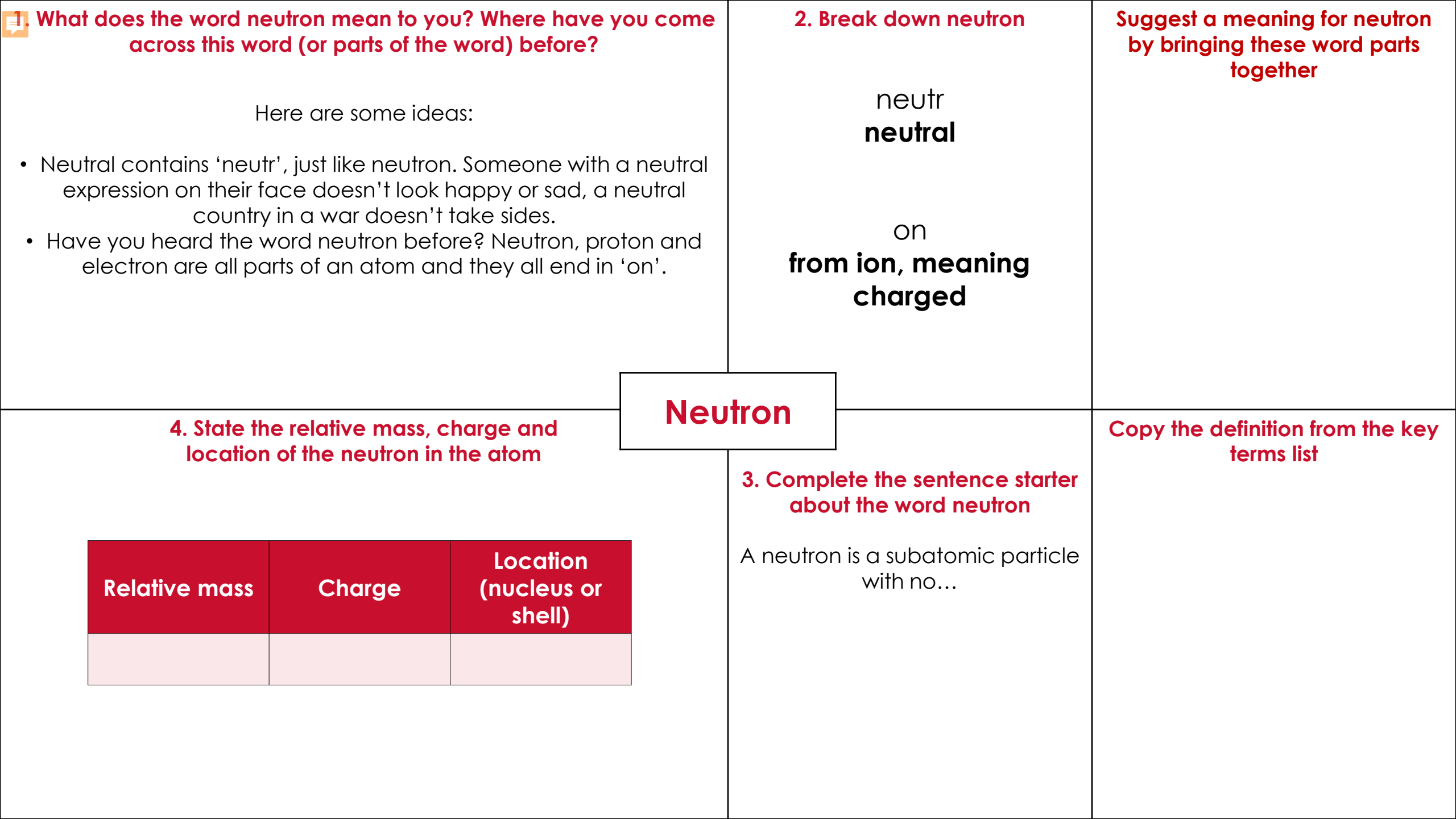
Frayer models are a simple but effective way to develop learners' understanding of a new piece of vocabulary. You will see what your learners already know and identify any misconceptions they have.

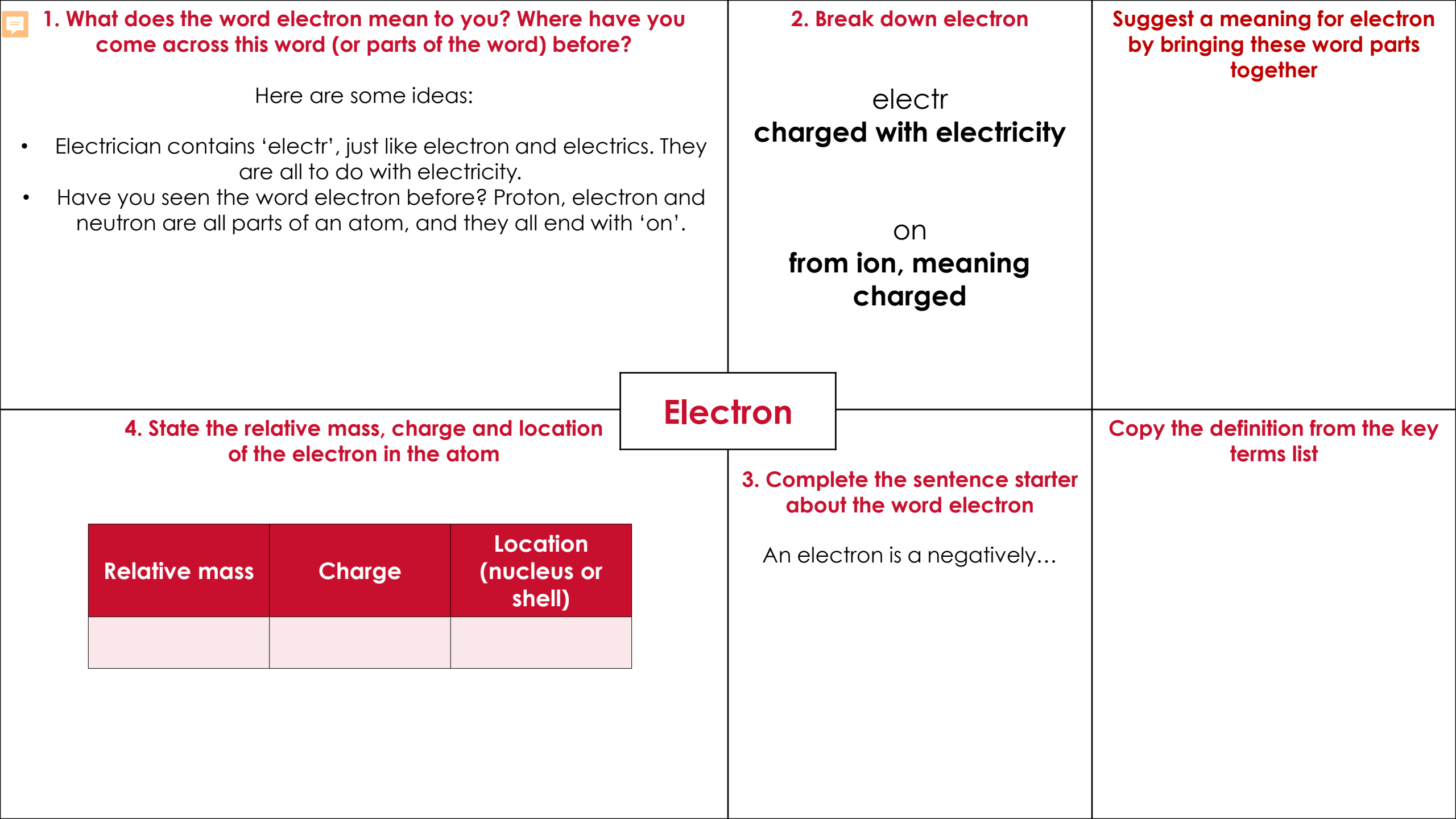
There are four stages learners can work through, but you can adapt this model to best suit your learners. You can guide learners through all quadrants, but particularly quadrant 2 works best as a teacher-led discussion.



Find more guidance, including tips, adaptations and further reading, in the teacher notes:

rsc.li/3XTkheu







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

Here are some ideas:

- Nucleus contains 'nucle', just like nuclear energy and nuclear family.
- Have you seen the word nucleus before? In biology it means the central part of a cell. It can also mean the centre of something more generally, like core members of a big group of people.

2. What do we know about nucleus?

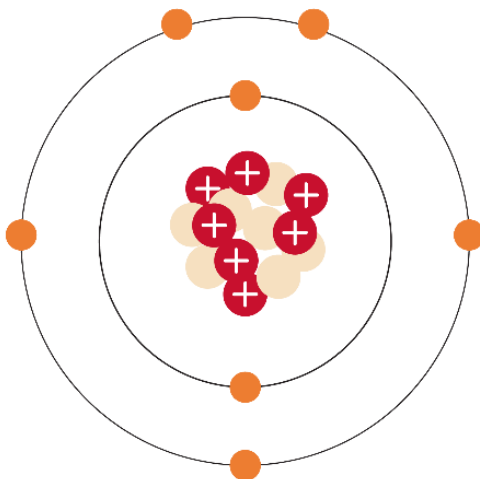
A nucleus is at the centre of an atom, it has a positive charge.

In Latin, it means kernel or little nut.

Nucleus

4. This is an atom of nitrogen

- Write down how many protons, neutrons and electrons it has
 - Label the nucleus



3. Complete the sentence starter about the word nucleus

A nucleus is the positively charged centre of...

Copy the definition from the key terms list

 1. What does the word shell mean to you? Where have you come across this word before?

Here are some ideas:

- Snails have shells and other animals too. Have you ever seen empty shells washed up on the beach?
- It can generally mean the outer layer or cover of something.

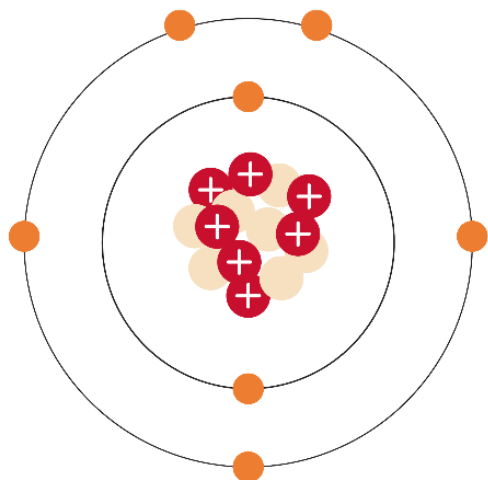
2. What do we know about shells?

Shells are parts of an atom. They are around the nucleus and they contain electrons.

Shell can mean to enclose in a case.

Electron shell/energy level

4. This is an atom of nitrogen. Label the electron shells



3. Complete the sentence starter for the phrase electron shell/energy level

Electron shells/energy levels are a region surrounding the ...

Copy the definition from the key terms list

<div data-bbox="0 0 50 64" data-label="Image"></div> <div data-bbox="50 14 1248 99" data-label="Text"> <p>1. What does the word isotope mean to you? Where have you come across this word (or parts of this word) before?</p> </div> <div data-bbox="433 142 840 185" data-label="Text"> <p>Here are a few ideas:</p> </div> <div data-bbox="25 185 1248 371" data-label="List-Group"> <ul style="list-style-type: none"> • Isotope contains 'iso', like an isotonic drink. Isotonic drinks contain salt and sugar, similar to human blood. • Isobars also contains 'iso'. Isobars are lines on a weather map that connect places with the same air pressure. </div>	<div data-bbox="1375 14 1809 57" data-label="Text"> <p>2. Break down isotope</p> </div> <div data-bbox="1375 142 1809 257" data-label="Text"> <p>iso equal to, the same</p> </div> <div data-bbox="1503 371 1656 485" data-label="Text"> <p>tope place</p> </div>	<div data-bbox="1936 14 2522 142" data-label="Text"> <p>Suggest a meaning for isotope by bringing these word parts together</p> </div>
<div data-bbox="152 721 1121 856" data-label="Text"> <p>4. Why can the following carbon atoms be classed as isotopes? To answer this question, fill in the word gaps to complete the sentence below.</p> </div> <div data-bbox="305 863 968 1021" data-label="Chemical-Block"> ${}^{12}_6\text{C} \quad {}^{13}_6\text{C} \quad {}^{14}_6\text{C}$ </div> <div data-bbox="25 1099 1248 1192" data-label="Text"> <p>These carbon atoms can be classed as isotopes because they have the same number of _____ but different numbers of _____.</p> </div>	<div data-bbox="1286 806 1898 906" data-label="Text"> <p>3. Complete the sentence starter for the word isotope</p> </div> <div data-bbox="1337 942 1847 1035" data-label="Text"> <p>Isotopes are atoms with the same number of...</p> </div>	<div data-bbox="1936 721 2522 813" data-label="Text"> <p>Copy the definition from the key terms list</p> </div>

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

2. Break down proton

prot

Meaning 'first', supposedly because the nucleus of hydrogen contains one proton.

on

from the word ion, meaning charged

Proton

4. State the relative mass, charge and location of the proton in the atom

3. Define proton

A positively charged subatomic particle with a relative mass of 1, found in the nucleus of an atom.

Relative mass	Charge	Location (nucleus/shell)
1	+1	Nucleus

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

2. Break down neutron

neutr

neutral

on

from the word ion, meaning charged
electrically neutral particle of the atom

Neutron

4. State the relative mass, charge and location of the neutron in the atom

3. Define neutron

A subatomic particle with no charge and a relative mass of 1,
found in the nucleus of an atom.

Relative mass	Charge	Location (nucleus/shell)
1	0	Nucleus

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

2. Break down electron

electr

charged with electricity

on

from the word ion, meaning charged

Electron

4. State the relative mass, charge and location of the electron in the atom

3. Define electron

A negatively charged subatomic particle with very little mass found in the electron shells/energy levels of atoms.

Relative mass	Charge	Location (nucleus/shell)
1/1840 or negligible	-1	shell

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

2. What do we know about nucleus?

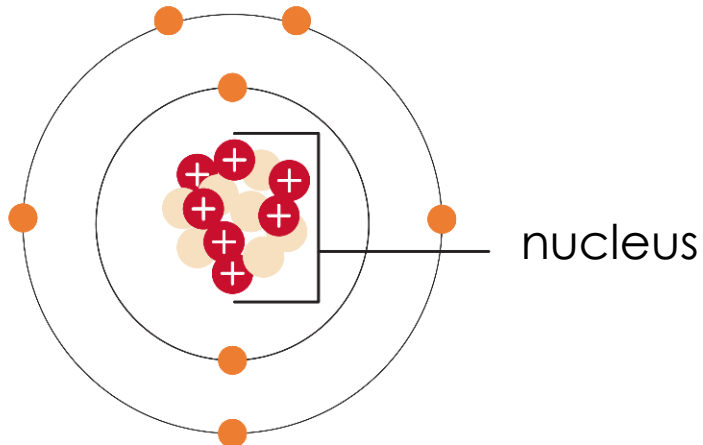
nucleus

In Latin, it means kernel or little nut.

Nucleus

4. This is an atom of nitrogen

- Write down how many protons, neutrons and electrons it has
 - Label the nucleus



7 protons
7 neutrons
7 electrons

3. Define nucleus, in a chemistry context

The positively charged centre of the atom consisting of protons and neutrons.

1. What does the word shell mean to you? Where have you come across this word before?

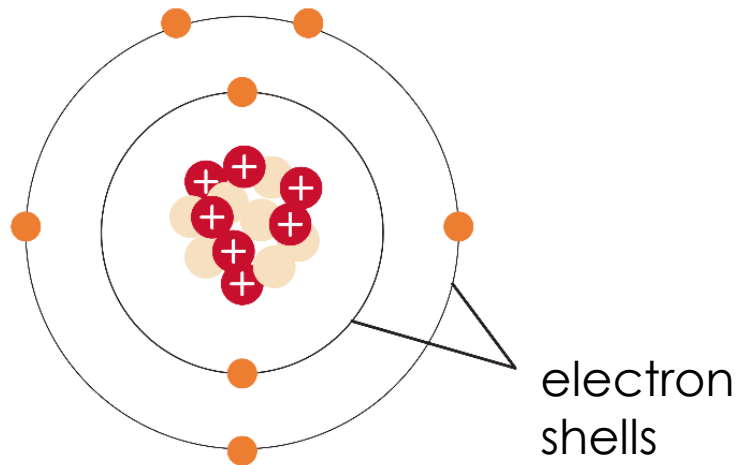
2. What do we know about shell?

Shells are parts of an atom. They are around the nucleus and they contain electrons.

Shell can mean to enclose in a case.

Electron shell

4. This is an atom of nitrogen.
Label the electron shells



3. Define shell, in a chemistry context

A region surrounding the nucleus of an atom where electrons are found; each level has a maximum number of electrons it can hold.



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

2. Break down isotope

iso

equal to, the same

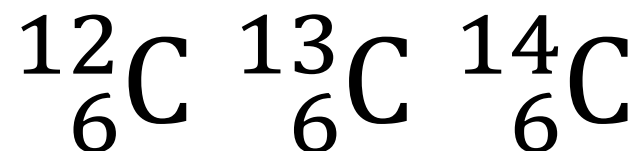
tope

place

Despite having different atomic masses, the various forms of an element occupy the same place on the periodic table.

Isotope

4. Why can the following carbon atoms be classed as isotopes? To answer this question, fill in the word gaps to complete the sentence below.



These carbon atoms can be classed as isotopes because they have the same number of **protons** but different numbers of **neutrons**.

3. Define isotope

Atoms with the same number of protons but different numbers of neutrons.

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>**

3. Explain

Introduce the definition.

4. Consolidate

Learners apply their knowledge.