

Chemistry &gt; Big idea CPS: Particles and structure &gt; Topic CPS6: Periodic Table

## Key concept (age 11-14)

### CPS6.1: Atomic model

Learning focus	The structure of an atom may be represented by an atomic model.				
As students' conceptual understanding progresses they can:	<div> <div>CONCEPTUAL PROGRESSION</div> <div></div> </div>				
	Recognise that atoms are not visible under any type of microscope and that scientists have never 'seen' the structure of an atom. <b>P</b>	Distinguish the nucleus of an atom from the nucleus of a cell.	Identify the force of attraction between electrons and the nucleus as being due to electric charge.	Recognise that a typical diagram of atomic structure is not drawn to scale.	Compare the particle and atomic models. <b>B</b>
Diagnostic questions	Seeing atoms	Nucleus	Attractive forces	Relative size	Comparing models
Response activities	Size sequence	Type of nucleus	Forces of attraction	Sports field	Model explanations

Key:

**P** Prior understanding from earlier stages of learning

**B** Bridge to later stages of learning

Seeing atoms	Nucleus	Attractive forces	Relative size	Comparing models																				
<p><b>Seeing atoms</b></p> <p>Is it possible to see atoms?</p> <p>For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th></th> <th>I am sure (100%)</th> <th>I think (75%)</th> <th>I think (50%)</th> <th>I am sure (100%)</th> </tr> </thead> <tbody> <tr> <td>A. Atoms can be observed with a school microscope.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B. Atoms can be observed with a powerful microscope.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C. Scientists have observed atoms using other equipment.</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		I am sure (100%)	I think (75%)	I think (50%)	I am sure (100%)	A. Atoms can be observed with a school microscope.					B. Atoms can be observed with a powerful microscope.					C. Scientists have observed atoms using other equipment.					<p><b>Nucleus</b></p> <p>Some students are discussing the nucleus of an atom. Who do you agree with, and why?</p> <p>Phyllis: I think the nucleus controls the atom.</p> <p>Greg: The nucleus is at the centre of the atom.</p> <p>Freddie: An atom can reproduce.</p>	<p><b>Attractive forces</b></p> <p>What gives rise to the force of attraction between electrons and the nucleus?</p> <p>Put a tick (✓) in the box next to the best answer:</p> <p>A. magnetism</p> <p>B. gravity</p> <p>C. electric charge</p>	<p><b>Relative size</b></p> <p>The nucleus of an atom is shown with a diameter of 100 nm.</p> <p>Put a tick (✓) in the box next to the best answer:</p> <p>A. 1000 (10<sup>3</sup>) m</p> <p>B. 1 m</p> <p>C. 100 m</p> <p>D. 1000 m</p>	<p><b>Comparing models</b></p> <p>A helium atom may be represented using the particle model and the atomic model.</p> <p>Some students compare the two different models. Who do you agree with and why?</p> <p>Ryan: The particle model is wrong because atoms are actually made of protons, neutrons and electrons.</p> <p>Arash: The particle model can be used to explain some things that the atomic model cannot.</p> <p>Arnon: The atomic model does not show what an atom actually looks like, but it is better because it can explain more things.</p> <p>Noah: The atomic model is better because it shows what a helium atom actually looks like very close up.</p>
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<p><b>Size sequence</b></p> <p>Arrange the following in order of size, starting with the smallest.</p> <table border="1"> <thead> <tr> <th>Cards for Size sequence</th> <th></th> </tr> </thead> <tbody> <tr> <td>atomic nucleus</td> <td>DNA (genetic material)</td> </tr> <tr> <td>water molecule</td> <td>atom</td> </tr> <tr> <td>proton</td> <td>cell nucleus</td> </tr> <tr> <td>cheek cell</td> <td>nerve cell</td> </tr> </tbody> </table>	Cards for Size sequence		atomic nucleus	DNA (genetic material)	water molecule	atom	proton	cell nucleus	cheek cell	nerve cell	<p><b>Type of nucleus</b></p> <p>The word nucleus is used to describe both part of an atom and part of a cell. Put a tick (✓) in the box to complete the sentence.</p> <p>You must only use the words <b>atomic</b> and <b>cell</b>.</p> <p>A/an _____ nucleus contains DNA (genetic material).</p> <p>A/an _____ nucleus is made up of protons and neutrons only.</p> <p>A/an _____ nucleus is surrounded by cytoplasm.</p> <p>A/an _____ nucleus cannot be seen through even a very powerful microscope.</p> <p>A/an _____ nucleus is much smaller than a/an _____ nucleus.</p>	<p><b>Forces of attraction</b></p> <p>Put a tick (✓) in the box to complete the sentence.</p> <p>You must only use the words <b>magnetism</b>, <b>gravity</b> and <b>electric charge</b>.</p> <p>A pencil is dropped on the floor. The attraction of the pencil towards the floor is due to _____.</p> <p>A plastic comb is rubbed. It attracts small pieces of tissue paper. The force of attraction between the plastic comb and the tissue paper is due to _____.</p> <p>A fridge door snaps shut. The force of attraction between the door and the fridge is due to _____.</p> <p>The Moon orbits the Earth. The force of attraction between the Moon and Earth is due to _____.</p> <p>The force of attraction between a positively charged nucleus and a negatively charged electron is due to _____.</p>	<p><b>Sports field</b></p> <p>If a sports field were the size of an atom, what object represents the size of the nucleus?</p> <p>The sports field is about 100m long. Select the best answer:</p> <p>A. a pin of a needle</p> <p>B. a pea</p> <p>C. a golf ball</p> <p>D. a football</p>	<p><b>Model explanations</b></p> <p>A helium atom may be represented using the particle model and the atomic model.</p> <p>Which model would you use to explain each of the following and why?</p> <p>A. A helium atom has no overall charge.</p> <p>B. Helium is the gas used at night temperatures.</p> <p>C. Helium is a light element.</p>										
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Sequencing	Focused cloze	Focused cloze	Application and practice	Critiquing a representation																				