

## Atomic structure

### Introduction

These questions are designed to help you to develop your mental models (pictures in your mind) of atoms. This will help you to use different models to create explanations. Use the icon in the margin to find out which level of understanding the question is developing.



**Macroscopic:** what we can see. Think about the properties that we can observe, measure and record.



**Sub-microscopic:** smaller than we can see. Think about the particle or atomic level.



**Symbolic:** representations. Think about how we represent chemical ideas including symbols and diagrams.

### Questions



1. An atom is made up of three different types of sub-atomic particle. Every element has an atomic number and a mass number. These can help to work out the number of each sub-atomic particle in an atom.

(a) Complete the sentences below with the correct sub-atomic particles (protons, neutrons or electrons).

The atomic number gives the number of positive \_\_\_\_\_ and the number of negative \_\_\_\_\_. The mass number minus the atomic number gives the number of \_\_\_\_\_.

(b) The atomic number of lithium is 3 and the mass number is 7. State the number of each sub-atomic particle in an atom of lithium.

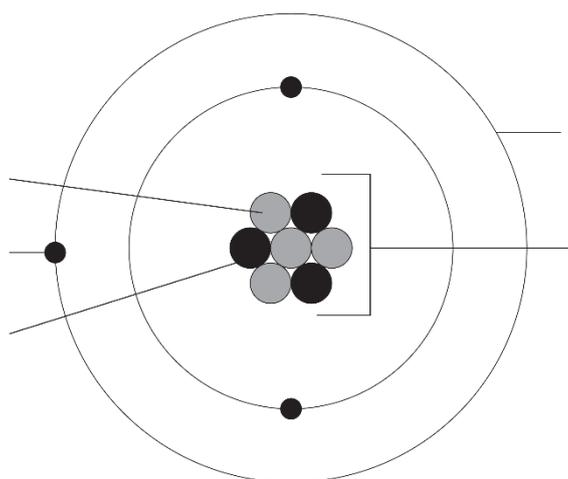
protons

electrons

neutrons

(c) The atomic model is a way of representing different parts on an atom. Add the following labels to the diagram to show the different parts of a lithium atom:

- proton
- neutron
- electron
- nucleus
- energy level (or electron shell)



2. Different sub-atomic particles have different charges.

(a) State the name of the sub-atomic particle with the following charges.

Charge	Sub-atomic particle
positive	
negative	
no charge	

(b) Explain why the nucleus of an atom has a positive charge overall.

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(c) Explain why an atom has no charge overall.

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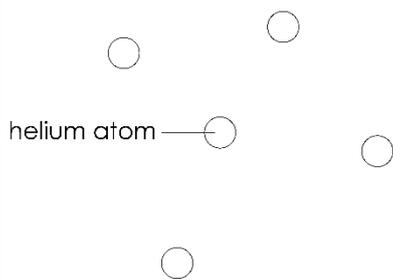


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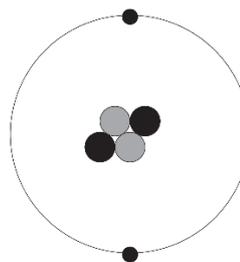
(d) Name the force between the nucleus and the electrons that holds an atom together.

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3. In the two diagrams below, a helium atom is represented in two different ways. Diagram A shows a **particle model** of helium. There are weak forces of attraction between the helium atoms. Diagram B shows the **atomic model** of helium. It shows the different parts that make up a helium atom.



A



B

- (a) Use the particle model to explain why helium fills the shape of a container.

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- (b) Use the atomic model to explain why an atom of helium has no overall charge.

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- (c) Use the most suitable model to explain why helium has a low boiling point.

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- (d) Suggest why there is **not** one correct model of helium.

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