

**NAIL IT!**

You must remember that the number of protons (the atomic number) in atoms of the same element never changes. If its atomic number were to change, it would be a different element.

**MATHS SKILLS**

You can work out the number of each sub-atomic particle in an atom by using its atomic number and mass number.

In a **neutral atom**  $\text{atomic number} = \text{number of protons} = \text{number of electrons}$

The  $\text{mass number} = \text{number of protons} + \text{number of neutrons} = \text{atomic number} + \text{number of neutrons}$

This means that:  $\text{number of neutrons} = \text{mass number} - \text{atomic number}$

In a **positive ion**  $\text{number of electrons} = \text{atomic number} - \text{the number of charges on the ion}$

In a **negative ion**  $\text{number of electrons} = \text{atomic number} + \text{the number of charges on the ion}$

**WORKIT!**

- 1 An atom of potassium has the atomic number 19 and mass number 39. What are the number of electrons, protons and neutrons in an atom of potassium?

The number of protons and electrons are equal to the atomic number = 19

The number of neutrons = mass number - atomic number =  $39 - 19 = 20$

- 2 How many electrons are there in a calcium ion  $\text{Ca}^{2+}$ ? [Atomic number of calcium = 20]

For  $\text{Ca}^{2+}$  number of electrons =  $20 - 2 = 18$

- 3 How many electrons are there in  $\text{N}^{3-}$  ion? [Atomic number of nitrogen = 7]

For  $\text{N}^{3-}$  number of electrons =  $7 + 3 = 10$

**CHECK IT!**

- 1 An oxygen atom contains 8 protons. Why can't it have 9 protons?
- 2 Explain why virtually all of the mass of the atom is found in the nucleus.
- 3 A phosphorus atom (symbol P) has an atomic number 15 and a mass number 31. Show how you could represent the phosphorus atom.
- 4 How many electrons are there in an  $\text{Al}^{3+}$  ion? [Atomic number of aluminium = 13]
- 5 An atom of sodium can be represented as shown below. Give the number of protons, electrons and neutrons in a sodium atom.  ${}_{11}^{23}\text{Na}$