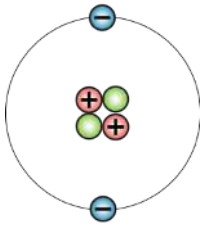
0 1

The below diagram shows the arrangement of subatomic particles within a helium atom.



0 1 . 1

Complete the following table which displays information on each of these subatomic particles.

Particle	Mass (relative)	Charge (relative)
Proton	1	+ 1
Neutron	1	0
Electron	$\frac{1}{1800}$	– 1

0 1 . 2

The nucleus of this helium atom can be represented in the form:

$$^{A}_{Z}He$$

Determine the values of the constants A and Z.

A = **4**

Z = **2**

Remember that the mass number (A) tells us the total number of protons *and* neutrons in the nucleus of an atom.

0 1 . 3

Under certain conditions, helium atoms can become ionised.
Explain what is meant by an ion.

An ion is formed when an atom loses or gains electrons [1], giving it a (net) positive or negative charge [1].

0 1 . 4

When heated to a high temperature, a particular helium atom develops a charge of +1. What must have happened to the atom to allow it to develop this charge?

It must have lost one electron [1].

The initial overall charge of the (neutral) helium atom was **+ 2 (from the protons) – 2 (from the electrons) = 0**. To have an overall charge of + 1, it must have lost one electron: **+ 2 – 1 = + 1**

0 2

A scientist makes the following statement:

Of all the isotopes of carbon, carbon-12 is the most stable.

0 2 . 1

Explain the meaning of the term isotope.

Isotopes are atoms which have the same number of protons as one another (in other words are of the same element) [1] but different numbers of neutrons [1].

0 2 . 2

Uranium-235 is used in the generation of electricity in nuclear power stations. A uranium-235 nucleus may be represented using the following notation:

$$^{235}_{92}\mathrm{U}$$

Determine the number of protons and neutrons in a uranium-235 nucleus.

Number of protons = **92**

Number of neutrons = **143**

0 2 . 3

State the (approximate) radius of an atom.

Radius = **10^{-10}** m

[1 mark]

0 2 . 4

Uranium-238 is also present within the reactors of nuclear power stations. What is the difference between uranium-235 and uranium-238?

A uranium-238 nucleus has three more neutrons than a uranium-235 nucleus [1].

[1 mark]