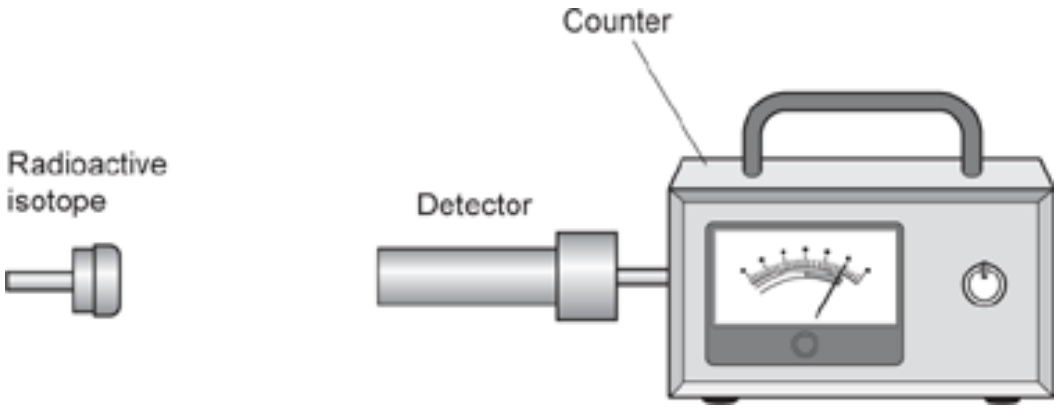
1. A scientist measures the activity, in counts per minute (cpm), of different radioactive isotopes.

The diagram shows the equipment the scientist uses.



The scientist:

- Records the activity on the counter before the detector is switched on.
- Switches on the detector and records the activity with the radioactive isotope nearby.

The table shows the scientist's results.

	Activity (cpm)
Detector switched off	5
Detector switched on	420

i. How can the scientist make the results more accurate?

Tick (✓) **one** box.

Handle the radioactive isotope using tongs. ☐

Move the radioactive isotope further away from the detector. ☐

Place lead in front of the radioactive isotope. ☐

Zero the counter and take another reading. ☐

[1]

ii. The activity of a different radioactive isotope is 480 counts per minute (cpm).

Calculate the activity in counts per second.

Activity = ... counts per second **[1]**

2. Hydrogen gas is placed in a glass tube in a laboratory.

Fig. 19.1 shows the emission spectrum of hydrogen.

Each line in the emission spectrum has a different colour

Fig. 19.1

i. Complete the sentences to explain the cause of the lines in the emission spectrum.

Use words from the list.

atoms	**electrons**	**light**	**protons**	**sound**

..... move from a higher energy level to a lower energy level and emit .....

[2]

ii. There is a potential difference of 3000 V across the tube.

A charge of 0.08 C flows in the tube.

Calculate the energy transferred.

Use the equation: energy transferred = charge × potential difference

Energy transferred = ... J **[2]**

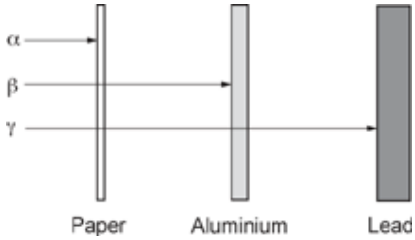
iii. A special power supply is needed to provide the high potential difference of 3000 V.

Describe **one** risk of using this power supply

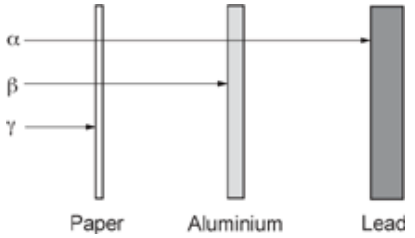
---**[1]**

3. Which diagram shows how alpha particles (α), beta particles (β) and gamma rays (γ) penetrate different materials?

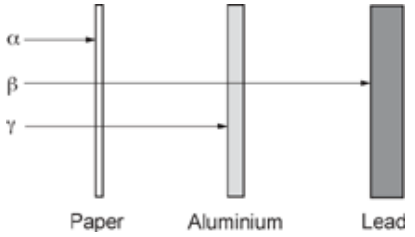
A



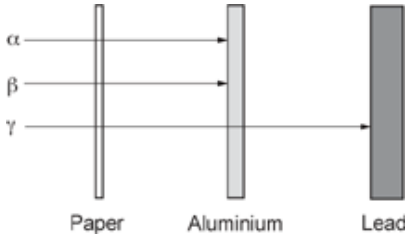
B



C



D



Your answer ☐ **[1]**

4. One atom of carbon contains 6 protons, 6 electrons and 6 neutrons.

Another atom of carbon contains 6 protons, 6 electrons and 7 neutrons.

Which answer describes these different atoms of carbon?

A Alpha particles
B Ions
C Isotopes
D Nuclei

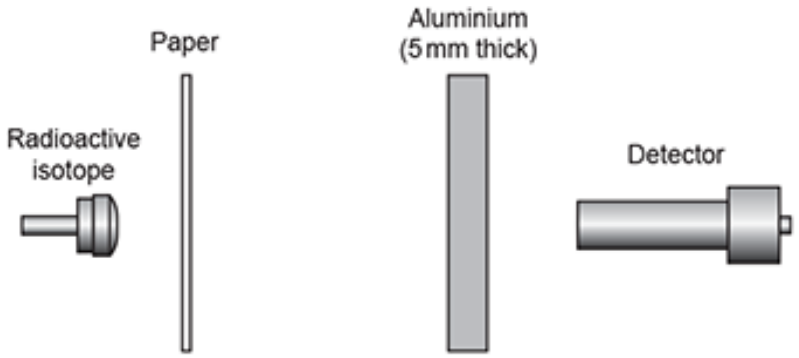
Your answer ☐ **[1]**

5. Which statement describes the nucleus of an atom?

A It contains electrons and protons only.
B It contains neutrons only.
C It contains protons and neutrons only.
D It contains protons, neutrons and electrons.

Your answer ☐ **[1]**

6. The diagram shows a radioactive isotope emitting alpha particles **and** beta particles.



Which particles are detected by the detector?

A Alpha particles and beta particles
B Alpha particles only
C Beta particles only
D No particles

Your answer ☐ **[1]**

END OF QUESTION PAPER