

31 A student is investigating the count rate of a radioactive substance.

How must he adjust his reading for the background count?

- A** Add the background count to his reading.
- B** Ignore the background count as it will not affect his reading.
- C** Subtract the background count from his reading.
- D** Take repeat readings to eliminate the background count.

33 A beta-particle enters a uniform magnetic field directed into the page and deflects downwards, as shown.



Which direction of electric field would also deflect an electron downwards?

- A** into the page
- B** out of the page
- C** down the page
- D** up the page

34 The radioactive isotope radon, $^{222}_{86}\text{Rn}$, is an alpha (α) emitter.

During this radioactive decay, an isotope of polonium, Po, is produced.

How many neutrons does a nucleus of this isotope of polonium contain?

- A** 130 **B** 132 **C** 134 **D** 136

9 (a) An experiment directs alpha particles at a very thin sheet of gold foil.

(i) Most of the alpha particles pass through the thin foil in a straight line.

State the conclusion about atoms from this observation.

.....
 [1]

(ii) Some of the alpha particles are deflected through angles less than 90° and a few are deflected through 180° .

State and explain **two** conclusions about the nuclei of atoms from this observation.

conclusion 1

explanation 1

.....

conclusion 2

explanation 2

..... [4]

(b) A source contains a radioactive isotope of strontium. This isotope decays by emission of β -particles. The half-life of this isotope is 29 years.

(i) State the change in the nucleus which occurs when a β -particle is emitted.

..... [1]

(ii) The initial mass of this isotope of strontium in the source is $25\mu\text{g}$.

Calculate the mass of the strontium isotope that decays in 87 years.

mass = μg [3]

[Total: 9]

10 The isotope americium-241 is represented by



This isotope decays by an α -emission to an isotope of neptunium (Np).

(a) Complete the nuclide equation for this decay.



[3]

(b) Fig. 10.1 shows a simple diagram of a smoke detector. The smoke detector contains a small sample of americium-241. This isotope ionises the air between the metal plates in the detector.

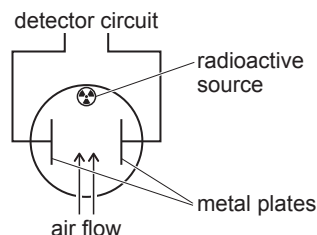


Fig. 10.1

(i) Describe how the americium-241 ionises air.

.....

 [3]

(ii) Suggest and explain **two** reasons why smoke detectors use an isotope that emits α -particles rather than an isotope that emits γ -radiation.

1.

 2.

[2]