

# Multiple-choice test

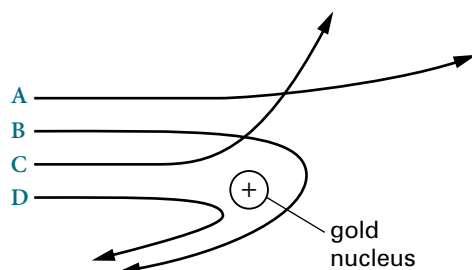
## Block 5: Supplement

Click on the correct answer to each question.

- 1 Rutherford's  $\alpha$  particle scattering experiment revealed the existence of the atomic nucleus. Which row in the table shows correctly the charges of  $\alpha$  particles and atomic nuclei?

	Charge of alpha particle	Charge of atomic nucleus
A	positive	positive
B	positive	negative
C	negative	positive
D	negative	negative

- 2 When  $\alpha$  particles are directed at the nucleus of a gold atom, a small fraction are back-scattered. Which line in the diagram shows correctly the path of an  $\alpha$  particle that is back-scattered?



- 3 Which row in the table gives correct descriptions of how energy is released in the processes of nuclear fission and nuclear fusion?

	Nuclear fusion	Nuclear fission
A	small nuclei split to form smaller nuclei	large nuclei split to form smaller nuclei
B	small nuclei join to form bigger nuclei	large nuclei split to form smaller nuclei
C	small nuclei split to form smaller nuclei	large nuclei join to form bigger nuclei
D	small nuclei join to form bigger nuclei	large nuclei join to form bigger nuclei

4 When an atom of lutetium  ${}_{71}^{176}\text{Lu}$  undergoes radioactive decay, it becomes an atom of hafnium  ${}_{72}^{176}\text{Hf}$ . What particle is emitted in this decay?

- A proton
- B electron
- C neutron
- D alpha particle

5 The radioactive isotope of polonium  ${}_{84}^{211}\text{Po}$  decays by emitting an  $\alpha$  particle to become an isotope of lead. Which is the correct symbol for this isotope?

- A  ${}_{82}^{209}\text{Pb}$
- B  ${}_{80}^{209}\text{Pb}$
- C  ${}_{82}^{207}\text{Pb}$
- D  ${}_{80}^{207}\text{Pb}$

6 Radiation from a radioactive rock is directed into a uniform magnetic field. The radiation follows a curved path in the magnetic field. Which type of radiation is definitely **not** being emitted by the rock?

- A  $\alpha$  particles
- B  $\beta$  particles
- C  $\gamma$  rays
- D protons

7 Alpha, beta and gamma are three types of ionising radiation emitted by radioactive substances. Which row in the table shows correctly the most ionising and the most penetrating?

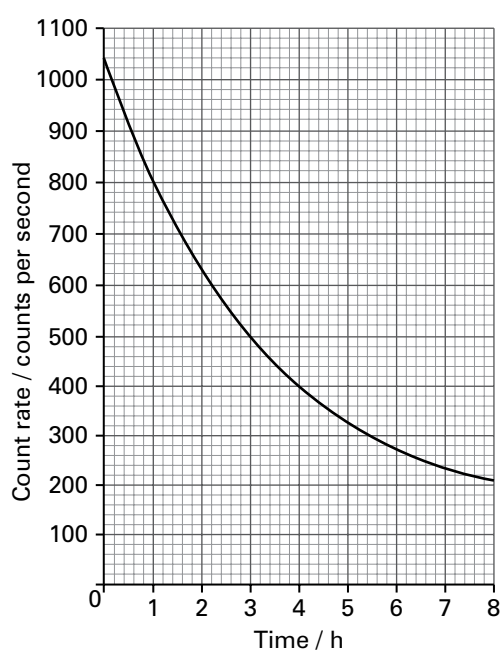
	Most ionising	Most penetrating
A	$\alpha$	$\alpha$
B	$\alpha$	$\gamma$
C	$\gamma$	$\alpha$
D	$\gamma$	$\gamma$

8 The radioactive isotope technetium-99m is used as a tracer in medicine. Its half-life is about 6 hours. It emits  $\gamma$  radiation.

Why is this isotope a good choice for this purpose?

- A Most patients can be expected to live longer than 6 hours.
- B A substance with a short half-life can be safely stored for long periods of time.
- C A substance with a short half-life will not expose the patient to radiation for a long time.
- D The radiation from the isotope will be easily absorbed by the patient's body.

- 9 Beta radiation can be used to monitor the thickness of plastic sheeting as it is manufactured. Why is beta radiation a good choice for this?
- A Beta radiation can pass through plastic without being absorbed.
  - B Plastic sheeting becomes radioactive when it absorbs alpha radiation.
  - C Beta radiation is absorbed gradually as it passes through plastic.
  - D Factory workers will not be harmed by exposure to beta radiation.
- 10 The graph shows the count rate detected close to a radioactive source as it decays.



What is the approximate half-life of the source, in hours?

- A 1.0 h
- B 2.0 h
- C 3.0 h
- D 4.0 h