

- 6 (a) A decay sequence for a radioactive atom of radon-219 to a stable lead-207 atom is as shown in Fig. 6.1.

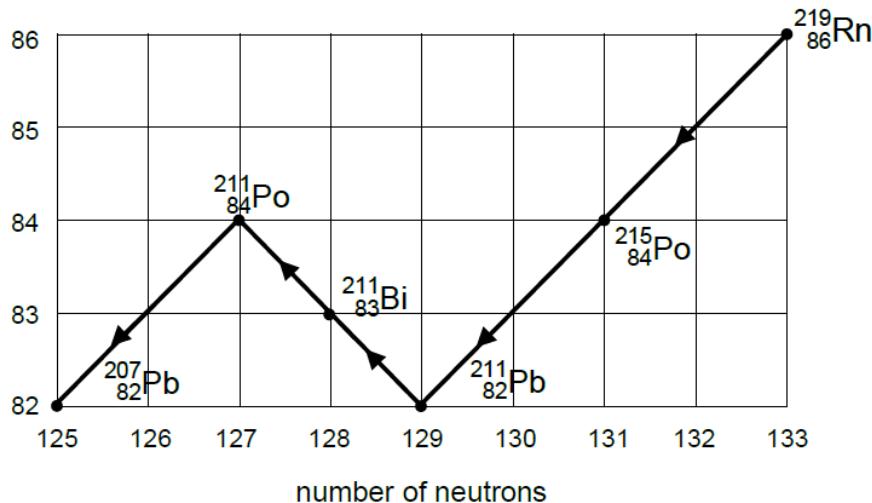


Fig. 6.1

- (i) Explain what the values on the vertical axis represent.

..... [1]

- (ii) State what particle is emitted when $^{211}_{83}\text{Bi}$ decays.

..... [1]

- (iii) Explain what happens within the nucleus to cause this decay.

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..... [1]

- (iv) The particle mentioned in (b)(ii) is emitted with a range of energies, state what did this predict.

..... [1]

- (b) Explain whether the following statements made by two students with regards to the decay series in Fig. 6.1 are correct.

- (i) Student A: "We can increase the production rate of alpha particles from $^{219}_{86}\text{Rn}$ by subjecting the sample to higher temperature and pressure"

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..... [1]

- (ii) Student B: "If I start with 1.000 mol of atoms of radioactive substance $^{219}_{86}\text{Rn}$ which has a half-life of 3.96 seconds, there will be exactly 0.500 mol of $^{219}_{86}\text{Rn}$ left after one half-life has passed."
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..... [2]

- (c) A device called a bubble chamber uses liquid hydrogen to visualise radiation, under a uniform magnetic field. Radiation produced from nuclear decays leave bubble tracks, which can be photographed as shown in Fig. 6.2.

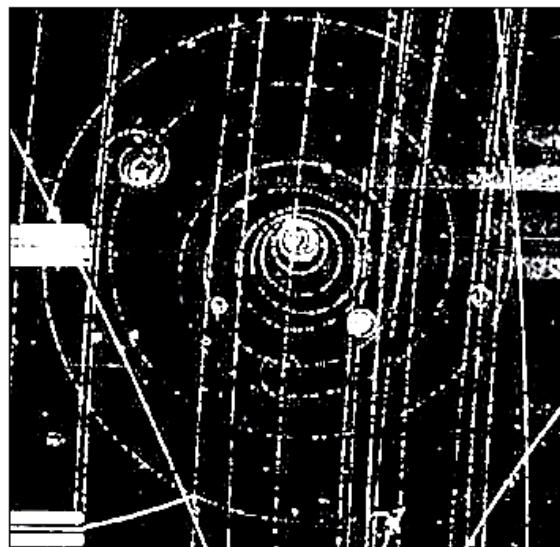


Fig. 6.2

- (i) Explain why the shape of the tracks are spirals rather than circles.

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[2]

- (ii) Explain why it is less likely to observe gamma radiations using the bubble chamber as opposed to alpha or beta radiation.

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[1]

Section B

Answer **one** question in this section in the spaces provided.