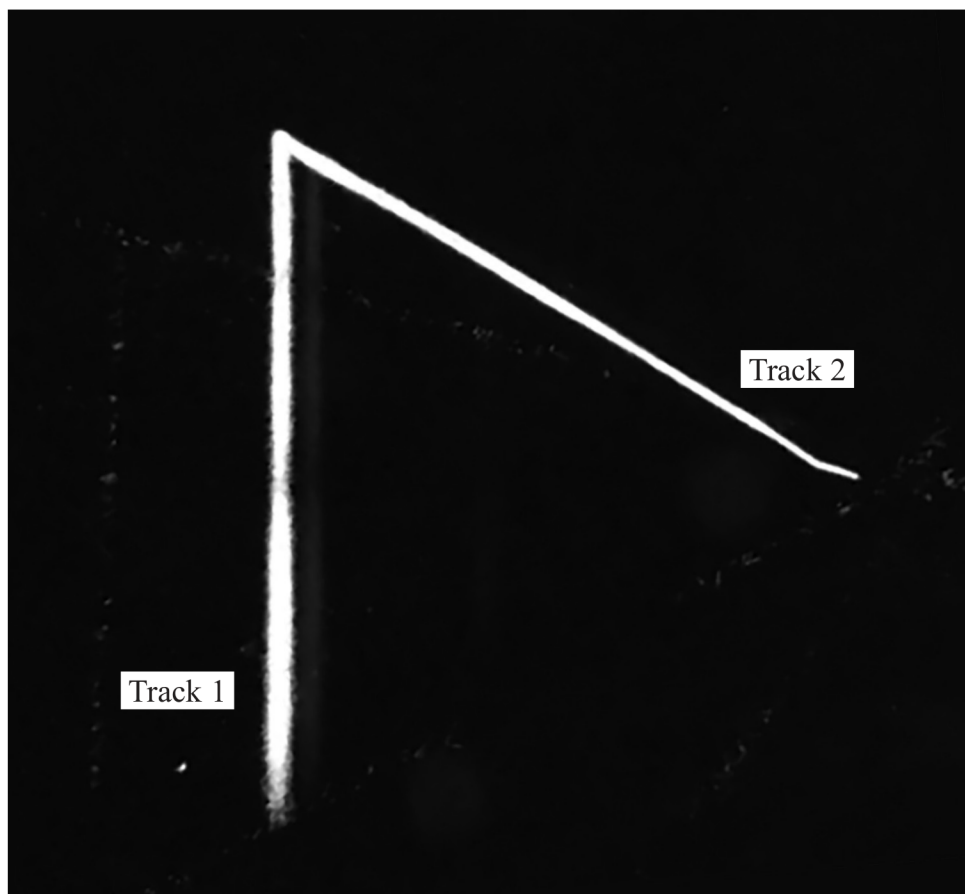


17 Cloud chambers are used to observe the paths of particles.

The photograph shows a pair of tracks made by alpha particles emitted when an atom of radon decays in a cloud chamber.



(a) The radon atoms do not leave tracks.

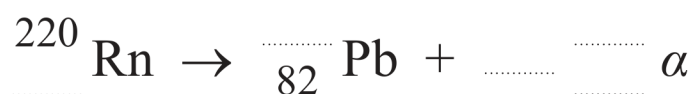
State a reason for this.

(1)

(b) Radon decays by emitting an alpha particle, producing a polonium nucleus. The polonium then decays almost immediately by emitting another alpha particle, producing a lead nucleus.

(i) Complete the nuclear equation for this sequence of decays.

(2)



- (ii) The radon atom was stationary before the first alpha emission. The angle between the two alpha tracks is 60° .

Sketch a vector diagram to show the momentum of the two alpha particles and the lead ion.

(2)

- (iii) Determine the magnitude of the velocity of the lead ion.

velocity of alpha particle emitted by radon = $1.74 \times 10^7 \text{ m s}^{-1}$

velocity of alpha particle emitted by polonium = $1.81 \times 10^7 \text{ m s}^{-1}$

mass of lead ion = $3.52 \times 10^{-25} \text{ kg}$

(6)

Magnitude of velocity =



(c) The photograph shows another pair of tracks following radon decay.



Deduce which track is for the first alpha particle emitted.

(3)

(Total for Question 17 = 14 marks)