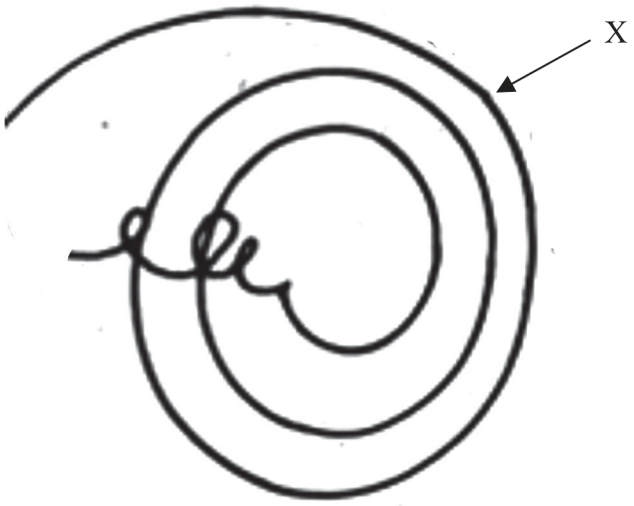
18 The diagram shows particle tracks in a detector.

A positive pion decays into an anti-muon at point X.



(a) State two ways in which the diagram shows that an anti-muon must also have a positive charge.

(2)

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(b) Explain how the diagram shows that the anti-muon is travelling in a clockwise path.

(3)

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(c) State the direction of the magnetic field acting in the detector.

(1)

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(d) The momentum of the pion is 1.2×10^{-19} Ns.

Calculate the radius of the path of the pion.

magnetic flux density = 3.5 T

(3)

Radius = ...

(e) A neutrino is also produced at X.

(i) Write an equation for this decay process.

(1)

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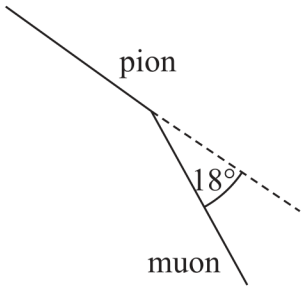
(ii) The initial path of the muon is at an angle of 18° to the direction of the pion, as shown. Data for the momentum of each particle at point X is listed below.

momentum of pion = 1.2×10^{-19} N s
momentum of muon = 0.75×10^{-19} N s
momentum of neutrino = 0.54×10^{-19} N s



Deduce whether this data is consistent with the law of conservation of momentum. You should include a scaled vector diagram in the space below.

(5)

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(Total for Question 18 = 15 marks)

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