

Student: _____

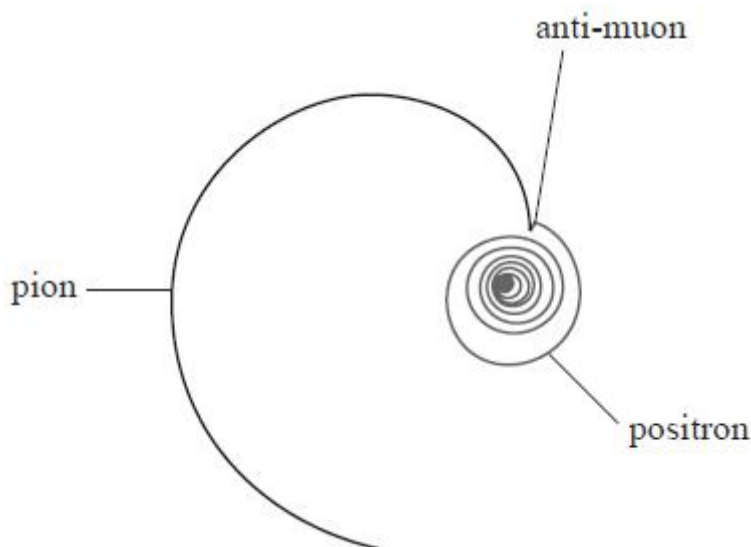
Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

Pions have a short half-life and decay into muons.

The diagram shows the tracks from the decay of a pion in a bubble chamber.



The pion decays into an anti-muon and muon neutrino.

The anti-muon then decays into a positron and an electron neutrino.

The magnetic field acts out of the page.

Use the diagram and the information given to explain what conclusions can be made about the particles in this interaction.

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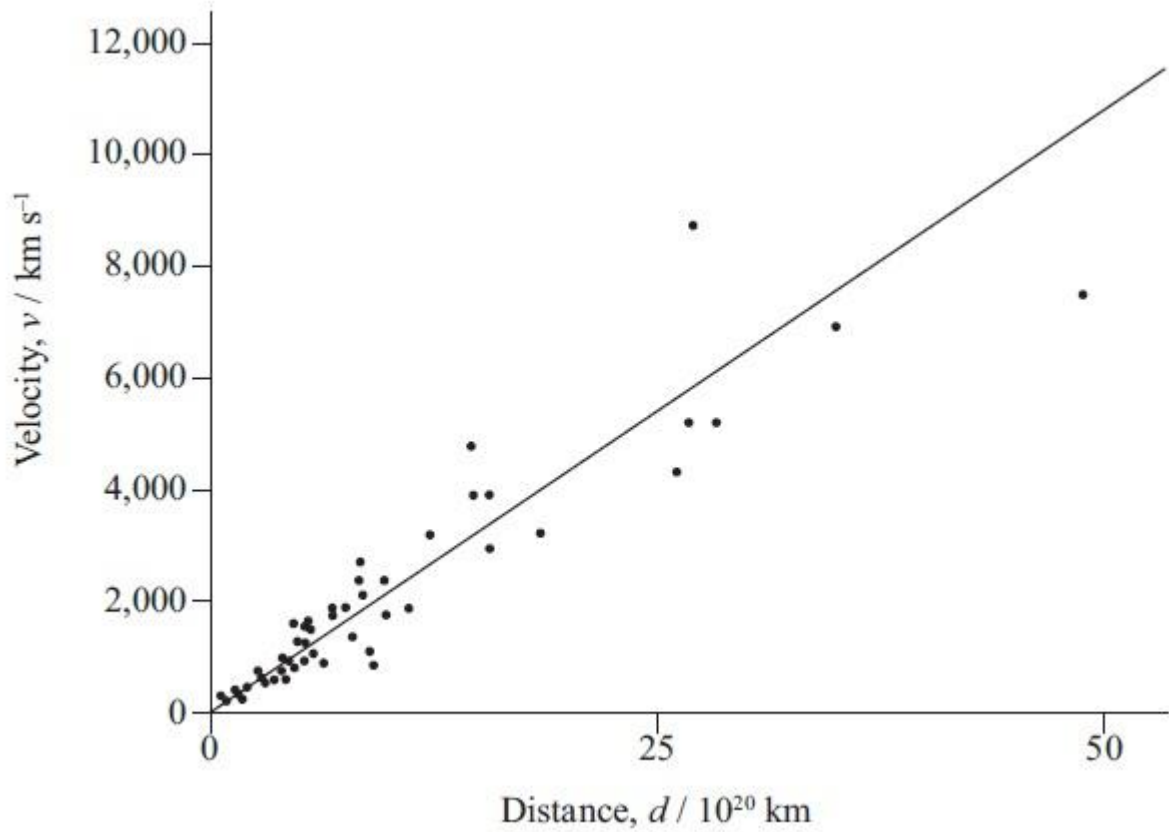
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Q2.

The graph shows how the velocity varies with distance for a number of distant galaxies. All the galaxies are receding from Earth, and there appears to be a linear relationship between the velocity of recession and the distance to the galaxy.



(a) Use the graph to estimate an age for the Universe

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Age of the Universe =

*(b) Describe how astronomers would have determined the velocity of each galaxy.

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*(c) Scientists are uncertain about the ultimate fate of the Universe.
Explain why.

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(Total for question = 12 marks)