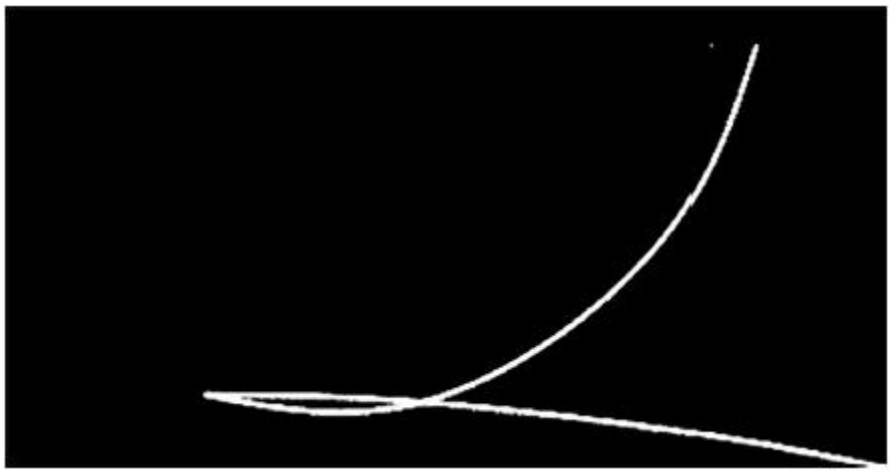
Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 8_ Nuclear and Particle Physics

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Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

The bubble chamber photograph shows tracks made by a proton and a pion. The proton and pion were both created by the decay of a lambda particle. No other particles were produced.



Write an equation to represent the decay of the lambda (Λ) particle.

(1)

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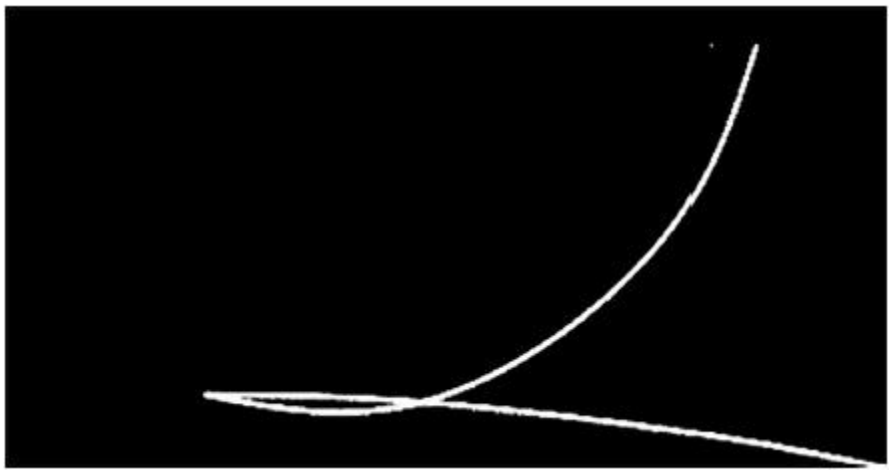
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(Total for question = 1 mark)

Q2.

The bubble chamber photograph shows tracks made by a proton and a pion. The proton and pion were both created by the decay of a lambda particle. No other particles were produced.

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The lambda particle consists of up, down and strange quarks.

Explain how the conservation of charge, baryon number and lepton number apply to the decay of the lambda particle.

(3)

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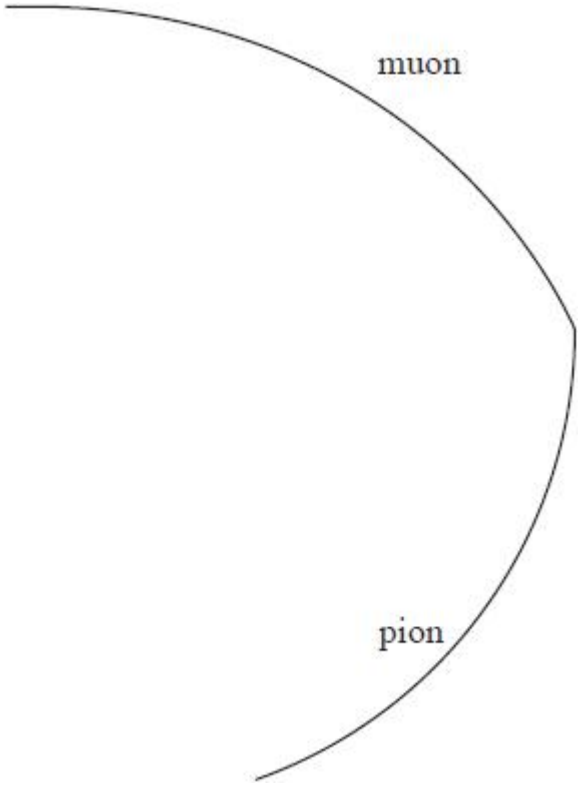
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(Total for question = 3 marks)

Q3.

A negatively charged pion decays into a muon and an antineutrino. The diagram shows tracks in a particle detector formed in such an event.

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The momentum of the pion just before it decays is 9.1×10^{-20} N s.

Determine the magnetic flux density of the magnetic field which acts in the detector and state its direction.

Scale of diagram 1 cm represents 10 cm

pion charge = -1.6×10^{-19} C

(4)

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Magnetic flux density = ...

Direction of magnetic field = ...

(Total for question = 4 marks)

Q4.

The magnetic force *F* that acts on a current-carrying conductor in a magnetic field is given by the equation

$$F = BIl.$$

(a) State the condition under which this equation applies.

(1)

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(b) The unit for magnetic flux density *B* is the tesla.

Express the tesla in base units.

(2)

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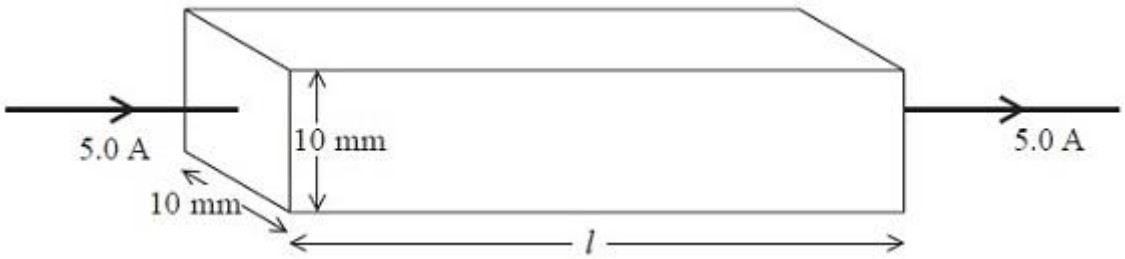
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(c) The diagram shows a rectangular bar of aluminium which has a current of 5.0 A through it.



The bar is placed in a magnetic field so that its weight is supported by the magnetic field.

Calculate the minimum value of the magnetic flux density *B* needed for this to occur.

density of aluminium = 2.7×10^3 kg m^{-3}

(3)

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Minimum *B* = ...

(d) State the direction of the magnetic field.

(1)

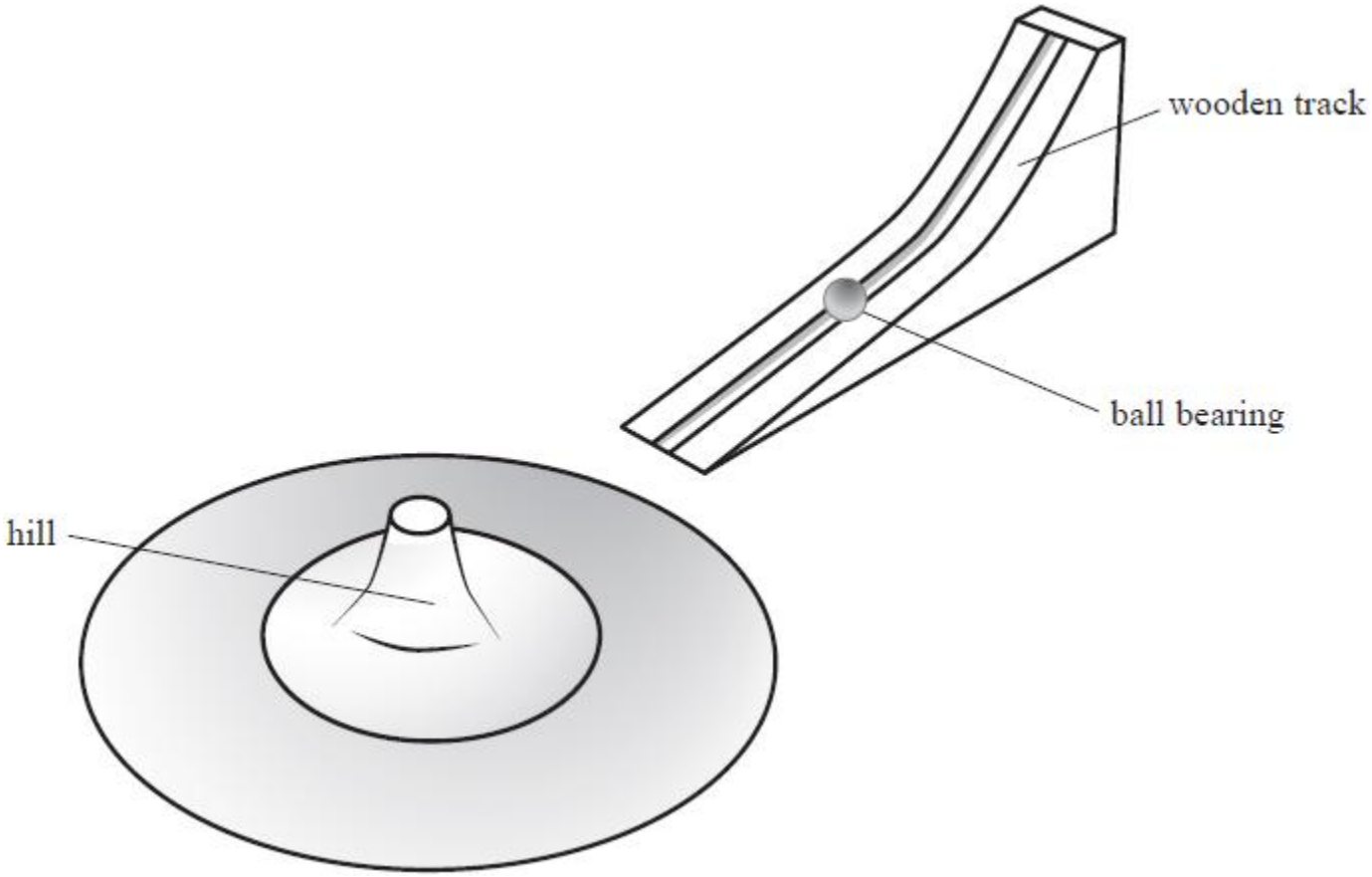
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(Total for Question = 7 marks)

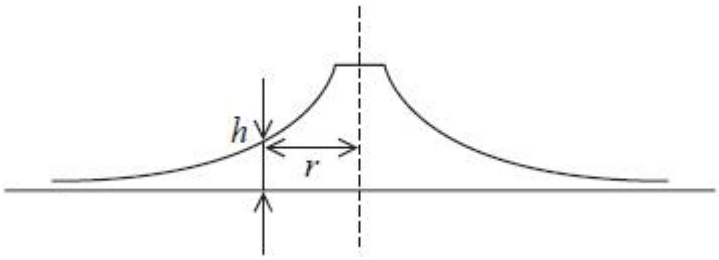
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Q5.

The diagram shows a model used to demonstrate alpha particle scattering. A ball bearing is set rolling on a wooden track. The track is positioned so that the ball bearing rolls onto a metal sheet with a curved surface known as a 'hill'.



The diagram shows a vertical cross-section through the hill. The surface is curved so that the height of a point *h* on the curved surface is inversely proportional to the distance *r* from the centre of the hill.



Explain why the hill is suitable as a model for the electric field surrounding the nucleus of an atom.

(3)

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(Total for question = 3 marks)

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