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

Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

A cosmic ray, consisting of a fast-moving proton, collides with a proton within the nucleus of an atom in the upper atmosphere. Three particles, a proton, a neutron and a pion result from the collision.

Write a particle equation for this collision.

(2)

.....

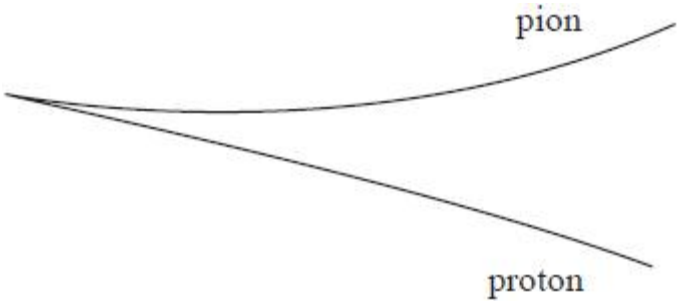
.....

(Total for question = 2 marks)

Q2.

A delta particle decays into a proton and a pion.

The diagram shows tracks in a particle detector formed when the delta particle decays.



(i) State why it can be concluded from the diagram that the delta particle is neutral.

(1)

.....

.....

(ii) Deduce the charge on the pion.

(2)

.....

.....

.....

.....

(iii) Complete the particle equation for the decay of the delta (Δ^0) particle.

(1)

$\Delta^0 \rightarrow$

(iv) State why the delta particle must be classified as a baryon based on the evidence of its decay.

(1)

.....

.....

(v) Explain how the momentum of the proton compares with the momentum of the pion.

(3)

.....

.....

.....

.....

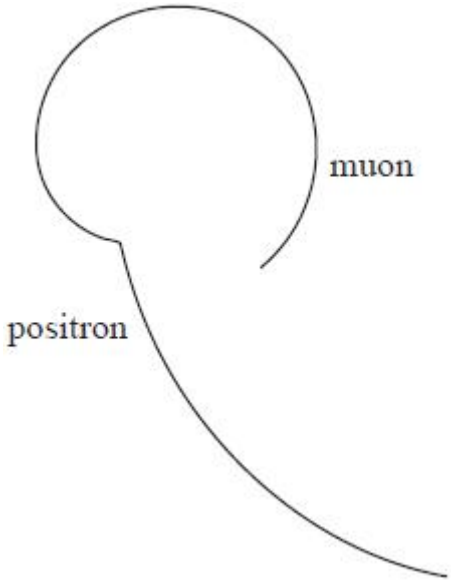
.....

.....

(Total for question = 8 marks)

Q3.

The decay of a positive muon produced a positron, an electron neutrino and a muon antineutrino. The diagram shows the tracks formed in a particle detector.



Write a nuclear equation for the decay of the muon (μ) described above.

(2)

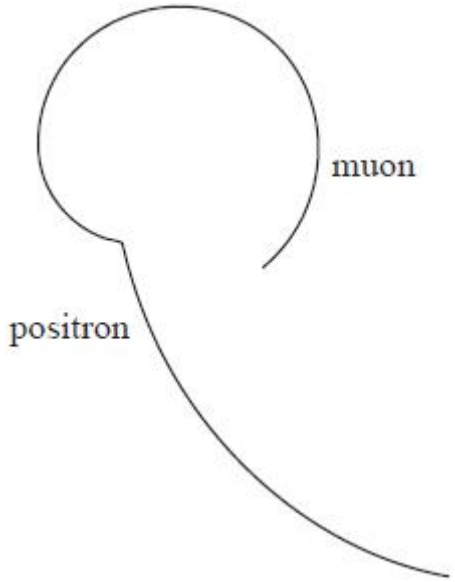
.....

.....

(Total for question = 2 marks)

Q4.

The decay of a positive muon produced a positron, an electron neutrino and a muon antineutrino. The diagram shows the tracks formed in a particle detector.



Explain how the diagram gives evidence that a particle or particles, other than the positron, were produced in this decay.

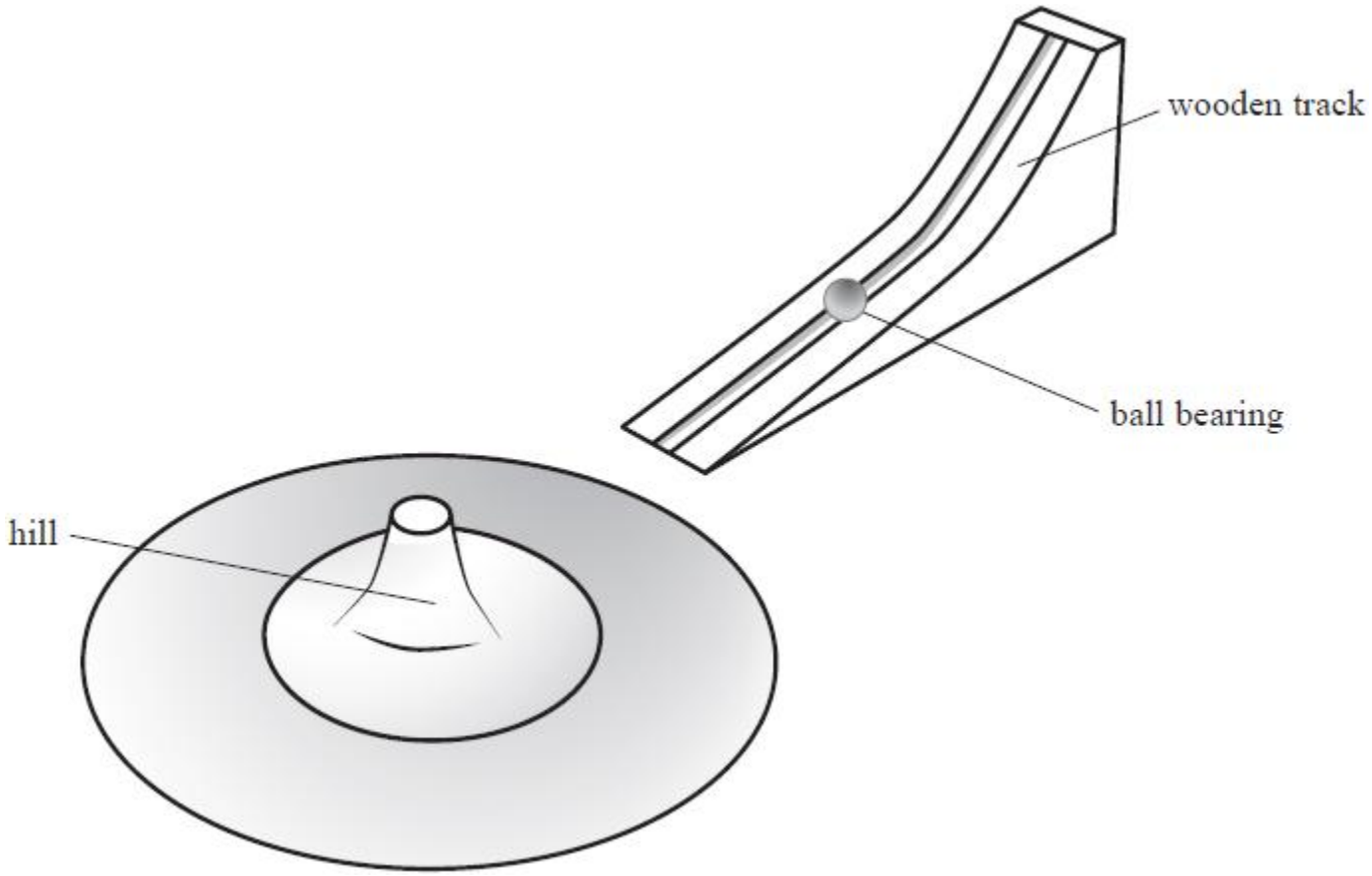
(4)

.....
.....
.....
.....
.....
.....
.....
.....

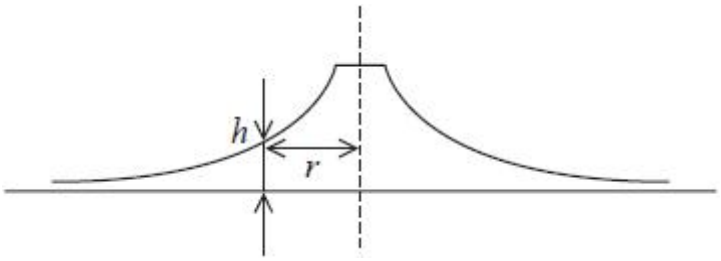
(Total for question = 4 marks)

Q5.

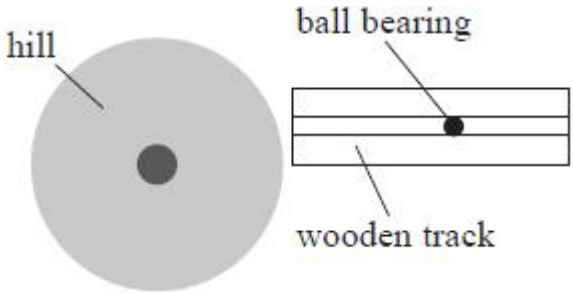
The diagram shows a model used to demonstrate alpha particle scattering. A ball bearing is set rolling on a wooden track. The track is positioned so that the ball bearing rolls onto a metal sheet with a curved surface known as a 'hill'.



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.



A plan view of the arrangement is shown.



The wooden track is moved to different positions and the ball bearing is released.

Describe the results of the alpha particle scattering experiment and how these can be demonstrated by moving the wooden track to different positions.

(4)

.....

.....

.....

.....

.....

.....

.....

(Total for question = 4 marks)