

16 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.

- *(a) Explain how observations and measurements from the photograph can be used to establish information about the lambda particle. (6)

- (b) 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)

- (c) Write an equation to represent the decay of the lambda (Λ) particle. (1)

- (d) The rest mass of the lambda particle is $1115\text{ MeV}/c^2$.

- (i) Calculate this mass in kg. (3)

Mass = kg

- (ii) The rest mass of a proton is $940\text{ MeV}/c^2$. The rest mass of a pion is $140\text{ MeV}/c^2$.

The kinetic energy of the lambda particle just before decay is 4.95 GeV .

Calculate the total kinetic energy of the proton and pion in MeV. (3)

Total kinetic energy = MeV

(Total for Question 16 = 16 marks)