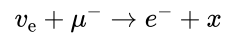


HL Paper 3

This question is about the standard model.

a. State what is meant by the standard model. [3]

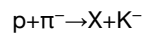
b. Use the conservation of lepton number and charge to deduce the nature of the particle x in the following reaction. [1]



c. State what is meant by deep inelastic scattering. [1]

This question is about linear accelerators.

b. A moving proton is incident on a stationary pion, producing a kaon (K meson) and an unknown hadron X according to the reaction given below. [2]



(i) State, with a reason, the electric charge of X .

(ii) State, with a reason, if X is a baryon or a meson.

c. In a deep inelastic scattering experiment, protons of momentum 2.70×10^{-18} N s are scattered by gold nuclei. [3]

Given that the diameter of nucleons is of the order 10^{-15} m and the diameter of quarks is less than 10^{-18} m, determine if these protons will be able to resolve

(i) nucleons within the gold nuclei.

(ii) quarks within the gold nuclei.

d. Outline how deep inelastic scattering experiments led to the conclusion that gluons exist. [2]