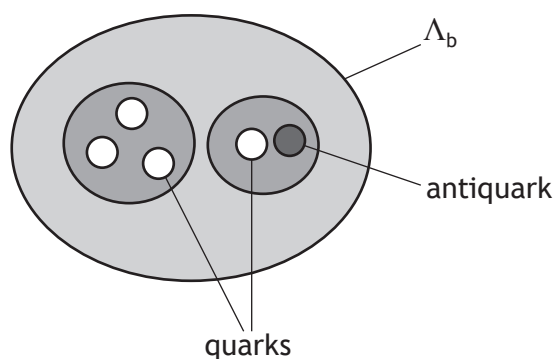


7. (continued)

- (c) One theory to explain the structure of the Λ_b pentaquark suggests that three of the quarks group together and one quark and the antiquark group together within the pentaquark.



- (i) State the type of particle that is made of a quark-antiquark pair.

1

- (ii) The mean lifetime of another quark-antiquark pair is $8.0 \times 10^{-21} \text{ s}$ in its own frame of reference.

During an experiment the quark-antiquark pair is travelling with a velocity of $0.91c$ relative to a stationary observer.

Calculate the mean lifetime of this quark-antiquark pair relative to the stationary observer.

3

Space for working and answer

7. (continued)

(d) The Λ_b pentaquark has a mass-energy equivalence of 4450 MeV.

One eV is equal to 1.60×10^{-19} J.

(i) Determine the energy, in joules, of the Λ_b pentaquark.

1

Space for working and answer

(ii) Calculate the mass of the Λ_b pentaquark.

3

Space for working and answer



* X 8 5 7 7 6 0 1 2 0 *