

- 6 (a) State what is meant by a fundamental particle.

..... [1]

- (b) (i) Particle Q is a meson with a charge of 0.

Determine a possible quark composition for Q.

..... [2]

- (ii) Particle Q has a mass of 0.67 u and a kinetic energy of $2.1 \times 10^{-16}\text{ J}$.

Calculate the speed of particle Q.

speed = m s^{-1} [3]

- (c) Radium-228 ($^{228}_{88}\text{Ra}$) is a radioactive nuclide.

- (i) State the number of electrons in a neutral atom of radium-228.

number of electrons = [1]

- (ii) A nucleus of radium-228 undergoes a series of decays to form nucleus X.
During the process, 5 α -particles and 4 β^- particles are emitted.

Determine the number of protons and the number of neutrons in nucleus X.

number of protons =

number of neutrons =

[2]

[Total: 9]