

7 (a) Give one example of

a hadron:

a lepton:

[1]

(b) Describe, in terms of the simple quark model,

(i) a proton,

.....[1]

(ii) a neutron.

.....[1]

(c) Beta particles may be emitted during the decay of an unstable nucleus of an atom. The emission of a beta particle is due to the decay of a neutron.

(i) Complete the following word equation for the particles produced in this reaction.

neutron \rightarrow + + [1]

(ii) State the change in quark composition of the particles during this reaction.

.....[1]

[Total: 5]

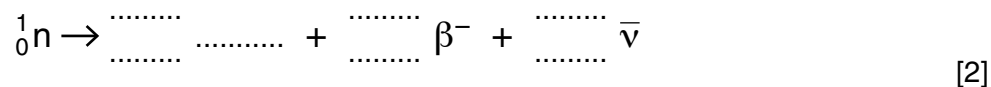
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6 A neutron decays by emitting a β^- particle.

(a) Complete the equation below for this decay.



(b) State the name of the particle represented by the symbol $\bar{\nu}$.

..... [1]

(c) State the name of the class (group) of particles that includes β^- and $\bar{\nu}$.

..... [1]

(d) State

(i) the quark structure of the neutron,

..... [1]

(ii) the change to the quark structure when the neutron decays.

.....
..... [1]

[Total: 6]

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- 8 (a) State the quantities, other than momentum, that are conserved in a nuclear reaction.

.....
[2]

- (b) A stationary nucleus of uranium-238 decays to a nucleus of thorium-234 by emitting an α -particle. The kinetic energy of the α -particle is $6.69 \times 10^{-13} \text{ J}$.

- (i) Show that the kinetic energy E_k of a mass m is related to its momentum p by the equation

$$E_k = \frac{p^2}{2m}.$$

[1]

- (ii) Use the conservation of momentum to determine the kinetic energy, in keV, of the thorium nucleus.

kinetic energy = keV [3]

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