

40 Which particle is a lepton?

- A** meson
- B** positron
- C** proton
- D** quark

A-Level Physics: **w25 12**

38 An up quark in a hadron changes to a down quark.

The elementary charge is e .

What is the magnitude of the change in the charge of the hadron?

- A** $\frac{1}{3}e$
- B** $\frac{2}{3}e$
- C** e
- D** zero

A-Level Physics: **w25 14**

40 Which combination of three quarks has no overall charge?

- A** down, strange, strange
- B** up, charm, strange
- C** up, charm, top
- D** up, down, strange

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 = ms^{-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]

38 Which list contains only fundamental particles?

- A antineutrinos, baryons, neutrons, electrons
- B mesons, electrons, neutrinos, protons
- C positrons, quarks, hadrons, protons
- D quarks, positrons, neutrinos, leptons

40 A hadron consists of antiquarks that are all identical.

What is a possible value, in terms of the elementary charge e , for the charge on the hadron?

- A $0e$
- B $+1e$
- C $+2e$
- D $+3e$

39 What is the composition of a meson?

- A 1 quark and 1 antiquark
- B 1 quark and 2 antiquarks
- C 2 quarks and 1 antiquark
- D 3 quarks

40 A nucleus of carbon-11 contains 6 protons and 5 neutrons.

The nucleus of carbon-11 decays by β^+ emission.

What is the total number of up and down quarks in the product of the decay of this nucleus?

	up quarks	down quarks
A	15	18
B	16	17
C	17	16
D	18	15

33 What **cannot** be the charge on a charge carrier?

- A $-4.8 \times 10^{-19} \text{ C}$
- B $-3.2 \times 10^{-19} \text{ C}$
- C $-2.4 \times 10^{-19} \text{ C}$
- D $+3.2 \times 10^{-19} \text{ C}$

38 A nucleus decays by emitting a β^+ particle.

Which particle **must** also be emitted from the nucleus?

- A antineutrino
- B β^- particle
- C α -particle
- D neutrino

39 What are the charges on an antidown quark and on an antistrange quark?

	antidown quark	antistrange quark
A	$+\frac{1}{3}e$	$+\frac{1}{3}e$
B	$+\frac{1}{3}e$	$-\frac{1}{3}e$
C	$-\frac{1}{3}e$	$+\frac{1}{3}e$
D	$-\frac{1}{3}e$	$-\frac{1}{3}e$