13.2 Fundamental Particles

Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	13. Particle & Nuclear Physics
Topic	13.2 Fundamental Particles
Difficulty	Hard

Time allowed: **10**

Score: **/4**

Percentage: **/100**

Question 1

The equation for β^- decay is

$$n \rightarrow p + e^- + \overline{v_e}$$

Using your knowledge of antiparticles and the weak interaction, what is the equation for β^+ decay?

A $\bar{n} \rightarrow \bar{p} + e^+ + v_e$

B $p \rightarrow n + e^+ + v_e$

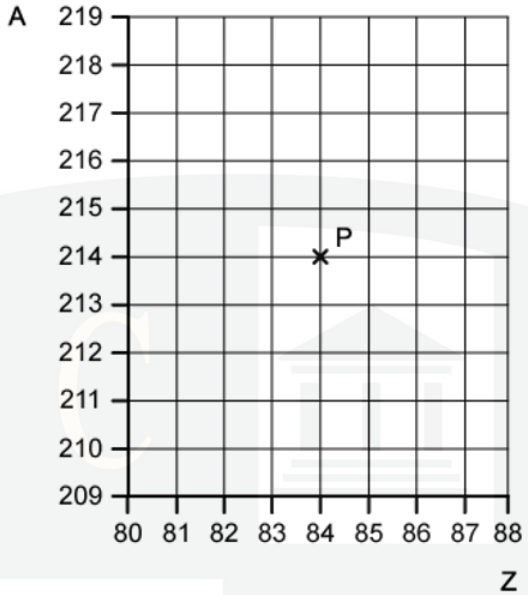
C $n + e^+ \rightarrow p + \overline{v_e}$

D $p \rightarrow n + e^+ + \overline{v_e}$

[1 mark]

Question 2

A graph of nucleon number A against proton number Z is shown in the diagram below.



The graph shows a cross that represents a nucleus P.

Nucleus P decays by emitting an α-particle to form a nucleus Q.
Nucleus Q then decays by emitting a β^- particle to form a nucleus R.

The quark composition of one nucleon in Q is changed during the emission of the β^- particle.

What is the corresponding change in quark composition from nucleus Q to nucleus R?

A no change

B *u*-quark to *d*-quark

C *d*-quark to *u*-quark

D *d*-quark to *s*-quark

[1 mark]

Question 3

Some particles are made up of a combination of three quarks.

Which particle would **not** give a particle a charge of either $+1.6 \times 10^{-19}$ C or zero?

A up, up, up

B up, up, down

C up, strange, strange

D up, down, down

[1 mark]

Question 4

Quarks are thought to make up protons and neutrons.

The 'up' quark has a charge of $\frac{2}{3}e$; a 'down' quark has a charge of $-\frac{1}{3}e$, where ***e*** is the elementary charge ($+ 1.6 \times 10^{-19}$ C)

How many up quarks and down quarks must a proton contain?

	up quarks	down quarks
A	0	3
B	2	1
C	1	2
D	1	1

[1 mark]