

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Mark Schemes

Q1.

(a) Any suitable process such as electron capture or beta plus decay. ✓ 1

(b) The weak interaction ✓ 1

(c) Valid equation must be given or no marks for the question.

For electron capture:

baryon number conserved $1 + 0 = 1 + 0$ ✓

lepton number conserved $0 + 1 = 0 + 1$ ✓

Baryon and Lepton numbers to be conserved

2

(d) up and antistrange ✓ 1

(e) conserved any correct answer such as charge ✓

not conserved is strangeness which is 1 before decay and 0 after decay ✓

2

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Q2.

(a)

1✓

0✓ 1✓

...

ud✓ uud✓

1 mark each

5

(b) Strong nuclear circled ✓ 1

- (c) Charge $1 + 1 = 1 + X$ $X = 1$ ✓ 1
- Baryon number $0 + 1 = 0 + X$ $X = 1$ ✓ 1
- Strangeness $0 + 0 = 1 + X$ $X = -1$ ✓ 1
- Any order*
- (d) Weak nuclear circled ✓ 1
- (e) Strangeness of X is -1,
First mark is for showing that strangeness changes
- The strangeness of the pion and neutron are both zero 1
- The strangeness changes from -1 to 0 ✓
- This can only occur in weak interactions. ✓
Second is for stating that this can only happen if the interaction is weak. 1
- (f) $\bar{\nu}_e$
First mark is for the proton 1
- $n \rightarrow p$ ✓ + $\beta^- + \bar{\nu}_e$ ✓
Second is for the beta minus and antineutrino. 1
- (g) The only particles remaining are electrons / positrons and neutrinos / antineutrinos which are stable ✓
1 1
- And a proton which is the only stable baryon ✓
1 1

[16]