

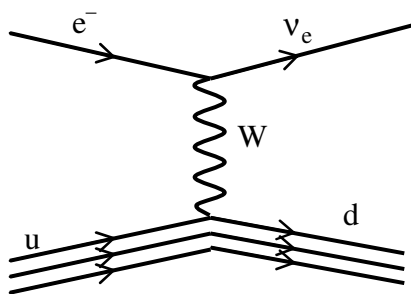
*It is not departmental policy to provide complete specimen answers to past examination papers. However, to help you in revision, numerical values and similar information are given below so that you can check your attempts. If you have attempted past questions and wish to discuss the descriptive questions or the details of your calculations, please see me!*

*Dr Booth*

**Question 1**

c) Strong interaction.

d)



e)  $c$  quark has spin  $1/2$ , isospin 0, charge  $+2/3$ , charm 1.

f) Quark contents:  $K^-$  is  $s\bar{u}$ ;  $K^0$  is  $d\bar{s}$ .

**Question 2**

c) 
$$F(q) = 2\pi A \frac{\frac{\pi\hbar}{qR} \sin \frac{qR}{\hbar} - 2}{\left(\frac{\pi}{2R}\right)^2 - \left(\frac{q}{\hbar}\right)^2}.$$

**Question 3**

c)(i) The  $\Delta^0$  consists of  $udd$  quarks.

c)(ii) The  $\Delta^0$  flavour wave-function is  $\frac{1}{\sqrt{3}}(udd + dud + ddu)$  (symmetric).

d) Positron energy is 580 GeV.

**Question 4**

c) .

- (i)  $\pi^+ \rightarrow \mu^+ + \nu_\mu$  Weak – involves neutrinos
- (ii)  $\tau^- \rightarrow \mu^- + \bar{\nu}_\mu$  Forbidden –  $L_\tau$  violated
- (iii)  $\Delta^- \rightarrow n + \pi^-$  Strong – hadrons, quantum numbers conserved
- (iv)  $\Omega^- \rightarrow n + K^-$  Forbidden –  $\Delta S = 2$
- (v)  $\Xi^0 \rightarrow n + K^0$  Forbidden –  $\Delta S = 3$
- (vi)  $\Sigma^0 \rightarrow \Lambda + \gamma$  Electromagnetic – photon involved, qu. nos. conserved
- (vii)  $\mu^+ + \mu^- \rightarrow e^+ + e^-$  Electromagnetic (EW at high energy) – leptons involved
- (viii)  $\pi^+ + n \rightarrow \Lambda + K^+$  Strong –  $\Delta S = 0$

**Question 5**

(b) Meson's intrinsic parity must be odd (negative).

(c)  $p_K = 142.8 \text{ MeV}/c$  .