Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Particle And Radiation

Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

(a) Complete the following equation for beta minus (β^-) decay of strontium-90 ($^{90}_{38}Sr$) into an isotope of yttrium (Y).

$$^{90}_{38}Sr \longrightarrow \overset{\cdots\cdots}{\underset{\cdots\cdots}{}}Y + \overset{\cdots\cdots}{\underset{\cdots\cdots}{}}\beta^- + \overset{0}{0}\cdots\cdots$$

(3)

(b) During β^- decay of a nucleus both the nucleon composition and the quark composition change.
State the change in quark composition.

_____

(1)

(c) A positive kaon consists of an up quark and an antistrange quark $(u\,\bar{s})$. This kaon decays by strong and weak interactions into three pions. Two of the pions have quark compositions of $(u\,\bar{d})$. The third pion has a different quark composition.

(i) Name the unique family of particles to which the kaon and pions belong.

_____

(1)

(ii) Tick the box corresponding to the charge of the third pion.

positive ☐ negative ☐ neutral ☐

(1)

(iii) Positive kaons have unusually long lifetimes.
Give a reason why you would expect this to be the case.

_____

_____

(1)

(iv) Name the exchange particles which are involved in the strong and weak interactions of the kaon.

strong interaction _____

weak interaction _____

(1)

(Total 8 marks)

Q2.

(a) The positive kaon, K^+, has a strangeness of +1.

(i) What is the quark structure of the K^+?

_____

(1)

(ii) What is the baryon number of the K^+?

_____

(1)

(iii) What is the antiparticle of the K^+?

_____

(1)

(b) The K^+ may decay into a neutrino and an antimuon in the following way.

$$K^+ \rightarrow \nu_\mu + \mu^+$$

(i) Complete the table using ticks and crosses as indicated in the first row.

Classification	$\mathbf{K^+}$	$\boldsymbol{\nu_\mu}$	$\boldsymbol{\mu^+}$
lepton	×	✓	✓
charged particle			
hadron			
meson			

(3)

(ii) In this decay, charge, energy and momentum are conserved.
Give another quantity that is conserved in this decay and one that is not conserved.

Conserved _____

Not conserved _____

(2)

(c) Another possible decay of the K^+ is shown in the following equation,

$K^+ \rightarrow \pi^+ + X$

(i) Identify X by ticking **one** box from the following list.

electron	
muon	
negative pion	
neutral pion	
neutrino	
neutron	
positron	

(1)

(ii) Give **one** reason for your choice in part (i).

_____

_____

_____

_____

(1)

(Total 10 marks)