

NATIONAL OPEN UNIVERSITY OF NIGERIA 14-16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS SCHOOL OF SCIENCE AND TECHNOLOGY **JANUARY/FEBRUARY 2013 EXAMINATION**

COURSE CODE: PHY 409

Elementary Particle Physics COURSE TITLE:

CREDIT UNIT:

INSTTRUCTION: Answer any five questions.

PHYSICAL CONSTANTS:

Speed of light $c = 2.9979 \, \text{ms}^{-1}$; mass of electro $m_e = 0.9110 \times 10^{-31} \, \text{kg}$;

Electronic charge $e = 1.6022 \times 10^{-19} C$; Avogadro's number $N_A = 6.0221 \times 10^{26} \, kmol^{-1}$;

Boltzmann constant $k = 1.3806 \times 10^{-23} J K^{-1}$; Plank's constant $h = 6.6257 \times 10^{-34} J S$

1.(a)(i) Define the term elementary particle.

4 marks

(ii) List five (5) each of gaseous ionization and solid-state particle detectors 5 marks

(b) (i) What are quarks

4 marks

(ii) Draw a table showing the elementary particles (not anti-particles) according to their families with the following properties: name, symbol, charge, and spin.

2.(a)(i) Briefly, discuss the four forces in nature.

8 marks

(ii) List the exact or absolute conservation laws which are obeyed by reaction or interactions involving elementary particles

4 marks

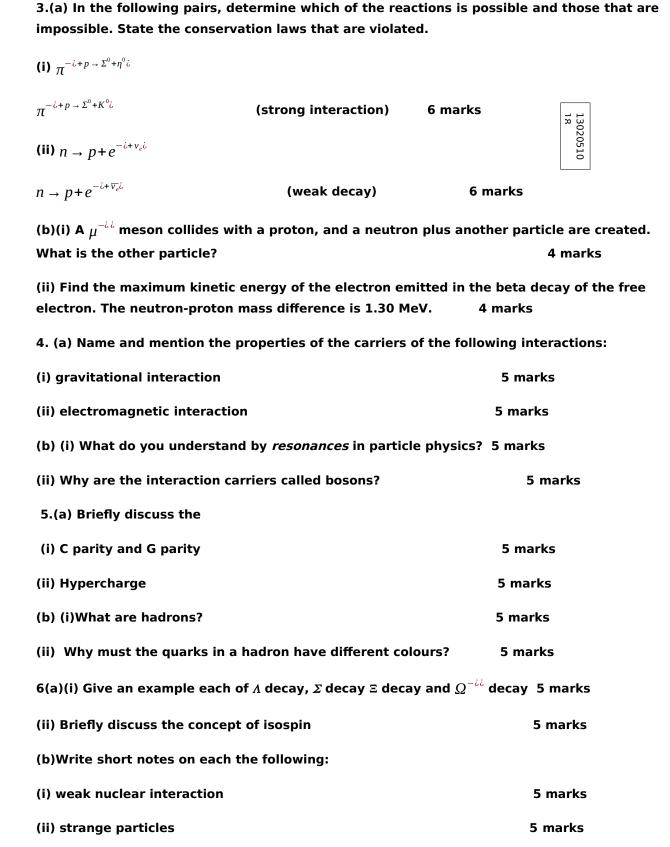
(b)(i) Consider a reaction where a Π meson decays into a μ meson and an antineutrino \bar{y} i.e.

$$\Pi^- \rightarrow \bar{\mu} + \bar{\gamma}_{\mu}$$

Determine the energies of the particles μ^- and $ar{\gamma}_\mu$ in terms of the masses of the pimeson and muon $\left|m_{\Pi} \ and \ m_{\mu} \right|$ 4 marks

(ii) A particle Σ^0 decays at rest to a Λ^0 particle. Determine the energy of the released photon.

4 marks



- 7 (a) (i) Briefly explain the parity transformation of the coordinate of a particle. 4 marks
- (ii) What do you understand by the conservation of parity?

4 marks

- (b) Show that
- (i) magnetic force law is invariant under parity transformation

6 marks

(ii) in the presence of a free magnetic monopole, the force law is not invariant under parity transformation.