CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN, NUVEM-GOA

SEMESTER END EXAMINATION/AUGUST 2020

B.Sc Semester: VI   **Nuclear Physics (PYD-106)**

Max marks: 30   **Date:** 10-8-2020   **Duration:** 2hrs   **Total No. of pages:**02

Instructions:

1) *All questions are compulsory.*
2) *Figures to the right indicate maximum marks.*
3) *Use of log tables and non-programmable calculators is permitted.*
4) *Symbols have their usual meanings unless specified.*

I. Answer any **five** of the following: **(2 marks x 5 = 10)**

a) Explain saturation property and spin dependence property of nuclear forces.

b) If the number of nucleons in a copper nucleus is 64 and the number of nucleons in oxygen nucleus is 16. How much larger is the copper nucleus than an oxygen nucleus?

c) Give the energetics of β^+ decay. Why is β^+ decay less probable than β^- decay?

d) What is meant by Packing Fraction? Draw the graph of packing fraction versus mass number. How does its value explain the stability of the nucleus?

e) What do you mean by 1) dead time and 2) quenching of G.M counter?

f) Give the three stages of the nuclear programme for India. What was the main goal in adopting this programme?

g) Calculate the amount of energy produced by the fission of 1.00kg of U^{235} given the average fission reaction of U^{235} produces 200 MeV of energy per fission.

h) Explain what you mean by Fissile and Fertile nuclei .Give two examples.

II. Answer any **four** of the following: **(4 marks x 5 = 20)**

1. a) 1gm of ^{90}Sr remains as 0.953gm after 2years.Calculate the half-life of^{90}Sr. How many grams of ^{90}Sr will be left after a period of 5yrs?

b) What is secular equilibrium? Show graphically the decay of parent and growth of daughter with time.

2. a) Explain how natural radioactive elements are classified to form the radioactive series.

b) What is secular equilibrium? Show graphically the decay of parent and growth of daughter with time.

3. a) Give the beta decay spectrum .Which two laws of physics were violated in this decay? Give the Pauli's hypothesis of neutrino for beta decay.

b) Derive the expression for alpha disintegration energy.

4. a) Give three experimental evidences for Magic numbers that led to shell model.

b) Using the Jensen Mayer schemefor the shell model,give the ground state spins and parities for^{17}O and ^{16}N.

5. a) The semi –empirical mass formula is simplified as, $_{z}M^{A} = \alpha A + \beta Z + \Upsilon Z^{2} \pm \delta$, where A is mass number and Z is atomic number. Draw the M(Z,A) versus Z curve,for odd A isobaric family.

b) Find the expression for charge of the most stable isobar. Hence explain the beta-activity of the odd A isobaric family.

6. a) Explain how the mass of the neutron was determined in the laboratory for the first time.

b) Explain briefly the following nuclear reactions:
   i) elastic scattering ii) radiative capture

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