Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category 'A' by MHRD)
Re-accredited with 'A++' Grade by NAAC. Recognised by UGC Under Section 12B
Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment I- August 2025
VI Semester

Class: III B.Sc., **Duration: 2 Hrs**
Major: Physics **Max. Marks: 60**

23BPHC11 Nuclear and Particle Physics

Course Outcomes:
1. Explain nuclei properties, compare a drop of liquid with that of a nucleus and understand Shell model.
2. Distinguish between principles and working of different types of detectors, counters and accelerators.
3. Describe basic radioactivity, calculate half-lives and understand radiation hazards.
4. Explain natural and artificial transmutations, calculate Q-value of a reaction, recognize the applications of Isotopes.
5. Distinguish between the forces of nature, recall the properties of cosmic rays, Classify elementary particles.

PART A **(6×1=6 marks)**
Choose the correct answer

1. Radius of ^{226}Ra is _____ fm.
a. 7.65 **b. 6.31** **c. 7.31** **d. 6.9** (CO1K3)

2. The binding energies per nucleon of ^{26}Al, ^{28}Mg, ^{56}Fe, ^{4}He are respectively 8.15 MeV, 8.27 MeV, 8.79 MeV and 7.07 MeV. Which is the most stable nucleus?
a. ^{28}Mg **b. ^{4}He** **c. ^{56}Fe** **d. ^{26}Al** (CO1K3)

3. _____is not a particle accelerator.
a. Cyclotron **b. Synchrotron** **c. GM Counter** **d, Betatron** (CO2K1)

4. Leptons are _____ particles.
a. Heavier mass **b. Intermediate mass**
c. lighter mass **d. massless** (CO2K1)

5. The energy of slow neutron ranges from_____
a. 0 to 500 eV **b. 500 to 1000eV**
c. 0 to 0.5 MeV **d. o.5 to 10MeV** (CO3K2)

6. 1 curie of radioactivity is given by_____
a. 3.7x10^{10} disint/min **b. 3.7x10^{10} disint/hr**
c. 3.7x10^{10} disint/sec **d. none of the above** (CO3K1)

PART-B **(3×6=18 marks)**

Answer the following

7. a. Explain about binding energy variation with mass number. (CO1K2)

(Or)

7. b. Calculate the binding energy of ^{60}Fe (Atomic number of ^{60}Fe is 59.9341 amu) (CO1K3)

8. a. Write a note on nuclear excited states. (CO1K2)

(Or)

8. b. Explain about the Particles, Antiparticles, Pair-production and annihilation. (CO2K2)

9. a. Explain in detail about the Quark model. (CO3K3)

(Or)

9. b. Discuss the four fundamental forces of interactions. (CO3K3)

PART-C **(3×12= 36 marks)**

Answer the following

10. a. Discuss the general properties of nucleus. Also explain magnetic moment and electric moment. (CO1K3)

(Or)

10. b.Explain Meson theory of nuclear forces. (CO1K2)

11. a. Explain the principle and working of cyclotron. Hence deduce the frequency of revolution of the particles. (CO4K3)

(Or)

11. b. Describe the construction and working of a scintillation counter with different types of phosphors . (CO4K3)

12. a. Describe the classification of Elementary particles and their properties in detail. (CO3K4)

(Or)

12. b. List the properties of nuclear forces and explain the meson theory of nuclear forces. (CO3K4)

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