Code No. : 10039 E   Sub. Code : SMPH 63

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2023

Sixth Semester

Physics — Core

NUCLEAR PHYSICS

(For those who joined in July 2017–2019)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Radius of the atomic nucleus is ———
   (a) 10^{-14} to 10^{-15} m   (b) 10^{-13} to 10^{-15} m
   (c) 10^{-12} to 10^{-13} m   (d) 10^{-13} to 10^{-14} m

2. Calculated value of nuclear density ———
   (a) 1.886×10^{17} kgm^{-3} (b) 1.816×10^{17} kgm^{-3}
   (c) 1.888×10^{17} kgm^{-3} (d) 1.861×10^{17} kgm^{-3}

3. Radioactivity was discovered by Henry Becqerel in ———
   (a) 1869   (b) 1866
   (c) 1896   (d) 1899

4. The alpha particles are ——— charged.
   (a) Positively and Negatively
   (b) Neutrally
   (c) Negatively
   (d) Positively

5. Energy release in one fission ———
   (a) 300 MeV   (b) 400 MeV
   (c) 100 MeV   (d) 200 MeV

6. The atom bomb is due to an ——— Chain reaction.
   (a) Controlled   (b) Uncontrolled
   (c) Both (a) and (b)   (d) None

7. The efficiency formula for G.M. counter is
   (a) $\Sigma = 1 - e^{alp}$ (b) $\Sigma = 1 + e^{alp}$
   (c) $\Sigma = 1 - e^{sp}$ (d) $\Sigma = 1 - e^{sl}$

8. In a cloud chamber a liquid drop form in a supersaturated ———
   (a) Solid   (b) Gas
   (c) Vapour   (d) Liquid

9. The energy of the order of cosmic rays ———
   (a) 15 GeV   (b) 51 GeV
   (c) 115 GeV   (d) 11 GeV

10. The conversion of photon into a electron and positron is called ———
    (a) Annihilation
    (b) Pair Broken
    (c) Pair production
    (d) Ionisation

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the characterization of nuclear force.

    Or

    (b) Describe Proton —Neutron hypothesis.

12. (a) Distinguish between the alpha and beta rays.

    Or

    (b) Explain the laws of radioactive disintegration.

13. (a) To describe the kinematics of nuclear reaction.

    Or

    (b) Explain the term conservation of momentum.

14. (a) Describe term bubble chamber.

    Or

    (b) Explain the action of scintillation counter.

15. (a) Describe the latitude effect.

    Or

    (b) Briefly explain the particles and antiparticles.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the binding energy curve and its significance.

Or

(b) Describe construction and working of liquid drop model.

17. (a) Briefly explain the application of radio isotopes.

Or

(b) Explain the neutron theory of beta decay.

18. (a) To derive the value of energy release in fission reaction.

Or

(b) Explain the construction and working of nuclear reactor and uses.

19. (a) Explain the principle, construction and working of G.M Counter.

Or

(b) Explain the principle, construction and working of Betatron.

20. (a) Explain the cascade theory of cosmic ray showers.

Or

(b) Explain the following elementary particle quantum number.

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