(6 pages)

Reg. No. :.....

Code No. : 20564 E **Sub. Code : SMPH 63**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2021.

Sixth Semester

Physics — Core

NUCLEAR PHYSICS

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. The force between two protons is

   (a) Electrostatic force

   (b) Electromagnetic force

   (c) Static force

   (d) Coulomb force

2. The B.E./A of deuterium is

(a) 1.1 MeV (b) 1.1 eV

(c) 8.8 MeV (d) 8.8 eV

3. Which one has highest penetrating power?

(a) Alpha Rays (b) Beta Rays

(c) Gamma Rays (d) (a) and (b)

4. The excited state and the ground state of isomers differ in their _____.

(a) Angular momentum

(b) Atomic number

(c) Spin value

(d) Both (a) and (c)

5. Complete the equation

$$ {}_4Be^9 + {}_2He^4 \rightarrow $$

(a) ${}_5C^{12} + {}_1H^1$ (b) ${}_7C^{13} + {}_{-1}e^0$

(c) ${}_6C^{12} + {}_0n^1$ (d) none

6. A nuclear reactor is a source of _____.

(a) atomic energy (b) molecular energy

(c) chemical energy (d) electrical energy

7. Betatron is a machine used to accelerate

(a) protons (b) neutrons

(c) electrons (d) all the above

8. In synchrotron

(a) B-field is varied

(b) Frequency may or may not be varied

(c) Only frequency is varied

(d) Both (a) and (b)

9. Lamda hyperon belongs to

(a) leptons (b) mesons

(c) baryons (d) photons

10. The instrument first used to discover cosmic rays is

(a) G.M. Counter

(b) Bubble chamber

(c) Gold leaf electroscope

(d) CRO

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Describe the meson theory of nuclear forces.

Or

(b) Define binding energy of the nucleus and give the significance of BE/A curve.

12. (a) Define radioactive series. Explain the four radioactive series.

Or

(b) What are radioisotopes? List out their applications.

13. (a) Define nuclear fission. Explain how energy released in fission process can be calculated.

Or

(b) What are the possible reactions in a fusion reactor? Also explain the conditions for fusion reactor.

14. (a) Write the principle and working of scintillation counter.

Or

(b) Discuss the construction and working of a synchrocyclotron.

15. (a) Explain the formation of Van Allen belts.

Or

(b) Explain the connection between symmetry and conservation laws in elementary particles.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Describe the general properties of nucleus.

Or

(b) Derive Weizsacker's semi-empirical mass formula.

17. (a) Discuss the properties of alpha, beta and gamma rays.

Or

(b) Explain the neutrino theory of beta decay.

18. (a) Describe nuclear fusion and thermonuclear reaction.

Or

(b) Explain the principle and action of atom bomb and hydrogen bomb.

19. (a) Describe the working of bubble chamber. What are its special features?

Or

(b) Obtain the tuning condition for the betatron.

20. (a) List out the elementary particles and their quantum numbers.

Or

(b) What are cosmic rays? Write about the discovery of cosmic rays.

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