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Reg. No. : .....

Code No. : 20039 E **Sub. Code : SMPH 63**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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. Nuclear binding energy is equivalent to ————

(a) mass of proton

(b) mass of neutron

(c) mass of nucleus

(d) mass defect of nucleus

2. The nuclei having an equal number of neutrons are called ————

(a) isotopes (b) isobars

(c) isotones (d) mirror nuclei

3. Radioactivity is the characteristics of which of the following

(a) nucleus (b) electron

(c) proton (d) neutron

4. What is the half life time of a radioactive substance, if its mean life is 200 seconds?

(a) 0.69 minutes (b) 2 minutes

(c) 2.31 minutes (d) 2.57 minutes

5. A nuclear fission reaction becoming self-sustaining depends on

(a) electrons (b) neutrons

(c) energy (d) protons

6. A nuclear reactor is a device to produce nuclear energy with the help of ————

(a) nuclear fusion

(b) uncontrolled chain reaction

(c) controlled chain reaction

(d) graphite as fuel

7. Scintillation detector is a large flat crystal of which material

(a) Sodium chloride

(b) Sodium iodide

(c) Sodium sulphate

(d) Sodium carbonate

8. Betatron is a machine used to accelerate ————

(a) Protons (b) Neutrons

(c) Electrons (d) All the above

9. Cosmic rays are made up of ————

(a) electrons (b) protons

(c) atomic nuclei (d) all the above

10. Primary cosmic rays are composed largely of very fast ————

(a) protons (b) neutrons

(c) electrons (d) gamma rays

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Write a short note on proton - neutron hypothesis.

Or

(b) Explain how the shell model accounts for magic numbers.

12. (a) Give the properties of alpha particles.

Or

(b) Explain the neutrino theory of β – decay.

13. (a) Obtain the Q value for a nuclear reaction.

Or

(b) Explain nuclear fusion reaction.

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

Or

(b) Discuss the principle, construction and working of synchrotron.

15. (a) Explain the nature of primary and secondary cosmic rays.

Or

(b) Explain about classifications of 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) Discuss the general properties of the nucleus.

Or

(b) Explain the meson theory of nuclear forces. Give the characteristics of nuclear forces.

17. (a) Explain the laws of radioactive disintegration.

Or

(b) Discuss radio carbon dating and the laws of successive disintegration.

18. (a) Explain a nuclear reactor and write its uses.

Or

(b) Write about thermonuclear reaction and Explain the confinement of plasma in a fusion reactor.

19. (a) Describe the characteristics of G.M counter and explain the plateau region and dead time of the counter.

Or

(b) Explain the principle, construction and working of a cyclotron. Give its limitations.

20. (a) What are cosmic rays? Write about the origin of cosmic rays.

Or

(b) Explain the four fundamental reactions in nature.

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