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Reg. No. :

Code No. : 20300 E Sub. Code : CMPH 53

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

Fifth Semester

Physics – Core

ATOMIC AND NUCLEAR PHYSICS

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. Band gap energy of silicon is
(a) 1.12 eV (b) 0.67 eV
(c) 1.6 eV (d) 0.2 eV
2. Specific charge of heavy ion is _____ that of electron.
(a) much greater than (b) much lesser than
(c) equal to (d) half

3. Stark effect takes place in the presence of
(a) magnetic field
(b) electric and magnetic field together
(c) electric field
(d) gravitational field
4. The value of Bohr magneton is
(a) $9.27 \times 10^{10} \text{ J/T}$ (b) $9.1 \times 10^{-31} \text{ J/T}$
(c) $9.27 \times 10^{27} \text{ J/T}$ (d) $9.27 \times 10^{-27} \text{ J/T}$
5. Wavelength of hard X-rays is of the order of
(a) 1000 nm (b) 100 f
(c) $2\text{\AA}$ (d) 2000 nm
6. Charged particles are trapped to form Van Allen belt due to _____ field.
(a) magnetic (b) electric
(c) gravitational (d) electromagnetic
7. Mass of proton in a.m.u. is
(a) 1.00727 (b) 1.00866
(c) 1.667 (d) 1.0023

8. The value of BE/A is maximum for
(a) He (b) Fe
(c) Pb (d) Ca
9. Fission of nucleus is achieved by bombarding it with
(a) protons (b) photons
(c) neutrons (d) electrons
10. Baryon is made up of
(a) one quark (b) two quarks
(c) four quarks (d) three quarks

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Obtain an expression for thermal conductivity.
Or
(b) List the properties of positive rays.

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12. (a) Obtain an expression magnetic moment of an electron due to its orbital motion.

Or

- (b) Write a note on Zeeman effect.

13. (a) State and explain Moseley's law. Give its importance.

Or

- (b) What are cosmic ray showers? How are they produced?

14. (a) Discuss the salient features of the binding energy curve.

Or

- (b) List out the properties of nucleus.

15. (a) Explain the chain reaction.

Or

- (b) Write notes on Baryons.

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[P.T.O.]

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) What is Hall effect? Obtain an expression for Hall coefficient of a metal.

Or

- (b) With a neat sketch and relevant theory, describe Thomson parabola method for determining mass of positive ions.

17. (a) Describe the vector model of atom. Also discuss any three quantum numbers associated with it.

Or

- (b) Give the theory of Zeeman effect. Sketch the Zeeman pattern for f to d transition.

18. (a) Describe rotating crystal method to determine the cell dimensions of a crystal.

Or

- (b) Analyse the effects of altitude and latitude on cosmic rays.

19. (a) List the properties of alpha, beta and gamma rays.

Or

- (b) Describe the construction and working of G M Counter.

20. (a) Explain the construction and working of a nuclear reactor.

Or

- (b) Explain the quark model.