

Reg. No. : .....

Code No. : 20301 E Sub. Code : AMPH 53

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

Fifth Semester

Physics — Core

ATOMIC AND NUCLEAR PHYSICS

(For those who joined in July 2020 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

The direction of deflection of positive rays is opposite to that

- (a) Canal rays
- (b) Cathode rays
- (c) IR rays
- (d) UV rays

Primary cosmic rays consists of

- (a) 9% proton 90% helium
- (b) 9% He 75% proton
- (c) 90% proton 9% helium
- (d) 90% Helium 10% proton

The average binding energy per nucleon of a nucleus in an atom is

- (a) 8 ev
- (b) 8 Mev
- (c) 8 joule
- (d) 15 Mev

The radius of nucleus is approximately

- (a)  $10^{-15} m$
- (b)  $10^{-12} m$
- (c)  $10^{-18} m$
- (d)  $10^{15} m$

Heavier particle groups are formed by

- (a) Protons
- (b) Neutrons
- (c) Baryons
- (d) Mesons

Nuclear Fission can be explained by

- (a) Shell model
- (b) Liquid drop model
- (c) Quark model
- (d) Vector model

2. The velocities of positive rays are ranging from

- (a)  $10^1$  to  $10^3 ms^{-1}$
- (b)  $10^5$  to  $10^6 ms^{-1}$
- (c)  $10^7$  to  $10^8 ms^{-1}$
- (d)  $10^3$  to  $10^6 ms^{-1}$

3. The spin quantum number is

- (a)  $-1/2$
- (b) 2
- (c)  $1/2$
- (d)  $\pm 1/2$

4. The orbital quantum number starts from

- (a) 0, 1, 2, 3.... (n-1)
- (b) 0, 1, 2, 3....(n+1)
- (c) 1, 2, 3 (n-1)
- (d) 1, 2, 3 (n+1)

5. The Wavelength of x-ray is

- (a)  $5 \text{ \AA}$  to 10
- (b) 10 to 0.5
- (c) 0.1 to 0.10
- (d) 0.5 to  $5 \text{ \AA}$

Page 2 Code No. : 20301 E

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Derive an expression for electrical conductivity.

Or

(b) Write the properties of positive rays.

12. (a) State and explain Pauli's exclusion principle.

Or

(b) Write a note on

- (i) J – J coupling
- (ii) Magnetic dipole moment due to orbital motion of the electron

13. (a) Write the properties of x rays.

Or

(b) State and explain Moseley's law.

14. (a) Explain Binding energy curve of nucleus.

Or

(b) Explain Betatron with a diagram.

15. (a) Define

- (i) Q value of a nuclear reaction.
- (ii) Nuclear fission

Or

(b) Explain principle and action of atom bomb.

PART C — ( $5 \times 8 = 40$  marks)

Answer ALL questions choosing either (a) or (b).  
Each answer should not exceed 600 words.

16. (a) State and explain Hall effect.

Or

(b) Explain Aston's mass spectrograph with diagram.

17. (a) Describe the vector Atom model. Explain various quantum numbers associated with it and bring out its merits.

Or

(b) Explain Stark effect.

18. (a) Describe Laue's method and point out its significance.

Or

(b) What are cosmic ray showers and van Allen belts?

19. (a) Describe the shell model of the nucleus.

Or

(b) Explain the construction and working of cloud chamber.

20. (a) Explain how a hydrogen bomb works.

Or

(b) Narrate the Quark model of elementary particles.