(6 pages) Reg. No. : .....

Code No. : 20306 E **Sub. Code : AMPH 53**

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

Fifth Semester

Physics — Core

ATOMIC AND NUCLEAR PHYSICS

(For those who joined in July 2020 only)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Potential energy of free electron in a metal is
   (a) negative
   (b) zero
   (c) positive
   (d) infinity

2. Isotopes are elements of
   (a) Same A different Z
   (b) Same Z different A
   (c) Same A and Z
   (d) None of these

3. The value of Planck's constant is
   (a) 6.626×10^{-34} Js
   (b) 6.626×10^{34} Js
   (c) 6.626×10^{-34} J/s
   (d) 6.626×10^{34} J/s

4. Number of electrons in p-orbital is
   (a) 0 (b) 6
   (c) 2 (d) 3

5. X-rays were discovered by
   (a) Roentgen (b) Moseley
   (c) Bragg (d) Thomson

6. The intensity of cosmic rays ———— with altitude.
   (a) increases
   (b) decreases
   (c) rapidly increases
   (d) rapidly falls

7. The size of nucleus is of the order of
   (a) 10^{-15} m (b) 10^{15} m
   (c) 10^{-15} mm (d) 10^{-15} cm

8. Betatron is device used to accelerate ———— to very high energies.
   (a) protons (b) neutrons
   (c) electrons (d) alpha particle

9. Atom bomb works on the principle of
   (a) nuclear fusion
   (b) nuclear fission
   (c) alpha decay
   (d) beta decay

10. Meson is made up of
    (a) one quark
    (b) one quark-one anti quark
    (c) two quarks
    (d) two quarks-two anti quarks

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Write a note on free electron theory.

Or

(b) What are called positive rays? List their properties

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

Or

(b) Obtain an expression for magnetic moment of an electron due to orbital motion.

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

Or

(b) What are primary and secondary cosmic rays?

14. (a) Explain the binding energy curve.

Or

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

15. (a) Discuss the energy released in fission reaction.

Or

(b) Explain the principle of hydrogen bomb.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) On the basis of free election theory, derive an expression for electrical conductivity of s metal.

Or

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

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

Or

(b) What is Zeeman effect? Give the quantum mechanical explanation.

18. (a) With a neat diagram, describe Bragg's spectrometer.

Or

(b) Describe the formation of Van Allen belts.

19. (a) Explain the Shell model of the nucleus.

Or

(b) With a neat sketch describe the construction and working of cyclotron with relevant theory.

20. (a) Write an essay on the classification of elementary particles.

Or

(b) Explain the working of atom bomb.

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