

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

Fifth Semester

Physics - Core

ATOMIC AND NUCLEAR PHYSICS

(For those who joined in July 2021 - 2022)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The direction in which Positive rays travel is opposite to
 - anode
 - cathode rays
 - adjacent wall
 - none of the above
- How are solids classified based on the band theory?
 - Conductors
 - Insulators
 - Semiconductors
 - All the above

- According to Pauli's exclusion principle there are _____ different quantum state in any shell.
 - $2n^2$
 - $2n$
 - $3n$
 - $3n^2$

- When the light source is placed in a magnetic field, the spectral lines are split into two or three lines is called
 - Normal Zeeman effect
 - Anomalous Zeeman effect
 - Paschen-back effect
 - Photo electric effect

- _____ is the equation of Bragg's law.
 - $n\lambda = 2d \sin \theta$
 - $n = 2d \sin \theta$
 - $n\lambda = 2d \cos \theta$
 - $nd\lambda = 2 \sin \theta$

- Cosmic rays are accelerated by
 - Magnetic fields
 - Electric fields
 - Pressure
 - Gravity

- A G.M. Counter is used for detecting?
 - Radioactivity
 - Underground water
 - Underground Oil
 - Coal

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- Cyclotron was invented by
 - John Biggins
 - Arthur Wynne
 - Stephen Poplawski
 - Ernest Lawrence
- Controlled chain reaction form the basis of an atomic bomb
 - True
 - False
- An atomb is an example of
 - Fusion reaction
 - Controlled fission reaction
 - Uncontrolled fission reaction
 - All the above

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

- (a) State the assumption of the free electron theory of metals.

Or

- (b) Give theory of Thomson's parabola method for positive ray analysis, with the help of diagram.

- (a) Explain the various quantum numbers associated with vector atom model.

Or

- (b) State and explain Pauli's exclusion principle.

- (a) What is the method of Production of X-rays?

Or

- (b) Distinguish between Primary and Secondary Cosmic rays.

- (a) State and explain the laws of radioactive disintegration process.

Or

- (b) Explain Binding Energy curve with diagram.

- (a) Derive the Q-value equation in nuclear reaction.

Or

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

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PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Classify the solids based on band theory of solids.

Or

- (b) Describe with theory the construction and working of Aston's mass spectrograph. Write any two limitations of Aston's mass spectrograph.

17. (a) Discuss the Normal and Anomalous Zeeman effect.

Or

- (b) Describe the principle, theory and significance of Stern and Gerlach experiment.

18. (a) What are cosmic rays? Explain.

- (i) Latitude effect
(ii) Altitude effect.

Or

- (b) Construction and working of Bragg's X-ray Spectrometer.

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19. (a) Explain :

- (i) α -decay
(ii) β -decay
(iii) γ -decay.

Or

- (b) Write the working principle of cyclotron in brief. Draw a schematic diagram to sketch of the cyclotron.

20. (a) What is chain reaction? Explain also nuclear reactor.

Or

- (b) Describe quark model of elementary particles.

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