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NOV-2016



काळ - 025

PHYSICS PAPER - I : PHY - 241
Modern Physics
(24125)

P. Pages : 3

Time : Two Hours

Max. Marks : 40

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory & carry equal marks. Figures to the right indicated full marks.
5. Use of logarithmic table or simple calculator is allowed.

1. Attempt **any eight** of the following.

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- i) For a particle moving with a non – relativistic velocity, the relation between group velocity and particle velocity is
 - a) $V_g = 2V$
 - b) $V_g = V$
 - c) $V_g = V/2$
 - d) $V_g = V^2$
- ii) Wavelength band of Gamma rays is
 - a) $10^{-8} < \lambda < 10^{-4}$
 - b) $10^{-5} < \lambda < 10^{-2}$
 - c) $10^{-4} < \lambda < 10^{-1}$
 - d) $10^{-6} < \lambda < 10^{+4}$
- iii) The process by which atoms are raised from the lower level to upper level is called
 - a) Stimulated emission
 - b) pumping process
 - c) spontaneous emission
 - d) Holography
- iv) Which is the following not able to explain the spectra of complex atoms which have two or more electrons?
 - a) Bohr's theory
 - b) Bohr – sommerfeld model
 - c) Correspondence principle
 - d) None of the above
- v) The velocity with which wave is propagate is called
 - a) phase velocity
 - b) Group velocity
 - c) Particle velocity
 - d) None of the above

- vi) Which of the following is utilized in isotope separation?
 a) Ordinary light b) Laser
 c) Monochromatic light d) None of the above
- vii) Which of the following expression is true for photons as well as the material particles?
 a) $\lambda = h/p$ b) $\lambda = h/\nu$
 c) $\lambda = h/E$ d) None of the above
- viii) Size of the hydrogen atom using uncertainty principle is approximately equal to
 a) 2 \AA b) 1 \AA
 c) 1.5 \AA d) None of the above
- ix) For a particle with relativistic velocity is
 a) $E^2 = p^2 C^2 + m_0^2 C^4$ b) $E^2 = p^2 C^4 + m_0^2 C^2$
 c) $E^2 = p^4 C^2 + m_0^4 C^4$ d) None of the above
- x) ----- are made of highly ionized gases of very low density.
 a) Photosphere b) chromosphere
 c) Corona d) Solar Interior

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2. Attempt **any four** of the following.

- a) What do you mean by holography?
- b) Explain the term solar constant.
- c) Calculate the de - Broglie wavelength of an electron moving with velocity $1/20^{\text{th}}$ of the velocity of light.
- d) Define conversion efficiency of solar cell?
- e) Explain directionality of LASER.
- f) Enlist the conventional and non - conventional sources of energy.

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3. Attempt **any two** of the following.

- a) Draw I-V characteristic of a solar cell. Explain the term open circuit voltage (V_{oc}) and short circuit current (I_{sc}).
- b) State Heisenberg's uncertainty principle. Enlist the application of Heisenberg's uncertainty principle.
- c) Describe He - Ne LASER in brief.

4. a) Attempt **any two** of the following. 6
- i) What are the possible ways to overcome the energy crisis in future?
 - ii) Write a short note on stimulated emission.
 - iii) Describe Bohr's postulates.
- b) Enlist the application of LASER. 2
5. a) Describe the necessary expression for the hydrogen spectrum and draw the energy level diagram showing different series. 6

OR

- a) Describe in detail Davisson and Germer experiment. Discuss its important. 6
- b) State the correspondence principle. 2
