FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2024

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U PHY5 B07 / CC20U PHY5 B07 - QUANTUM MECHANICS

(Physics - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours   Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Write the Rayleigh-Jeans formula.

2. What is Compton wavelength?

3. Explain Thomsons model of atom?

4. How did Rutherford try to rectify problems of Thomson's atom model?

5. State correspondence principle.

6. Which experiment confirmed de Broglie hypothesis? Briefly explain.

7. What is meant by probability amplitude?

8. Write down the normalisation condition of wavefunction. What is its physical concept?

9. Sketch the diagram of simple harmonic oscillator and write down the expression for the Hamiltonian.

10. Draw and mathematically define a finite one-dimensional potential barrier.

11. Find the normalisation constant of azimuthal wave function.

12. What is meant by degeneracy of an energy level?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. Explain pair production and pair annihilation.

14. What are the deficiencies of Bohr model?

15. In a simultaneous determination of the position and momentum of an electron of energy 1keV, the position is determined to an accuracy of 10 -10 .What is the percentage uncertainity in the momentum of this electron.

16. The phase velocity of the gravity waves of wavelegth λ is determined $V_p = g\lambda / 2\pi$ .Find the group velocity of the wave.

17. What are the properties of a well behaved wavefunction?

18. Solve the Schrodinger equation for a free particle.

19. Explain Stern -Gerlach experiment.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

20. What is photoelectric effect? Starting from experimental observations, explain how the wave nature of light unable to explain the observed properties of photoelectric effect? How did Einstein explain it successfully?

21. Solve the Schrodingers equation of a particle confined in a two-dimensional box. Find the energy eigen values and the normalised eigen functions.

(1 × 10 = 10 Marks)

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