J.D.B. Government Girls' College, Kota

M.Sc. SEM-II

Paper-201 (Statistical Mechanics)

Monthly Test

Maximum Marks: 15

Very Short Questions (1 Mark each)

1. Define phase space.
2. What do you mean by grand canonical ensemble?
3. Define density of states.
4. What is partition function?
5. Define specific heat of metals.

Short Questions (2.5 Marks each)

6. Establish connections between statistical and thermodynamics quantities.
7. State and prove Liouville's theorem.

Long Answer Questions (5 Marks)

8. Discuss the properties and physical significance of partition function.

   Or

   Discuss thermodynamic functions for canonical ensemble.

J.D.B. Government Girls' College, Kota

M.Sc. SEM-II

Paper-202 (Classical Electrodynamics-I)

Monthly Test

Maximum Marks: 15

Very Short Questions (1 Mark each)

1. State Uniqueness theorem.
2. Write down Poisson's and Laplace's equation.
3. Define energy density.
4. Define dipole layer.
5. What is conservative field?

Short Questions (2.5 Marks each)

6. State and Prove Green's reciprocity theorem.
7. Write Gauss's law. Deduce its differential and integral forms.

Long Answer Questions (5 Marks)

8. Obtain formal solution of electrostatic boundary value problem with Green's function.

Or

Describe Dirichlet and Neumann boundary conditions.

J.D.B. Government Girls' College, Kota

M.Sc. SEM-II

Paper-203 (Quantum Mechanics-II)

Monthly Test

Maximum Marks: 15

Very Short Questions (1 Mark each)

1. Define differential scattering cross section.
2. State optical theorem.
3. How does the formula of scattering cross section modify if the particles are identical?
4. What is the need of CM frame?
5. What is the difference between scattering and collision?

Short Questions (2.5 Marks each)

6. Determine the scattering cross section for slow particles in a spherical square well potential of depth U_0 and radius a.
7. Deduce the formula of scattering cross section if the particles are identical. Illustrate your answer by scattering of two spin half particles.

Long Answer Questions (5 Marks)

8. Obtain phase shift formula to determine scattering cross section

Or

Find expression for the total scattering cross section for the scattering involving Dirac Delta type potential.

J.D.B. Government Girls' College, Kota

M.Sc. SEM-II

Paper-204 (Atomic and Molecular Physics)

Monthly Test

Maximum Marks: 15

Very Short Questions (1 Mark each)

1. Plot the polar diagrams showing angular dependence of probability density of electron wave function of s, p, d states of hydrogen atom.
2. What is the degeneracy in the electronic levels of hydrogen atom.?
3. Show the space quantisation for l=2 states.
4. What do you mean by Lamb shift?
5. Define space quantisation.

Short Questions (2.5 Marks each)

6. Write down the Hamiltonian for hydrogen atom including all perturbation correction terms.
7. Show the quantum mechanical spectrum of hydrogen atom. Find the term shifts for 3s and 3p states of hydrogen atom.

Long Answer Questions (5 Marks)

8. Considering the relativistic behaviour of electron due to first order perturbation, derive an expression for splitting of a state for hydrogen atom fine structure.

   Or

   Considering the spin orbit and relativistic correction terms, derive an expression of term shift for splitting of a state for hydrogen atom fine structure and show the fine structure energy levels with transitions for n=3 to n=2 states.