(DPHY21)

ASSIGNMENT-1
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

ELECTROMAGNETIC THEORY AND MODERN OPTICS
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Explain the concept of boundary conditions in the electromagnetic theory of light.

   (b) Discuss polarization by refraction and its implications in electromagnetic theory.

2. (a) Explain reflection and transmission coefficients in the context of electromagnetic waves.

   (b) Discuss how phase changes occur during reflection and their consequences in terms of wave interference and propagation.

3. (a) Explain the concept of coherence in lasers.

   (b) Discuss how the resonator influences the characteristics of laser output and its role in achieving a stable and coherent laser beam.

4. (a) Explain absorption and emission processes in lasers.

   (b) Give a brief note on Ruby Laser.

5. (a) Give the fundamental concepts that underlie the creation of holograms.

   (b) Discuss the role of source coherence and stability in holography.

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ASSIGNMENT-2
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

ELECTROMAGNETIC THEORY AND MODERN OPTICS
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Explain hologram recording materials.

   (b) Discuss the factors in choosing appropriate recording materials.

2. (a) Explain the principle of total internal reflection in the context of optical fibres.

   (b) Explain how rays and modes are characterized in optical fibers.

3. (a) Discuss the structure of step-index fibers and represent it using ray optics.

   (b) Discuss how graded-index fibers differ from step-index fibers.

4. Write the following

   (a) Role of absorption in electromagnetic waves.

   (b) Semiconductor Laser.

   (c) Applications of holography.

   (d) Methods employed in fiber fabrication.

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(DPHY22)

ASSIGNMENT-1
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

NUCLEAR PHYSICS, MOLECULAR & RESONANCE SPECTROSCOPY
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Discuss the concepts of mass defect and binding energy.

   (b) Explain the role of the nuclear magnetic moment and how it contributes to the overall stability of a nucleus.

2. (a) Explain the significance of dipole and quadrupole moments in describing the shape and structure of atomic nuclei.

   (b) Give a brief note on charge independence and spin dependence of nuclear forces.

3. (a) Explain the different types of nuclear reactions and the conservation laws.

   (b) Give examples to illustrate the conservation of energy.

4. (a) Give a brief note on nuclear kinematics.

   (b) Explain Fermi's theory of beta decay.

5. (a) Explain the basic principles of NMR theory.

   (b) Explain the principles of electron spin resonance (ESR).

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ASSIGNMENT-2
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

NUCLEAR PHYSICS, MOLECULAR & RESONANCE SPECTROSCOPY
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Explain the relaxation mechanism in NMR.

   (b) Discuss how pulse methods are used to measure relaxation times.

2. (a) Give a note on types of molecules.

   (b) Explain the rotational spectra of rigid rotators.

3. (a) Give a note on vibrational energy of diatomic molecules.

   (b) Discuss key features of IR spectroscopy.

4. Write the following

   (a) Semi-Empirical mass formula.

   (b) Nuclear Isomerism,

   (c) NQR Spectroscopy.

   (d) Differences between rigid and non-rigid rotators.

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(DPHY23)

ASSIGNMENT-1
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

SOLID STATE PHYSICS – I
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Explain the significance of symmetry operations in crystallography.

   (b) Explain the types of crystals.

2. (a) Give a note on classifications of crystals based on crystal point groups and space groups.

   (b) Explain the characteristics and distinctions between different crystal structures.

3. (a) Discuss the factors contributing to cohesion energy in crystals.

   (b) Explain the significance of elastic constants in crystals.

4. (a) Give a brief note on lattice vibrations using the Ball and Spring model of a harmonic crystal.

   (b) Briefly explain the one-dimensional diatomic chain.

5. (a) Give a brief note on classical lattice heat capacity in solids.

   (b) Explain thermal properties of solids.

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ASSIGNMENT-2
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

SOLID STATE PHYSICS – I
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Explain how the periodic arrangement of atoms in solids influences the electronic structure.

   (b) Discuss the wave mechanical interpretation of energy bands and its implications for electronic properties.

2. (a) Explain the nearly free electron model in detail.

   (b) Discuss the concept of zone schemes for energy bands.

3. (a) Explain the zone schemes for energy bands in the context of insulators, semiconductors, and metals.

   (b) Discuss intrinsic carrier densities in semiconductors.

4. Write the following

   (a) Bragg's law in X-ray diffraction.

   (b) Reststrahlen band.

   (c) Differences between classical and quantum theories of heat capacity.

   (d) Integral Quantum Hall effect

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ASSIGNMENT-1
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

SOLID STATE PHYSICS – II
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Discuss the theory of dielectrics and the concepts of polarization, dielectric Constant.

   (b) Discuss the factors that contribute to the behaviour of dielectric materials.

2. (a) Explain the theory of dielectric losses.

   (b) Explain the implications of dielectric losses on the performance of devices and systems.

3. (a) Explain the types of point imperfections in crystals.

   (b) Give examples to illustrate the significance of point defects.

4. (a) Discuss the quantum theory underlying magnetic susceptibility.

   (b) Explain how the crystal field influences the magnetic behaviour of ions in solids.

5. (a) Explain the principles and assumptions of Weiss theory of ferromagnetism.

   (b) Discuss the concept of exchange interaction and its role in the Heisenberg model of magnetism.

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ASSIGNMENT-2
M.Sc. DEGREE EXAMINATION, MAY/JUNE-2025

Second Year

Physics

SOLID STATE PHYSICS – II
MAXIMUM MARKS :30
ANSWER ALL QUESTIONS

1. (a) Explain the concept of Giant Magneto Resistance (GMR) in materials.
   (b) Discuss the applications of GMR in technology.

2. (a) Discuss the phenomena associated with superconductivity that lack observable quantization.
   (b) How do these phenomena contribute to our understanding of super conducting behaviour?

3. (a) Explain the properties of superconductors that are directly dependent on the energy gap.
   (b) Give a note on the isotope effect in superconductivity.

4. Write the following
   (a) Dielectric Polarizability.
   (b) Principle of adiabatic demagnetization cooling.
   (c) Spin waves
   (d) Ginzburg-Landau theory of super conductivity.

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