

(DPHY21)

ASSIGNMENT - 1

M.Sc. DEGREE EXAMINATION, MARCH 2023

Second Year

Physics

ELECTROMAGNETIC THEORY AND MODERN OPTICS

MAXIMUM : 30 MARKS

ANSWER ALL QUESTIONS

1. (a) Discuss the dielectric reflection and refraction.
(b) Define polarization of reflection and polarization by refraction.
2. (a) Explain reflection and transmission coefficients.
(b) Discuss change of phase on reflection and calculate total internal reflection.
3. (a) Describe absorption and emission process. Explain the Einstein coefficients.
(b) Explain two level, three level and four level pumping.
4. (a) Write a short note on solid state laser and ruby lasers.
(b) Explain CO₂ laser and Ga As lasers with neat diagrams.
5. (a) Discuss the basic theory and the characteristics of holograms.
(b) Write the hologram recording materials.

(DPHY21)

ASSIGNMENT - 2

M.Sc. DEGREE EXAMINATION, MARCH 2023

Second Year

Physics

ELECTROMAGNETIC THEORY AND MODERN OPTICS

MAXIMUM : 30 MARKS

ANSWER ALL QUESTIONS

1. (a) Define film resolution and write the qualitative treatment of holograms.
(b) Explain the applications of holography.
2. (a) Describe the fiber types and write the rays and modes.
(b) Explain the mode theory of circular waveguides.
3. (a) Explain the graded index fiber structure and write the numerical aperture.
(b) Discuss material broadcasting in dispersion wave guide and write inter model dispersion.
4. Write all of the following
 - (a) Reflection and refraction.
 - (b) Laser pumping and Boltzmann's principle.
 - (c) Source coherence and stability.
 - (d) Pulse broadening in graded-index fibers.

(DPHY22)

ASSIGNMENT - 1

M.Sc. DEGREE EXAMINATION, MARCH 2023

Second Year

Physics

NUCLEAR PHYSICS, MOLECULAR AND RESONANCE SPECTROSCOPY

MAXIMUM : 30 MARKS

ANSWER ALL QUESTIONS

1. (a) Discuss about Mass and binding energy of Nucleus.
(b) Explain general characteristics of nuclear forces.
2. (a) Explain in detail liquid drop model of nucleus.
(b) What are magic numbers? Discuss meson theory of nuclear forces.
3. (a) Discuss about nuclear kinematics.
(b) Explain the types of nuclear decays in detail.
4. (a) Give brief note on Fermi theory of β -Decay.
(b) Discuss about the Interaction between the elementary particles and the conservation laws among the elementary particles.
5. (a) Discuss the basic principle and relaxation mechanics of NMR.
(b) Explain the ESR spectrometer.

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ASSIGNMENT - 2

M.Sc. DEGREE EXAMINATION, MARCH 2023

Second Year

Physics

NUCLEAR PHYSICS, MOLECULAR AND RESONANCE SPECTROSCOPY

MAXIMUM : 30 MARKS

ANSWER ALL QUESTIONS

1. (a) Draw the block diagram of NQR spectrometer and discuss its working principle.
(b) What are the fundamental requirements of NQR spectroscopy?
2. (a) Discuss the differences between diatomic linear symmetric top and asymmetric top molecules.
(b) Explain rotational spectra of Rigid rotator.
3. (a) Discuss about vibrational energy of diatomic molecules.
(b) Explain the vibration spectrum of diatomic molecules.
4. Write all of the following
 - (a) Discuss quadrupole moment of nucleus.
 - (b) What are nuclear reactors.
 - (c) Write a note on Bloch equation.
 - (d) IR Spectroscopy.

(DPHY23)

ASSIGNMENT - 1

M.Sc. DEGREE EXAMINATION, MARCH 2023

Second Year

Physics

SOLID STATE PHYSICS I
MAXIMUM : 30 MARKS

ANSWER ALL QUESTIONS

1. (a) Describe the unit cell and primitive structures.
(b) Write the symmetric operations of a crystal.
2. (a) Discuss Bragi's law and Lavies interpretation of x-ray diffraction by crystals.
(b) Explain the measurement of diffraction patterns of crystals.
3. (a) Describe the cohesion of atoms.
(b) Describe primary bonds and secondary bonds.
4. (a) Write a short note on normal modes of one dimensional mono atomic chain.
(b) Discuss the general theory of harmonic approximation.
5. (a) Discuss quantum theory of heat capacity.
(b) Explain anharmonic effects.

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ASSIGNMENT - 2

M.Sc. DEGREE EXAMINATION, MARCH 2023

Second Year

Physics

SOLID STATE PHYSICS I
MAXIMUM : 30 MARKS

ANSWER ALL QUESTIONS

1. (a) What are the consequences of periodicity?
(b) Explain the wave mechanical interpretation of energy bands.
2. (a) Describe the nearly free electron model and write the zone schemes for energy bands.
(b) Differentiate insulators, semiconductors and metals.
3. (a) Explain the carrier densities and temperature dependence of electrical conductivity.
(b) Give a few examples of p-n junction devices and explain thermoelectric effect.
4. Write all of the following
 - (a) Primitive structures and the symmetry operations.
 - (b) Cohesion energy.
 - (c) Crystal lattice heat capacity.
 - (d) Integral quantum effect.

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ASSIGNMENT - 1

M.Sc. DEGREE EXAMINATION, MARCH 2023

Physics

Second Year

SOLID STATE PHYSICS II
MAXIMUM : 30 MARKS

ANSWER ALL QUESTIONS

1. (a) Describe dielectric constant and describe the local electric field.
(b) Discuss the dielectric polarizability and write the sources of polarizability.
2. (a) Explain the theory of the ferroelectric displacive transitions.
(b) Write the thermodynamic theory of ferroelectric transitions.
3. (a) What are line imperfections and explain dislocations?
(b) Explain grain boundaries and write the role of dislocations in crystal growth.
4. (a) Define the quantum theory of magnetic susceptibility.
(b) Explain the application to magnetic ions in solids.
5. (a) Write the Weiss theory of ferromagnetism.
(b) Describe the Heisenberg model for ferromagnetic domains.

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ASSIGNMENT - 2

M.Sc. DEGREE EXAMINATION, MARCH 2023

Physics

Second Year

**SOLID STATE PHYSICS II
MAXIMUM : 30 MARKS**

ANSWER ALL QUESTIONS

- 1 (a) Discuss Neel model of anti-ferromagnetism and ferrimagnetism.
(b) Determine magnetically ordered structures.
- 2 (a) Define the properties dependent on energy gap.
(b) Write the important predictions of the BCS theory.
- 3 (a) Discuss the BCS theory and compare with experiment.
(b) Define Ginzburg theory for high temperature semiconductors
4. Write all of the following
 - (a) Theory of ferroelectric displacive transitions.
 - (b) Effect of crystal field and van vleck paramagnetism.
 - (c) GMR-CMR materials.
 - (d) Landan theory.