MPH-013

ASSIGNMENT BOOKLET

M.Sc. (Physics) Programme
(MSCPH)

OPTICS

Valid from 1st January, 2026 to 31st December, 2026

School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068
(2026)

Dear Student,

Please read the section on assignments in the Programme Guide for M.Sc. (Physics). A weightage of 30 per cent, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this course. The assignment is in this booklet. The total marks for this assignment is 50, of which 20 marks are needed to pass it.

Instructions for Formatting Your Assignments

Before attempting the assignment please read the following instructions carefully:

1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLMENT NO.: ……

NAME: ……

ADDRESS: ……

COURSE CODE:……

COURSE TITLE: ……

ASSIGNMENT CODE: ……..

STUDY CENTRE: …….. **DATE:** ……

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3) Leave 4 cm margin on the left, top and bottom of your answer sheet.

4) Your answers should be precise.

5) **Submit the assignment answer sheets within the due date.**

6) The assignment answer sheets are to be submitted to your Study Centre as per the schedule. **Answer sheets received after the due date shall not be accepted. We strongly suggest that you retain a copy of your answer sheets.**

7) This assignment is **valid from 1st January, 2026 to 31st December, 2026**. If you have failed in this assignment or fail to submit it by December 31, 2026, then you need to get the assignment for the year 2027, and submit it as per the instructions given in the Programme Guide.

8) **You cannot fill the examination form for this course** until you have submitted the assignment for the course. For any queries, please contact: srjha@ignou.ac.in; sgupta@ignou.ac.in

We wish you good luck.

Tutor Marked Assignment
CLASSICAL ELECTRODYNAMICS

Course Code: MPH-013
Assignment Code: MPH-013/TMA/2026
Max. Marks: 50

Note: Attempt all questions. The marks for each question are indicated against it.

1. a) Differentiate between isotropic and anisotropic media for electromagnetic wave propagation. Give one example of each. (3)

   b) Derive the wave equation for the electric field $\vec{E}$ in anisotropic non-conducting medium starting from Maxwell's equations. (7)

2. What is Jones vector? Determine the Jones matrix for a linear polariser which makes an angle of 60^{o} with the *x*-axis. (1,4)

3. a) Using the scalar theory of diffraction, obtain the expression for Fresnel diffraction integral. (6)

   b) On the basis of Fresnel diffraction integral, discuss the conditions which differentiate between Fresnel and Fraunhofer diffraction. (4)

4. a) List the components of a laser and discuss each of them briefly. (4)

   b) A mercury vapour lamp emits light of mean wavelength $\lambda = 5461\overset{\circ}{A}$ with a spectral spread $\Delta\lambda = 0.012\overset{\circ}{A}$. Calculate

      i) the coherence length,

      ii) the spectral line width in Hertz, and

      iii) the coherence time of the emitted radiation.

      Take the speed of light, $c = 3 \times 10^{8}\ ms^{-1}$. (6)

5. a) Derive the expressions for TE and TM mode fields in an optical waveguide, relating electric and magnetic field components. (7)

   b) What factors determine the number of modes propagating in an optical fiber? (3)

6. A step-index optical fiber has core refractive index 1.50, cladding refractive index 1.45, and core diameter 3 μm. The wavelength of light propagating in the fiber is 1.56 μm. Calculate the *V*-number and comment if it supports single-mode or multimode propagation. (5)

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