MPH-002

ASSIGNMENT BOOKLET

M.Sc. (Physics) Programme
(MSCPH)

CLASSICAL MECHANICS I

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 this assignment. For any queries, please contact: slamba@ignou.ac.in and mbnewmai@ignou.ac.in

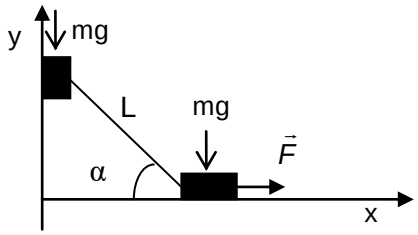
We wish you good luck.

Tutor Marked Assignment
CLASSICAL MECHANICS I

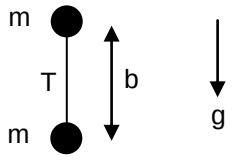
Course Code: MPH-002
Assignment Code: MPH-002/TMA/2026
Max. Marks: 50

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

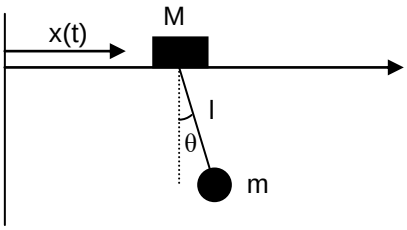
1. a) Two frictionless blocks of equal masses m are connected by a massless rigid rod of length L. The system is constrained to move in the vertical plane under the action of an applied force $\vec{F}$ as shown in the figure. Obtain the equation of motion of the system and calculate the condition for static equilibrium. (5)



b) Two equal of mass *m* attached by a thread of length *b* are oriented vertically as shown in the figure. The acceleration decrease according to height as $g = g_0(1 - z/a)$, where g_0 and *a* are constants. Calculate the vertical acceleration of the system as measured from the centre of the thread. (5)



c) A pendulum of mass *m* is pivoted to a support of mass *M* sliding without friction along x-axis as shown in the figure. Obtain the Lagrange equation of motion for the given system. (5)



d) Consider a simple pendulum of mass *m* whose length changes with time as $l = l_0 t^2$, $(x^2 + y^2 = l_0^2 t^4)$. Obtain the Lagrange equation of motion, the generalised momentum and the energy function for the system. (10)

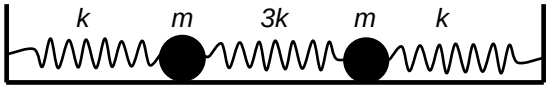
2. a) A central potential is given as $V(r)$:

(i) Obtain the criterion for a stable circular orbit.

(ii) If the central potential is given as $V(r) = -k/r^n$, $n \geq 1$.For what values of *n* are the circular orbits stable. (10)

b) The orbit of a particle in a central force field is given by $r = k e^{\alpha\theta}$, obtain the force law. (5)

c) Two objects of equal mass are connected by a three spring with spring constants as shown in figure. Obtain the normal mode frequencies. (10)



****