

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, June 2022

First Degree Programme under CBCSS

Physics

Core Course I

PY 1141 : BASIC MECHANICS AND PROPERTIES OF MATTER

(2018 & 2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences. **Each** question carries **1** mark.

1. What is the position of the centre of mass of a uniform triangular lamina?
2. What are the factors on which moment of inertia of a body depends?
3. State parallel axis theorem.
4. What is center of oscillation of compound pendulum?
5. What are the characteristics of simple harmonic motion?
6. Define elasticity.
7. Define surface tension.

P.T.O.

8. State Bernoulli's theorem.
9. State Newton's law of viscosity.
10. How does Venturi meter measure flow?

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions, not exceeding a paragraph; **each** question carries **2** marks.

11. A planet revolves around a massive star in a highly elliptical orbit. Is its angular momentum constant over the entire orbit? Give the reason.
12. Derive an expression for moment of inertia of an annular ring.
13. What is the function of a fly wheel? What is its moment of inertia?
14. What are the advantages of conservation laws?
15. Derive an expression for potential energy of a particle executing SHM.
16. Distinguish between transverse and longitudinal waves.
17. Derive an expression for the time period of a compound pendulum.
18. Why do girders have I section?
19. Derive the equation for time period of a torsional pendulum.
20. Obtain an expression for equation of continuity.
21. Explain surface energy, how is it related to surface tension.
22. What are cohesive and adhesive forces? Give Examples.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six**, each question carries **4** marks.

23. Two discs of moments of inertia I_1 and I_2 about their respective axes (normal to the disc and passing through the centre). and rotating with angular speeds ω_1 , and ω_2 are brought into contact face to face with their axes of rotation coincident. What is the angular speed of the two disc system?
24. What is the moment of inertia of a sphere of mass 20kg and radius $1/4$ m about its diameter?
25. What is the angular momentum of a particle whose rotational kinetic energy is 18 joules, if the angular momentum vector coincides with the axis of rotation and its moment of inertia about the axis is 0.01kg/m^2 .
26. If a force $F = Ax+Bx^2$ acts parallel to the X axis on object and moves it from $x = 1$ to $x = 2$, calculate the work done.
27. A body having a mass of 4gm executes simple harmonic motion. The force acting on the body, when displacement is 8 cm, is 24gm. Find the period? If the maximum velocity is 500 cm/sec, find the amplitude and maximum acceleration.
28. Find the frequency, period and wave number for a light of wavelength 6000 AU.
29. A steel wire of 1 mm radius is bent to form a circle of 10cm radius. What is the bending moment, if $Y = 2 \times 10^{11}\text{nm}^{-2}$.
30. By how much will the surface of liquid be depressed in a glass tube of radius 0.02 cm, if the angle of contact of the liquid is 135° and its surface tension is $54.7 \times 10^{-2}\text{nm}^{-1}$. Density of liquid = 13500kgm^{-3} .
31. An air bubble of radius 1 cm is allowed to rise through a long cylindrical column of viscous liquid and travels at a steady rate of 0.21cms^{-1} . If the density of the liquid is 1470kgm^{-3} , find its viscosity. Assuming $g = 9.8\text{ms}^{-2}$, neglect the density of air.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions; **each** question carries **15** marks.

32. Obtain the angular momentum of a rotating rigid body about a fixed axis and hence define moment of inertia about the axis of rotation.
33. Define conservative force. Show that a central force is conservative. Hence prove that the work done by a conservative force round a closed path is zero.
34. Derive the differential equation of a simple harmonic oscillator and find out its solution.
35. What do mean by bending moment? Derive an expression for the depression of a uniform beam supported at its ends and loaded in the middle.

(2 × 15 = 30 Marks)