QP Code: D132542	Total Pages: 2	Name:
		Register No.

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(CUFYUGP)

PHY1MN102/APH1MN102: Properties of Matter and Thermodynamics

2024 Admission onwards

Maximum Time :2 Hours | **Maximum Marks :70**

Section A

All Questions can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)

1	How will you identify that a body is under equilibrium? What are the first and second conditions for equilibrium?
2	Explain the principle behind the working of hydraulic lift.
3	Draw a typical stress- strain diagram and mark (a) the proportional (ii)limit elastic limit (iii) fracture point and (iii) permanent set.
4	Derive the equation of continuity.
5	Derive the expression for the hydrostatic work done during isothermal expansion of an ideal gas.
6	Define the term 'Entropy' of a system. How does it change in a reversible cyclic process?
7	a. Define the centre of mass of a body? b. If the bond length of carbon monoxide molecule is $1.13A^0$, find the position of the centre of mass of the CO molecule. The mass of carbon atom is 12.00 u and that of oxygen atom is 16.00 u
8	Some football players are able to kick the ball so that the ball takes a curve. Explain the same based on Bernoulli's principle
9	What are the three different types of moduli of elasticity? Briefly explain each of them.
10	Strictly speaking, which one will be easier to lift- a 5 kg iron block or a 5 kg dry cotton. Justify your answer.

Section B

All Questions can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)

11	Derive the equation for speed of efflux using Bernoulli's principle.
12	A uniform plank of length L = 6.0 m and mass M = 90 kg rests on sawhorses separated by D = 1.5 m and equidistant from the center of the plank. A boy wants to stand on the right-hand end of the plank. If the plank is to remain at rest, how massive can the boy be?
13	A typical bedroom contains about 2500 moles of air. Find the change in the internal energy of this much air when it is cooled from 35.0°C to 26.0°C at a constant pressure of 1.00 atm. Treat the air as an ideal gas with γ= 1.4
14	600 g of ice at 0^0C is converted into water at 60^0C. Find the entropy change if the latent heat capacity of ice is 80 cal/g and the specific heat capacity of water is 1 cal $g^{-1}\ ^0C^{-1}$
15	a. Briefly explain the working of refrigerator with the help of a schematic energy flow diagram. b. Define the coefficient of performance and give its expression in terms of heats.
16	a. Derive the expression for the entropy change in free expansion of an ideal gas. b. Find the change in entropy when the volume of one mole of an ideal gas is doubled isothermally at 27^0C
17	A 15 kg solid gold statue is raised from the sea bottom. What is the tension in the hoisting cable (assumed massless) when the statue is (a) at rest and completely underwater and (b) at rest and completely out of the water? Density of gold is 19.3 x 10^3 kg/m^3, density of sea water is 1.03 x 10^3 kg/m^3 and density of air is 1.2 kg/m^3
18	A Carnot engine whose heat sink is at 27^0C has an efficiency of 40%. By how much should the temperature of the source be changed to increase the efficiency by 10% of the original efficiency.

Section C	
Answer any ONE. Each Question carries 10 marks (1x10=10 Marks)	
19	a. Explain the Otto cycle. With the help of proper PV diagram, find the expression for the efficiency of the Otto engine. b. Calculate the theoretical efficiency of an Otto – cycle engine with $\gamma = 1.4$ and the compression ratio 9.5
20	a. State and prove Bernoulli's principle. b. Using Bernoulli's principle, explain the working of Venturi meter. c. Water enters a house through a pipe with an inside diameter of 2.0 cm at an absolute pressure of 4.0 x 10^5 Pa. A pipe with diameter 1.0 cm leads to the second-floor bathroom 5.0 m above. When the flow speed at the inlet pipe is 1.5 m/s, find the flow speed and pressure at the outlet pipe