B. Sc. DEGREE END SEMESTER EXAMINATION : NOVEMBER 2023
SEMESTER 1 : COMPLEMENTARY PHYSICS FOR CHEMISTRY
COURSE : **19U1CPPHY2 : PROPERTIES OF MATTER AND THERMODYNAMICS**
(For Regular 2023 Admission and Improvement / Supplementary 2022/ 2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 60

PART A
Answer any 8 (2 marks each)

1.   What is Flexural rigidity?
2.   Explain the relation connecting the three different modulii of elasticity.
3.   Distinguish between an isochoric and isobaric process.
4.   Define Rigidity Modulus?
5.   Explain the significance of first law of thermodynamics.
6.   State Carnot's theorem.
7.   What do you mean by surface energy?
8.   What is the cause of Brownian motion?
9.   What is viscosity ?
10. Explain the relation between surface tension and surface energy.

(2 x 8 = 16)

PART B
Answer any 6 (4 marks each)

11. A bar 1 m in length and 0.01 m square in section is clamped horizontally as a cantilever. When a load of 1 kg is applied to the free end, the depression of this end is 0.04 m. Find the Young's modulus of the material of the bar.

12. The reading of a pressure meter attached with a closed water pipe is $3.5 \times 10^5 N/m^2$. On opening the valve the reading of the pressure meter is reduced to $3 \times 10^5 N/m^2$. Calculate the speed of water flowing in the pipe.

13. Obtain the expression for the change in entropy during an isothermal process.

14. An oil drop falls through air with a terminal velocity of $5 \times 10^{-4} m/s$. Calculate the terminal velocity of the same drop with half the radius.

15. 1 mole of oxygen gas expands isothermally to four times its initial volume. Calculate the increase in entropy. Given $R = 8.314 \, Jmol^{-1}K^{-1}$.

16. A rod whose radius is 0.63×10^{-2} m is supported horizontally on two knife edges of 0.7 m apart. It is loaded at the center with 0.9 kg. The depression of the middle point is observed to be 0.025×10^{-2} m. Calculate the Young's modus of the material of the rod.

17. Describe an experiment to determine the Youngs modulus of the material of a rectangular scale by non-uniform bending

18. A Carnot's engine is working between two temperatures, 600K and 300K. If the engine receives 4000J of heat from the source in each cycle, calculate the amount of heat rejected to the sink in each cycle. Calculate the efficiency of the engine and the work done by the engine in each cycle.

(4 x 6 = 24)

Answer any 2 (10 marks each)

19. Describe with theory the torsion pendulum method for determining the rigidity modulus of the material of a wire.

20. Discuss the second law of thermodynamics and explain the working of a refrigerator.

21. Derive Stoke's formula for the velocity of a small sphere falling through a viscous fluid.

22. Explain the case of Uniform bending of beams and derive the expression for elevation of midpoint of beams. Describe the experimental procedure for determination of Youngs Modulus.

(10 x 2 = 20)