

TB221380V

Reg. No :

Name :

B. Sc. DEGREE (C.B.C.S.) EXAMINATION, NOVEMBER 2022
(2022 Admissions (regular) 2021 Admissions (Improvement / Supplementary), 2020, 2019, 2018, Admissions
Supplementary)

SEMESTER I - COMPLEMENTARY COURSE 2 (PHYSICS)
(For CHEMISTRY)
PH1C02B18 - PROPERTIES OF MATTER & THERMODYNAMICS

Time : 3 Hours

Maximum Marks : 60

Part A

I. Answer any Ten questions. Each question carries 1 mark

(10x1=10)

1. Define Young's modulus.
2. Differentiate between elastic and plastic bodies.
3. Give the reason why steel girders and rails are made in the form of I –section.
4. Distinguish between uniform bending and non-uniform bending.
5. Give the reason why greased cotton soak less than ordinary cotton.
6. Argue that Reynold's number can be used to get an idea about the streamlined flow of a liquid.
7. Distinguish between stream line flow and turbulent flow.
8. Explain the term adiabatic process. Give an example.
9. List out the parameters on which internal energy of a perfect gas depend.
10. Explain a method by which we can alter the temperature of source and sink to improve the efficiency of a heat engine.
11. Is entropy a state function or a path function? Justify.
12. Give Kelvin-Planck statement of second law of thermodynamics.

Part B

II. Answer any Six questions. Each question carries 5 marks

(6x5=30)

13. A bar of width 2.5 cm and thickness 2.5 mm is supported symmetrically on two knife edges 1 m apart. When loaded with weight 100 g at each end which is projected 10 cm from the respective knife edges, the centre is elevated by 2 mm. Determine the Young's modulus of the material.
14. Two cylinders of the same length, mass and density but one solid of radius r and the other hollow of inner and outer radii r_1 and r_2 respectively. Determine which one requires more couple to twist through same angle.
15. A steel wire of length 2 m and diameter 0.5 mm stretches by 2 mm under the action of a load of 2 kg. Compute the Young's modulus of the material.
16. Write a short essay on factors affecting surface tension.
17. A river is flowing at a speed of 9km/h. If the river is 5m deep find the shearing stress between the horizontal layers of water. Given coefficient of viscosity is 0.001 Ns/m².
18. Two capillary tubes of radii r_1 and r_2 and lengths l_1 and l_2 are connected in series. Show that the rate of flow of liquid

through the combination is $\frac{\pi P}{8\eta} \left\{ \frac{l_1}{r_1^4} + \frac{l_2}{r_2^4} \right\}^{-1}$

19. In a refrigerator one removes heat from a lower temperature and deposits to the surroundings at a higher temperature. In this process, mechanical work has to be done, which is provided by an electric motor. If the motor is of 1kW power, and heat is transferred from -3°C to 27°C , find the heat taken out of the refrigerator per second assuming its efficiency is 50% of a perfect engine.
20. Efficiency of Carnot's engine increased from $1/3$ to $1/2$ when source temperature is raised by 100K. Calculate the temperature of the sink.
21. Explain the term entropy. Obtain an equation for change in entropy.

Part C

III. Answer any Two questions. Each question carries 10 marks

(2x10=20)

22. Derive the expression for couple per unit twist of a uniform cylinder.
23. Derive an expression for the depression at the loaded end of a cantilever.
24. Explain surface tension and surface energy. How are they related? Obtain an expression for the excess pressure inside a soap bubble.
25. Describe Carnot's cycle. Derive the expression for the efficiency of an ideal heat engine in terms of temperature.