

II Semester B.Sc. Examination, June 2009
(Semester Scheme)
PHYSICS – II
Properties of Matter, Heat and Thermodynamics

Time : 3 Hours

Max. Marks : 60

PART – A

Answer **any five** questions. **Each** question carries **six** marks : (5×6=30)

1. Describe, with necessary theory, the method of determining the rigidity modulus of a material by dynamic method. 6
2. a) State Toricelli's theorem and obtain an expression for the speed of efflux.
 b) Explain the 'dynamic lift' in an aeroplane based on Bernoulli's principle. (4+2)
3. What is angle of contact ? Explain. Derive an expression for the excess pressure on a curved liquid surface. (2+4)
4. Obtain an expression for the coefficient of viscosity using the concept of 'Transfer of momentum'. Hence deduce the relation between coefficient of diffusion and coefficient of viscosity. (4+2)
5. a) State and explain Zeroth law of Thermodynamics.
 b) Obtain an expression for the work done during an Isothermal process. (3+3)
6. a) What is coefficient of performance ?
 b) State and prove Carnot's theorem. (1+5)
7. a) Write the Maxwell's Thermodynamic relations.
 b) Using Maxwell thermodynamic relation, arrive at Clausius-Clapeyron's equation. (2+4)
8. Give the theory of Joule-Thomson effect and hence deduce an expression for Joule. Thomson coefficient. 6



PART - B

Answer **any four** questions. **Each** question carries **five** marks.

(4×5=)

9. A Steel wire of radius 1 mm is bent into an arc of a circle of radius 50 cms. Calculate the (i) bending moment and (ii) maximum stress. (3)
10. Eight spherical raindrops of equal size are falling vertically through air with a terminal velocity of 0.10 ms^{-1} . What should be the velocity, if these drops were to combine to form one large spherical drop ?
11. Calculate the work done in blowing a soap bubble of radius 0.026 m. What additional work should be done in order to increase its radius to double the value ? Given surface Tension of the solution as $28 \times 10^{-3} \text{ Nm}^{-1}$.
12. Calculate the probability that the speed of Oxygen molecule lies between 100 ms^{-1} and 101 ms^{-1} at 200K. Given molecular mass of oxygen as 32 gram/mole.
13. A reversible engine converts one sixth of heat input into work. When the temperature of the sink is reduced by 62 K, its efficiency is doubled ? Find the temperature of the source and the sink.
14. Vander Waal's constant for a gas is $a = 0.0245 \text{ Nm}^4/\text{mole}^2$, $b = 2.67 \times 10^{-5} \text{ m}^3/\text{mole}$ and $R = 8.14 \text{ J/k/mole}$. Calculate the temperature of inversion and critical temperature.

PART - C

Answer **any five** questions. **Each** question carries **two** marks :

(5×2=)

15. a) Can Poisson's ratio of a material be negative ? Explain.
 - b) Why light roofs are blown off during a wind storm ? Explain.
 - c) Why rain drops assume spherical shape ? Explain.
 - d) Show the graphical representation of Andrew's Isothermals in case of carbon-di-oxide.
 - e) How is the work done in an adiabatic process related to the internal energy ? Explain.
 - f) 'Entropy of the Universe always increases'. Why ?
 - g) Why 'Helmholtz function' is called as Helmholtz free energy ? Explain.
 - h) Does adiabatic demagnetization produce cooling ? Explain.
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