SM – 210

# II Semester B.Sc. Examination, June 2008
## (Semester Scheme)
## PHYSICS – II
## Properties of Matter, Heat and Thermodynamics

Time : 3 Hours Max. Marks : 60

PART – A

I. Answer **any five** of the following. **Each** question carries **six** Marks. **(5×6=30)**

1. a) What is internal bending moment ?

   b) Deduce an expression for the depression at the loaded end of a single cantilever. **(1+5)**

2. a) State and explain Bernoulli's theorem.

   b) With necessary theory describe stoke's method of determining coefficient of viscosity of a highly viscus liquid. **(2+4)**

3. a) Define surface tension and surface energy.

   b) Obtain an expression for the pressure difference across a curved liquid surface. **(2+4)**

4. a) State the principle of equipartition of energy.

   b) Deduce an expression for the diffusion coefficient of a gas on the basis of kinetic theory of gases. **(1+5)**

5. a) Distinguish between isothermal and adiabatic processes.

   b) Obtain the relation connecting pressure and volume of a gas undergoing adiabatic process. **(2+4)**

6. a) What is entropy ?

   b) Obtain an expression for the change in entropy when two gases are mixed. **(1+5)**

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7. a) Define Helmholtz and Gibb's free energy.

   b) Using Maxwell's thermodynamic relation obtain an expression for the difference in specific heats for a Vander Wall's gas. **(2+4)**

8. a) Describe porons plug experiment.

   b) Prove that enthalpy remains constant during Joule-Thomson effect. **(3+3)**

## PART – B

II. Answer **any four** of the following : **(4×5=20)**

9) A disc of mass 1 kg and radius 0.1 m is suspended by a wire of length 0.6 m and radius $5\times10^{-4}$ m. If the period of torsional oscillations is 3.9 S. Calculate the rigidity modules of the material of the wire.

10) Water is convayed through a horizonatal tube of diameter 0.08 m and length 4 km at the rate of 20 liters per second. Assuming only viscous resistance, calculate the pressure difference required to maintain the flow. $\eta$ of water = $10^{-3}$ NS $m^{-2}$.

11) Calculate the height to which water rises in a capillary tube of radius $5\times10^{-4}$ m when it is dipped in a beaker containing water. Surface tension of water is 0.07 $Nm^{-1}$ and the angle of contact is zero.

12) Calculate the dipression in the meeting point of ice for an increase of pressure of 2 atmosphere. Specific volume of ice and water at 0° C are $1.091 \times 10^{-3}$ $m^3$ $kg^{-1}$ and $1\times10^{-3}$ $m^3$ $kg^{-1}$ respectively. Latent heat of ice = $338 \times 10^3$ $Jkg^{-1}$ 1 atmosphere = $10^5$ $Nm^{-2}$.

13) One litre of hydrogen at 27° C and pressure $10^5$ $Nm^{-2}$ expands isothermally until its volume is doubled. Find the final pressure and the amount of work done.

14) A reversible heat engine of efficiency 40% has its efficiency increased to 50% when the temperature of the sink is lowered by 50K. Find the temperature of the source and the sink.

## PART – C

III. Answer **any five** of the following : **(5×2=10)**

15) a) Explain why steel girders are made in the firm of I section.

b) Why does a small air bubble rise slowly through a liquid where as the bigger one rises rapidly ?

c) Why it is difficult to separate two plates of glass with a thin layer of water between them ?

d) Explain, why $C_p$ is greater them $C_v$ ?

e) What are the factors on which the cooling due to adiabatic demagnetisation depend ?

f) The meeting point of ice decreases and that of wax increases with an increase in pressure. Explain.

g) Hydrogen gas is subjected to Joule-Kelvin effect at Lab temperature. Will it result in cooling or heating of the gas ? Explain.

h) There is always heating during adiabatic compression of a gas. Explain.