



Reg. No. :

Name :

**V Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/
Improvement) Examination, November 2022
(2019 Admission Onwards)
CORE COURSE IN PHYSICS
5B08PHY : Thermodynamics and Statistical Mechanics**

Time : 3 Hours

Max. Marks : 40

PART – A

(Short answer questions. Answer **all** questions. **Each** carries **one** mark.)

- Distinguish between intensive and extensive parameters.
- What is meant by quasistatic process ?
- State Clausius statement of second law of thermodynamics.
- Write down the Clausius-Clapeyron equation and explain the symbols.
- What is Joule Thomson expansion ?
- Explain the Bose Einstein distribution function. (6×1=6)

PART – B

(Short essay questions. Answer **any 6** questions. **Each** carries **two** marks.)

- Distinguish between microscopic and macroscopic point of view.
- Give two conditions for a process to be reversible.
- State Stefan-Boltzmann law. Write the value of Stefan-Boltzmann constant.
- Write a note on Helmholtz function and Gibbs function.
- Draw TS diagrams for
 - an isothermal process
 - an adiabatic process.P.T.O.

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- Explain why C_p is greater than C_v .
- Explain how entropy is related to disorder of the system.
- Define thermal efficiency of a heat engine. Why the efficiency of a heat engine is always less than 100% ? (6×2=12)

PART – C

(Problems. Answer **any four** questions. **Each** carries **three** marks.)

- Give the Fahrenheit temperature corresponding to the :
 - ice point
 - steam point of water.
- One mole of a gas at 92°C expands isothermally until, its volume is doubled. Calculate the work done.
- The equation of state of an ideal gas is $PV = nRT$.
 - Show that the volume expansivity β is equal to $1/T$.
 - Show that the isothermal compressibility K is equal to $1/P$.
- A company claims to have developed an engine working between 227°C and 15°C having an efficiency 45%. Comment on this claim.
- Find the rms speed of oxygen molecules at 0°C .
- One gram molecule of gas expands isothermally to four times its volume. Calculate the change in entropy in terms of the gas constant. (4×3=12)

PART – D

(Long Essay. Answer **any two** questions. **Each** carries **five** marks.)

- State and prove Carnot's theorem.
- Derive the relation connecting pressure and volume for a quasistatic adiabatic process.
 - Show that adiabatics are steeper than isotherms.
- Explain the four thermodynamic potentials and derive Maxwell's relations.
- Distinguish between Maxwell Boltzmann, Bose Einstein and Fermi Dirac statistics. (2×5=10)