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.)

1. Distinguish between intensive and extensive parameters.

2. What is meant by quasistatic process ?

3. State Clausius statement of second law of thermodynamics.

4. Write down the Clausius-Clapeyron equation and explain the symbols.

5. What is Joule Thomson expansion ?

6. Explain the Bose Einstein distribution function.

(6×1=6)

PART – B

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

7. Distinguish between microscopic and macroscopic point of view.

8. Give two conditions for a process to be reversible.

9. State Stefan-Boltzmann law. Write the value of Stefan-Boltzmann constant.

10. Write a note on Helmholtz function and Gibbs function.

11. Draw TS diagrams for
    a) an isothermal process   b) an adiabatic process.

P.T.O.

12. Explain why C_p is greater than C_v.

13. Explain how entropy is related to disorder of the system.

14. 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.)

15. Give the Fahrenheit temperature corresponding to the :
    a) ice point   b) steam point of water.

16. One mole of a gas at 92°C expands isothermally until, its volume is doubled. Calculate the work done.

17. The equation of state of an ideal gas is PV = nRT.
    a) Show that the volume expansivity β is equal to 1/T.
    b) Show that the isothermal compressibility K is equal to 1/P.

18. A company claims to have developed an engine working between 227°C and 15°C having an efficiency 45%. Comment on this claim.

19. Find the rms speed of oxygen molecules at 0°C.

20. 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.)

21. State and prove Carnot's theorem.

22. a) Derive the relation connecting pressure and volume for a quasistatic adiabatic process.
    b) Show that adiabatics are steeper than isotherms.

23. Explain the four thermodynamic potentials and derive Maxwell's relations.

24. Distinguish between Maxwell Boltzmann, Bose Einstein and Fermi Dirac statistics.   **(2×5=10)**

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