



23105164

QP CODE: 23105164

Reg No :

Name :

**B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS,
MARCH 2023**

Sixth Semester

CORE COURSE - PH6CRT09 - THERMAL AND STATISTICAL PHYSICS

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model
II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

436477F7

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What is critical temperature?
2. State the significance and limitations of first law of thermodynamics.
3. What is an indicator diagram? What is its significance?
4. State second law of thermodynamics.
5. Explain Carnot theorem.
6. Define entropy of a thermodynamic system.
7. What is enthalpy?
8. What is meant by zero point energy?
9. Define coefficient of thermal conductivity. What are its dimensions?
10. Define Grand Canonical ensemble.
11. Differentiate between classical statistics and quantum statistics.
12. Write down BE distribution law and explain the symbols.

(10×1=10)





Part B

Answer any **six** questions.

Each question carries **5** marks.

13. The van der Waals constants for Carbon dioxide are $a=1.32 \times 10^4 \text{ N m}^4 \text{ mole}^{-2}$ and $b=3.64 \times 10^{-5} \text{ m}^3 \text{ mole}^{-1}$. Calculate the critical pressure and temperature.
14. Explain thermal equilibrium. State and explain Zeroth Law of thermodynamics. Introduce the concept of temperature based on this law.
15. Discuss in detail coefficient of expansivity and compressibility.
16. Apply first law of thermodynamics to derive $C_p - C_v = R$
17. Calculate the increase in entropy of 1 kg of ice when it is converted into steam. Given the specific heat of water is $1 \text{ kcal/kg}^\circ\text{C}$, latent heat of ice is 80 k cal/kg and the latent heat of steam is 540 k cal/kg .
18. Prove that in a T-S diagram the slope of isochoric curve is T/C_v and that of isobaric curve is T/C_p .
19. Write down the Maxwell's relations and use them to show that the internal energy is a function of T only.
20. Flip a coin 6 times. Calculate the total number of microstates and also the most probable microstate.
21. The first vibrational energy of a diatomic molecule is 600 cm^{-1} above the ground state. Calculate the relative population in these levels at 127°C .

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **10** marks.

22. Explain the working of a Carnot's Engine. Arrive at an expression for the work done in a cycle.
23. a) What do you mean by thermal radiations? Explain the nature and properties of thermal radiations. b) Explain the terms emissive power, absorptive power and radiant emittance,





24. State Stefan- Boltzmann law of radiation. Deduce this law on thermodynamic considerations.
25. What is FD statistics? What are the basic postulates used? Derive an expression for the most probable distribution of the particles governed by FD statistics.

(2×10=20)

