

TB246960F

Reg. No : .....

Name : .....

## BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2021 ADMISSIONS REGULAR

SEMESTER VI - CORE COURSE (PHYSICS )

PH6B09B18 - Thermal and Statistical Physics

Time : 3 Hours

Maximum Marks : 60

## Part A

I. Answer any Ten questions. Each question carries 1 mark

(10x1=10)

1. What are critical constants? Explain briefly.
2. What is an indicator diagram? Explain its importance.
3. Give Kelvin's and Clausius statements for the second law of thermodynamics.
4. Distinguish between open system and closed system.
5. What is T-S diagram? Explain its importance.
6. What is meant by enthalpy?
7. Explain Gibb's free energy.
8. Explain the term intrinsic energy of a system.
9. Distinguish between  $\mu$  space and gamma space.
10. State and explain the principle of equal a priori probability.
11. What is the total number of microstates possible for a system containing N particles distributed in two compartments?
12. Explain the concept of cells in phase space. What is the volume of a cell in six dimensional phase space?



## Part B

II. Answer any Six questions. Each question carries 5 marks

(6x5=30)

13. Explain the behavior of gases at high pressure.
14. Determine the efficiency of a Carnot's engine working between steam point and ice point.
15. A Carnot's engine has same efficiency between 1000K and 500K and between xK and 1000K (temperature of the sink). Calculate x .
16. Describe how has the idea of a black body been achieved in practice?
17. Discuss the Kirchoff's law of heat radiation.
18. One mole of oxygen gas expands isothermally to four times its initial volume. Calculate the increase in entropy.
19. Write a short note on Gibb's paradox
20. What is an electron gas? Starting from Fermi – Dirac distribution law, derive an expression for the energy distribution of free electrons in a metal.
21. Calculate the probability that in tossing a coin 10 times, one gets a) 5 heads and 5 tails b) 7 heads and 3 tails.

## Part C

III. Answer any Two questions. Each question carries 10 marks

(2x10=20)

22. Describe Andrew's experiments on carbon dioxide. Discuss the results obtained. What is the importance of these results in the liquefaction of gases?

23. Explain the working of a Carnot's engine with the help of an indicator diagram. Arrive at an expression for the work done in a cycle.
24. Describe Maxwell's thermodynamic relations using thermodynamic variables.
25. What is Bose – Einstein statistics? Derive an expression for the most probable distribution of a system obeying this statistics.

