QP CODE: 22100925

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, APRIL 2022

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

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Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Explain thermodynamic system and thermodynamic variables.
2. Define isothermal compressibility.
3. Define molar specific heat capacity at constant volume.
4. Deduce the relation between, coefficient of performance of refrigerator and efficiency of heat engine
5. What is meant by Kelvin's absolute scale of temperature?
6. Briefly explain the concept of entropy.
7. What is enthalpy?
8. Deduce equation for thermal conductivity.
9. State Stefan's law.
10. What is meant by thermodynamic probability?
11. Define Canonical ensemble.
12. What are the characteristics of Bose particles?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Explain Andrew's experiment on carbon dioxide. Discuss the results obtained.

14. Derive the general expression for work done by a thermodynamic system of gas in a cylinder. Show the work is a path dependent function.

15. An ideal gas expands to 6 times its initial volume at constant temperature. If the pressure after expansion is 18 Pa, find the initial pressure.

16. A Carnot engine operates between 27^{o} C and 127^{o} C. In each cycle, it receives 800 calories heat from the source. Calculate the amount of heat rejected to the sink in each cycle. Calculate the efficiency of the engine and the work done in each cycle.

17. 10 gm of water is heated from 40^{0} C to 80^{0} C. Calculate the change in entropy.

18. Find the expression for efficiency of a reversible Carnot's engine with the help of T-S diagram.

19. Prove that it is impossible to obtain absolute zero temperature.

20. A system has two energy levels with an energy gap of 1.2×10^{-21} J. The upper level is two - fold degenerate. Calculate the probability that lower level is occupied if the system is in thermal contact with heat reservoir at 150 K.

21. A certain energy level allowed for a fermion has degeneracy g=10. Find the number of ways 4 such identical fermions can be filled in this energy level?

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. What are critical constants of a gas? Deduce the expression for critical constants in terms Van der Waals constants.

23. Define heat capacity and internal energy? Derive (i) difference of heat capacity equations(C_p-C_v) using Tds equations and (ii) first energy equation.

24. Describe Lee's disc method to determine the thermal conductivity of a bad conductor.

25. Derive Maxwell Boltzmann distribution law.

(2×10=20)