QP CODE: 21101105

21101105

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) EXAMINATION, APRIL 2021

Sixth Semester

CORE - 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

F7510057

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. How does a real gas differ from an ideal gas?
2. What is meant by quasi-static process? Can it be achieved in practice?
3. Explain internal energy of a system.
4. Prove the equivalence of Clausius and Kelvin- Planck's statement of the second law of thermodynamics.
5. Discuss the reversibility of a Carnot's cycle.
6. Define entropy of a thermodynamic system.
7. Represent Carnot Cycle on a temperature-entropy diagram.
8. Write Maxwell's four thermodynamic relations.
9. What is Stefan's constant? What is its unit?
10. Calculate the volume of a phase cell in mu space.
11. Give two examples of fermions.
12. What are the postulates used in BE statistics?

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. Explain thermal equilibrium. State and explain Zeroth Law of thermodynamics. Introduce the concept of temperature based on this law.

14. Deduce the equation for enthalpy from molar specific heat at constant pressure and molar specific heat at constant temperature.

15. Calculate the work done when unit mass of an ideal gas expands isothermally at 27°C to double its original volume. [R= 8.3145Jmol^{-1}K^{-1}]

16. Define thermodynamic scale of temperature and show that this scale agrees with that of perfect gas scale.

17. Show that for a perfect gas $(\partial U/\partial V)_T = 0$.

18. Derive Clausius - Clapeyron latent heat equation using first Tds equation.

19. An ice box is built of wood of 1.75 cm thick, lined inside with cork of 3cm thick. If the temperature of the inner surface of cork is 0^0 C and that of outer surface of wood is 12^0 C. What is the temperature of interface? The thermal conductivity of wood and cork are 0.0006 and 0.00012 CGS units respectively.

20. The first vibrational energy of a diatomic molecule is 600 cm^{-1} above the ground state. Calculate the relative population in these levels at 127^0 C.

21. Explain in detail the three types of ensembles.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Derive and discuss Van der Waals equation of state of a gas. Discuss the limitation of Van der Waals equation.

23. What happens to the change in entropy of a system when it undergoes (a) a reversible change (b) an irreversible change (c) an adiabatic process.

24. a) What do you mean by thermal radiations? Explain the nature and properties of thermal radiations.
    b) Explain the terms emissive power, absorbtive power and radiant emittance.

25. Derive Maxwell Boltzmann distribution law.

(2×10=20)