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20100435

QP CODE: 20100435

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Reg No : .....

Name : .....

BSc DEGREE (CBCS) EXAMINATION, MARCH 2020

Sixth Semester

Core course - PH6CRT09 - THERMAL AND STATISTICAL PHYSICS

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

2017 Admission Onwards

1C131905

Time: 3 Hours Maximum Marks :60

Part A

Answer any ***ten*** *questions.*

Each question carries 1 mark.

1. Explain the state of thermodynamic equilibrium.
2. What is irreversible process? Give examples of irreversible process.
3. What is a cyclic process? Give example.
4. Define molar specific heat capacity at constant volume.
5. Define efficiency of heat engine.
6. What is the importance of T-S diagram ?
7. What is the physical significance of thermodynamic potentials?
8. Write heat capacity equations.
9. Define coefficient of thermal conductivity. What are its dimensions?
10. Write down the expression for average energy of a particle and explain the symbols.
11. Grand canonical ensemble can be considered as an open system. Why?
12. Give two examples of bosons.

(10×1=10)

Part B

Answer any six questions

Each question carries 5 marks

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

14. Why it is necessary to modify the ideal gas equation of state? Describe how van der Waals corrections are introduced in the ideal gas equation.

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. Derive Clausius –Clapeyron Latent heat Equation.

17. State and prove the principle of increase of entropy.

18. Assuming the specific heat capacity of water, find the change in entropy when 0.1 kg of water at 15^0 C is mixed with 0.16kg of water at 40^0 C.

19. Calculate the maximum amount of heat which may be lost per second by radiation from a sphere of 5cm in diameter at a temperature of 600K when placed in an enclosure at a temperature of 300K. (σ=5.7X10 $^{-12}$).

20. A free particle moves along a line of length L in the positive X-direction. Let the momentum of the particle be p_x and energy be $E = c\, p_x$ where c is a constant. Obtain the density of states.

21. An atom has two energy levels E_1 = 0.2 eV and E_2 = 0.4 eV with degeneracies g_1 = 1 and g_2 = 2. In equilibrium at temperature T=300 K, the number of atoms in the lower energy level E_1 is n1=100,000. Find the number of atoms in the higher energy level E_2 using Maxwell-Boltzmann statistics. (Round-off the answer to nearest integer)

(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. Explain thermodynamic potential and their relations with thermodynamic variables.

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)