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G – 2478

Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree Examination, May 2019

First Degree Programme under CBCSS

COMPLEMENTARY COURSE

PY 1231.3 – THERMAL PHYSICS AND STATISTICAL MECHANICS

(For Statistics)

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

PART – A

very short answer type.

Answer all questions in one word or maximum of two sentences. Each question carries one mark.

1. State Wiedmann — Franz law.
2. What is an adiabatic process?
3. Explain thermal conductivity.
4. Write down the expression for isothermal elasticity.
5. State Kelvin statement of the Second law of Thermodynamics.

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6. Write down the expression for work done by an ideal gas in an isothermal process.
7. Explain Dulong — Petit law.
8. Write down Rayleigh — Jeans law.
9. State Pauli's exclusion principle.
10. Give an example each for a Fermion and a Boson.

(10 × 1 = 10 Marks)

#### PART – B

Answer **any eight** questions in about one paragraph. Each carry two marks

11. State and explain Carnot's theorem.
12. Show that  $C_p - C_v = nR$ .
13. Describe the TS diagram for Carnot cycle.
14. Explain the concept of phase space.
15. Describe Fermi energy.
16. State and explain Stefan's law.
17. Discuss the change in entropy during a reversible process.
18. Distinguish between reversible and irreversible processes.
19. Compare average velocity, root mean square velocity and most probable velocity.

20. Describe the Planck radiation formula.
21. Explain the Einstein model of specific heat of a solid.
22. What is the connection between entropy and available energy?

(8 × 2 = 16 Marks)

### PART – C

Answer **any six** questions. Each carries four marks.

23. Find the work done by 2 moles of Hydrogen gas when it expands to thrice its initial volume at constant temperature of 300 K.
24. A motor car tyre has a pressure of 2 atmos at room temperature of 27°C. If it suddenly bursts, find its resulting temperature. Take  $\gamma = 1.4$ .
25. A Carnot engine of source temperature 400 K absorbs 200 joules of heat and rejects 150 calories into the sink. Find the temperature of the sink and the efficiency.
26. Derive the expression for work done by an ideal gas during an adiabatic process.
27. Compare the three distribution laws in statistical mechanics.
28. Explain the Carnot cycle with suitable diagram.
29. Describe how the Rayleigh — Jeans law fails to explain the black body spectrum.
30. Explain the change in entropy when ice is converted into steam.
31. State and explain Wein's displacement law.

(6 × 4 = 24 Marks)

PART – D

Answer **any two** questions. Each carries fifteen marks.

32. Describe the working of a Carnot engine. Derive the expression for its efficiency
33. Explain the Lee's disc experiment to measure thermal conductivity
34. Derive the expressions for molecular energies of an ideal gas
35. Explain the specific heat of electrons in a metal using Fermi – Dirac statistics.

(2 × 15 = 30 Marks)

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