# PSG COLLEGE OF ARTS & SCIENCE
## (AUTONOMOUS)

### BSc  DEGREE EXAMINATION MAY 2024
(Second Semester)

### Branch- PHYSICS

### THERMAL AND STATISTICAL PHYSICS

Time: Three Hours                          Maximum: 75 Marks

## SECTION-A (10 Marks)
### Answer ALL questions
ALL questions carry EQUAL marks          $(10 \times 1 = 10)$

| Module No. | Question No. | Question | K Level | CO |
|---|---|---|---|---|
| 1 | 1 | Liquid thermometers are filled with _____<br>a) Mercury                b) alcohol<br>c) Gallium                d) Both  a & b | K1 | CO1 |
| | 2 | Total seebeck effect can be found as<br>a) Total peltier effect        b) Total Thomson effect<br>c) Partly peltier and partly Thomson effect<br>d) None of the mentioned | K2 | CO1 |
| 2 | 3 | The gas with the highest critical temperature is _____.<br>a) $H_2$        b) $H_e$        c) $N_2$        d) $CO_2$ | K1 | CO2 |
| | 4 | The phenomena of super conductors was first discovered by<br>_____<br>a) Kammerlingh Onnes        b) Neils bohr<br>c) Richard Smalley        d) Otto lehman | K2 | CO2 |
| 3 | 5 | Thermal conductivity is defined as the heat flow per unit time<br>a) When the temperature gradient is unity<br>b) Across the wall with no temperature<br>c) Through a unit thickness of the wall<br>d) Across unit area where the temperature gradient is unity | K1 | CO3 |
| | 6 | As the wavelength of the radiation decreases, the intensity of the black body radiations _____<br>a) Increases                b) Decreases<br>c) First increases then decrease  d) First decreases then increase | K2 | CO3 |
| 4 | 7 | The First Law thermodynamics expresses<br>a)  Law of conservation energy<br>b)  Law of conservation of mass<br>c)  Law of conservation of momentum<br>d)  All the above | K1 | CO4 |
| | 8 | Entropy is a measure of<br>a)  Perfect order        b) Available energy<br>c)  Disorder        d) None of the above | K2 | CO4 |
| 5 | 9 | Maxwell-Boltzmann statistics is applicable to<br>a)  identical and distinguishable particles<br>b)  identical and indistinguishable particles<br>c)  fermions<br>d)  bosons | K1 | CO5 |
| | 10 | The quantity $e^{-E_i/KT}$ is known as<br>a)  Bose Einstein factor        b) Boltzmann factor<br>c   Einstein factor        d) None of the above | K2 | CO5 |

## SECTION – B (35 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks          (5 × 7 = 35)

| Module No. | Question No. | Question | K Level | CO |
|---|---|---|---|---|
| 1 | 11.a. | Discus the working of the electrical resistance thermometer. | K5 | CO3 |
| | | (OR) | | |
| | 11.b. | Describe the construction and working of platinum resistance thermometer. | | |
| 2 | 12.a. | Discuss the Thomson effect. | K3 | CO3 |
| | | (OR) | | |
| | 12.b. | Derive Van der Waal's equation. | | |
| 3 | 13.a. | Describe Lee's method for determination of the thermal conductivity of bad conductor. | K3 | CO3 |
| | | (OR) | | |
| | 13.b. | Deduce Newton's law of cooling from Stefan's law. | | |
| 4 | 14.a. | Calculate the efficiency of Carnot engine working between the steam point and ice point. | K4 | CO4 |
| | | (OR) | | |
| | 14.b. | What are Thermodynamic potentials? Explain their applications. | | |
| 5 | 15.a. | Obtain an expression for Maxwell Boltzmann distribution law. | K4 | CO4 |
| | | (OR) | | |
| | 15.b. | Explain the Photon gas. | | |

## SECTION -C (30 Marks)
Answer **ANY THREE** questions
ALL questions carry **EQUAL** Marks     (3 × 10 = 30)

| Module No. | Question No. | Question | K Level | CO |
|---|---|---|---|---|
| 1 | 16 | Describe the construction and working of thermoelectric thermometer. | K4 | CO4 |
| 2 | 17 | Enumerate the adiabatic demagnetization of paramagnetic salt. | K4 | CO4 |
| 3 | 18 | Describe the Forbe's method. | K4 | CO4 |
| 4 | 19 | Derive Maxwell thermodynamic relations. | K5 | CO3 |
| 5 | 20 | Deduce the expression for Fermi – Dirac distribution. | K5 | CO3 |

Z-Z-Z          END