PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2024
(Fourth Semester)

Branch – **PHYSICS**

APPLIED THERMODYNAMICS AND STATISTICAL MECHANICS

Time: Three Hours | Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1. The _____ of a substance is that physical quantity which remains constant when the substance undergoes a reversible adiabatic process.
   (i) enthalpy (ii) phase space
   (iii) black body (iv) entropy

2. The three rectangular coordinates x, y, z describing the position of an atom and the three rectangular components of momentum of the atom p_x, p_y, p_z together give the state of an atom in a six – dimensional space is called the _____.
   (i) radiation (ii) gamma space
   (iii) phase space (iv) space radiation

3. The particles which obey Pauli's exclusion principle are called _____.
   (i) Photons (ii) Bosons
   (iii) Mesons (iv) Fermions

4. The heat required to raise the temperature of one gram molecule of the substance through 1°C is known as _____ of a substance.
   (i) specific heat (ii) absorption
   (iii) capacity (iv) emission

5. A perfectly _____ is one which absorbs all the heat radiations incident on it.
   (i) radiation (ii) black body
   (iii) absorption (iv) emission

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6. (a) State and explain first law of thermodynamics.
   (OR)
   (b) Explain Entropy in terms of probability.

7. (a) Give an account on phase space.
   (OR)
   (b) Discuss about canonical ensemble.

8. (a) What are Bosons? Give examples.
   (OR)
   (b) What are Fermions? Give examples.

9. (a) Explain about molecular beams.
   (OR)
   (b) Apply statistics and explain quantized linear oscillator.

Cont...

10. (a) What are quantum statistics?

(OR)

(b) Write short notes on Electron gas.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11. (a) Derive Maxwell's thermodynamical relations.

(OR)

(b) State and explain Carnot's theorem.

12. (a) Classify ensemble and explain about grand canonical ensemble.

(OR)

(b) State and prove Liouville's theorem.

13. (a) Develop Bose – Einstein distribution law.

(OR)

(b) Discuss Bose – Einstein Condensation.

14. (a) Derive Maxwell's law of distribution of velocities.

(OR)

(b) Write a detailed note on specific heat capacity of a diatomic gas.

15. (a) Discuss about Einstein's theory of specific heat of solids.

(OR)

(b) Explain about Debye's model of specific heat of solids.

Z-Z-Z END