

(6 pages)

Reg. No. : \_\_\_\_\_

Code No. : 10030 E      Sub. Code : SMPH 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Second Semester

Physics — Core

THERMAL PHYSICS AND STATISTICAL  
MECHANICS

(For those who joined in July 2017 2019 only)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 1 = 10 marks)

Answer ALL questions,  
choose the correct answer

1. The phenomena of super conductors was first discovered by
  - (a) KammerlinghOnnes
  - (b) Neilsbohr
  - (c) Richard Smalley
  - (d) Otto lehman

2. In mechanical refrigeration system, the refrigerant has the maximum temperature
  - (a) In evaporator
  - (b) Before expansion valve
  - (c) Between compressor and condenser
  - (d) Between condenser and evaporator
3. Diffusion can occur in \_\_\_\_\_ materials
  - (a) solid
  - (b) liquid
  - (c) gaseous
  - (d) all of these
4. When is deviation more in the behaviour of a gas from the ideal gas equation  $PV = nRT$ 
  - (a) At high temperature and low pressure
  - (b) At high temperature and high pressure
  - (c) At low temperature and low high pressure
  - (d) At low temperature and high pressure
5. A thermodynamic process where no heat is exchanged with the surroundings is
  - (a) isothermal
  - (b) adiabatic
  - (c) isobaric
  - (d) isotropic



In a Carnot cycle, the working medium receives heat at a \_\_\_\_\_ temperature.

- (a) lower
- (b) higher
- (c) constant
- (d) none of mentioned

Which of the following laws was expressed by Nernst?

- (a) The first law of thermodynamics
- (b) The second law of thermodynamics
- (c) Third law of thermodynamics
- (d) None of the above

The entropy is

- (a) an intensive property
- (b) an extensive property
- (c) both (a) and (b)
- (d) none of the above

Maxwell-Boltzmann law is for the \_\_\_\_\_

- (a) Distinguishable particles
- (b) Indistinguishable Particles
- (c) Particles with half integral spin
- (d) Particles with integral spin

10. Bosons have symmetrical wave functions. They do not obey \_\_\_\_\_

- (a) Aufbau principle
- (b) Pauli's Exclusion Principle
- (c) Hund's Rule of Maximum Multiplicity
- (d) Heisenberg's Uncertainty Principle

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Compare Helium I and II.

Or

(b) List out the applications of superfluidity.

12. (a) Derive an expression for pressure gas laws.

Or

(b) Narrate an essay on Vander Walls constant.

13. (a) State and prove Carnot's theorem.

Or

(b) Discuss about the working principle and efficiency of Otto Engine.



4. (a) State and explain the third law of thermodynamics.

Or

(b) List out the applications for Maxwell's thermodynamics relation.

5. (a) Write a note on phase space.

Or

(b) Explain the Fermi-Dirac statistics distribution law.

SECTION C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Describe about the liquefaction of Helium.

Or

(b) Narrate an essay on adiabatic demagnetization of air conditioner.

17. (a) Explain the transport phenomena in gases.

Or

(b) Discuss about the laws for kinetic theory of gases.

18. (a) Calculate the work done during adiabatic and isothermal process.

Or

(b) Explain the working principle of Carnot's Engine.

19. (a) Describe about the effect of pressure on melting point and boiling point.

Or

(b) Explain the relation between Clausius Clapeyron equation and specific heat.

20. (a) Write an essay on thermodynamic probability.

Or

(b) Compare Maxwell Boltzmann, Bose-Einstein and Fermi-Dirac statistics distribution law.

