

Code No. : 20445 E Sub. Code : CMPH 41

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

Fourth Semester

Physics – Core

HEAT AND THERMODYNAMICS

(For those who joined in July 2021 – 2022)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Liquid Helium below 2.19K is called
 - (a) Helium II
 - (b) Helium I
 - (c) Nitrogen
 - (d) Oxygen
2. The inversion temperature of air is
 - (a) > 0
 - (b) < 0
 - (c) $= 0$
 - (d) None
8. The efficiency of an Otto cycle is increased by increasing _____
 - (a) pressure ratio
 - (b) compression ratio
 - (c) temperature ratio
 - (d) both (a) and (b)
9. The entropy of an isolated system can never _____
 - (a) increase
 - (b) decrease
 - (c) be zero
 - (d) none of the mentioned
10. The value of c_p and c_v depend on
 - (a) temperature of the gas
 - (b) γ and R
 - (c) pressure of the gas
 - (d) all of the mentioned

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Write short notes on Helium II.
- Or
- (b) How adiabatic demagnetisation produce low temperature Explain.

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3. What is the average velocity of the molecules of an ideal gas?
 - (a) Infinity
 - (b) Constant
 - (c) Unstable
 - (d) Zero
4. On which factor does the average kinetic energy of gas molecules depend?
 - (a) Nature of the gas
 - (b) Temperature
 - (c) Volume
 - (d) Mass
5. Heat transfer takes place according to which of the following law?
 - (a) Newton's second law of motion
 - (b) First law of thermodynamics
 - (c) Newton's law of cooling
 - (d) Second law of thermodynamics
6. The unit of absorptive power is _____
 - (a) T
 - (b) Ts^{-1}
 - (c) Ts
 - (d) No unit
7. On a temperature entropy chart, Carnot cycle will be a
 - (a) Rhombus
 - (b) Rectangle
 - (c) Triangle
 - (d) Square

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12. (a) Deduce an expression for the pressure of a gas on the basis of this Kinetic theory.
- Or
- (b) Deduce the equation of state for real gases obtain expression for the critical constants of a gas.
13. (a) Describe Forbe's method for determining the thermal conductivity of a metal rod.
- Or
- (b) Deduce stefans law of radiation from principles of thermo dynamics.
14. (a) State and explain first law of thermo dynamics.
- Or
- (b) State Carnot's theorem deduce it from the second law of thermo dynamics.
15. (a) Define entropy show that entropy remains constant in a reversible engine.
- Or
- (b) Derive clausius clapeyron's equation.

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[P.T.O.]

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Explain liquification of Helium.

Or

- (b) Discuss briefly refrigerators and air conditioning machines.

17. (a) Derive on the basis of kinetic theory of gases, laws for an ideal gas.

Or

- (b) Obtain the expression for the viscosity of a gas in terms of mean free path.

18. (a) Explain lee's disc method determining thermal conductivity of a bad conductor.

Or

- (b) Define solar constant. Explain with necessary theory how the solar constant is determined.

19. (a) Derive an expression for work done during adiabatic and isothermal process.

Or

- (b) Explain the diesel engine cycle.

20. (a) What is T-S diagram? In what respect it is superior to the indicator diagram.

Or

- (b) Derive Maxwell Thermodynamical relation.