

(6 pages)

Reg. No. :

Code No. : 20036 E Sub. Code : CMPH 41

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fourth Semester

Physics – Core

HEAT AND THERMODYNAMICS

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Who first liquefied helium?
 - (a) Heike Kamerlingh Onnes
 - (b) William Ramsay
 - (c) Lord Kelvin
 - (d) Robert Boyle

2. What is the primary function of an air conditioner?
 - (a) to heat the air
 - (b) to cool the air
 - (c) to purify the air
 - (d) to humidity the air
3. The van der waals equation of state is used for _____
 - (a) ideal gas
 - (b) real gas
 - (c) both ideal and real gas
 - (d) any gas at very high temperature
4. On which factor does the kinetic energy of gas molecular depend?
 - (a) nature of the gas
 - (b) temperature
 - (c) volume
 - (d) mass
5. Optical pyrometer is generally used to measure _____
 - (a) low pressure
 - (b) low temperature
 - (c) high temperature
 - (d) high pressure

6. Which of the following is the rate of heat transfer unit?
(a) Watt (b) Pascal
(c) Joule (d) Newton
7. The law that forms the basis of measurement of temperature is _____ law of thermodynamics
(a) zeroth (b) first
(c) second (d) third
8. The work done in an adiabatic change in a gas depends only on change of _____
(a) pressure (b) volume
(c) temperature (d) none
9. Heat and work are _____
(a) extensive properties
(b) intensive properties
(c) point function
(d) path function
10. The entropy of an isolated system can never _____
(a) increase (b) decrease
(c) be zero (d) none of the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the process of liquefaction of helium.
Or
(b) Define super fluidity and give its application.
12. (a) Which laws are called gas laws? Explain them.
Or
(b) Derive the relation between Vander wall's constant and critical constants.
13. (a) Discuss the distribution of energy in black body radiation.
Or
(b) Define solar constant. Describe a pyroheliometer used to determine solar constant.
14. (a) State and explain the first law of thermodynamics.
Or
(b) Define adiabatic process. Derive the gas equation during an adiabatic process.

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

Or

- (b) Explain the temperature entropy diagram.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Describe, with necessary theory, the method of producing very low temperatures by adiabatic demagnetisation.

Or

- (b) Describe in detail the principle and working of a refrigerator.

17. (a) Derive the expression for pressure of a gas.

Or

- (b) Obtain an expression for the coefficient of thermal conductivity of a gas applying the kinetic theory.

18. (a) Describe Forbe's method of determining the thermal conductivity of a metallic bar.

Or

- (b) State Stefan's law of radiation and deduce Newton's law of cooling from it.

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19. (a) State and prove Carnet's theorem.

Or

- (b) Explain the working of diesel engine and deduce its efficiency.

20. (a) Deduce the first latent heat equation.

Or

- (b) Derive the expression for entropy of perfect gas

(i) In terms of pressure and temperature

(ii) In terms of volume and pressure.

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