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Exam Code : D-23

Subject Code—60417

B. Sc. EXAMINATION

(Batch 2019 Onwards) (Main/Re-appear)

(Third Semester)

PHYSICS

CPL-302 (Course V)

Heat and Thermodynamics

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) Give sign conventions followed in the study of thermodynamics. 2
- (b) Why specific heat at constant pressure is more than specific heat at constant volume ? 2

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P.T.O.

- (c) Why does a rubber spring heat up on stretching ? 2
- (d) What are the major differences between real and ideal gases ? 2
- (e) Do all substances get cooled on adiabatic expansion ? Explain. 2
- (f) What are the different types of van der-Waals forces ? 2
- ✓(g) State isothermal and adiabatic processes. 2
- ✓(h) State T-S diagram. 2

Unit I

2. (a) Explain the process of melting of solids and boiling of liquids using first law of thermodynamics. 12
- (b) The efficiency of a Carnot heat engine cannot be 100% even when there is no dissipation of energy. Explain. 4

- ✓ 3. (a) Show that no irreversible heat engine can have efficiency greater than that of a reversible heat engine working between the same temperature limits. 10
- (b) What do you understand by the coefficient of performance in refrigerator ? Explain. 6

Unit II

4. (a) Derive an expression for the entropy of one mole of an ideal gas and calculate the change in entropy in a reversible isothermal expansion from a volume V_1 to V_2 . 12
- (b) Explain, what do you understand by a thermodynamic scale of temperature ? 4
5. (a) What do you mean by Phase transition ? Explain 1st and 2nd order phase transitions both mathematically and graphically. 12

- (b) What do you mean by increase in entropy? Explain with an example. 4

Unit III

6. (a) Define Helmholtz and Gibbs's function. Derive all the four Maxwell's thermodynamical relation. 12
- (b) Explain the coefficient of volume and pressure expansion with their physical significances. 4
7. (a) Explain the phenomena of change in temperature during adiabatic process. 8
- (b) Derive the possible Internal energy equations for both ideal and van der-Waals gases. 8

Unit IV

8. (a) Explain the free adiabatic expansion of a perfect gas. 8

(b) Explain the comparison of van der waals equation of state for a gas with experimental curves through the PV diagram.

9. (a) Explain the continuity of liquid and gaseous state. Also differentiate between vapour and gas.

(b) Can a gas be liquefied at any temperature by increase in pressure alone ?

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1,310

Now $C_p = C_v + R$ and divide by C_v
We get