C 40625

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SIXTH SEMESTER U.G. DEGREE EXAMINATION MARCH 2023

(CBCSS—UG)

Physics/Applied Physics

PHY 6B 10/APH 6B 10—THERMODYNAMICS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

The symbols used in question paper have their usual meanings.

Section A (Short Answer Type)

Answer **all** *questions in two* **or** *three sentences, each correct answer carries a maximum of 2 marks.*

1. Prove that all Carnot engines operating between the same two reservoirs have the same efficiency.

2. What are the features of thermodynamic temperature scale ?

3. Plot the TS diagram of a Carnot's cycle.

4. What are the insights obtained from the relation $dU = \dorm{d}W + \dorm{d}Q$?

5. What is Helmholtz function ? Why is it important ?

6. Derive Clausius theorem.

7. What are the general characteristics of macroscopic co-ordinates ?

8. Distinguish between the systems separated by adiabatic walls and diathermic walls.

9. How is external work different from internal work ?

10. Differentiate between isobaric and isochoric processes.

11. State and explain the second law of thermodynamics.

12. Comment on the molar heat capacities of monatomic gases.

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Turn over

Section B (Paragraph/Problem Type)

Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks.

13. Under what pressure ice freezes at 271 K if the change in specific volume when 1 kg. of water freezes is 91×10^{-6} m^3. Given latent heat of ice = 3.36×10^5 Jkg^{-1}.

14. Prove the principle of increase of entropy.

15. What is a hydrostatic system ? Briefly explain.

16. Show that adiabatics are steeper than isothermals.

17. A mass of mercury at standard atmospheric pressure and a temperature of 25 °C is kept at constant volume. If the temperature is raised to 27°C, what will be the final pressure ? For mercury, volume expansivity = 1.81×10^{-4} K^{-1} and the isothermal compressibility = 4.01×10^{-11} Pa^{-1}.

18. Determine the work done in an adiabatic process in terms of temperature.

19. Derive the relation connecting Cp and Cv.

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Section C (Essay Type)

Essay-Answer in about two pages, any one questions.
The question carries 10 marks.

20. Discuss the equality of the ideal gas and thermodynamic temperatures.

21. Explain the PV diagram and PT diagram of H_2O.

($1 \times 10 = 10$ m