Chapter- 13

Thermodynamics

Very Short Answer Type Questions

01. What is the change in internal energy of a system that has absorbed 2 kcal of heat and done 500J of work?

02. When two bodies will be said to be in thermal equilibrium. Write the physical quantity that determines the thermal equilibrium.

03. Name the thermodynamic variables defined by (i) Zeroth law and (ii) 1st law of thermodynamics

04. What do you mean by the internal energy of the system?

05. What is an indicator diagram? What does the area between p - v curve and volume axis signify?

06. What is an isothermal process?

07. What is an adiabatic process?

08. What is the equation of state of (i) Isothermal process. (ii) Adiabatic process.

09. What is the cyclic process?

10. What is a reversible process? Give an example.

11. On what factors efficiency of a Carnot heat engine depends?

12. Explain how heat engine is different from the refrigerator.

Short questions (2 Marks)

13. Why $C_P > C_V$? Can the specific heat of gas be infinity?

14. What is a heat pump? Give an example.

15. Derive an expression for the work done by gas, undergoing expansion from volume V_1 and V_2.

16. What is the isobaric process? Plot P versus V graph. What is the work done in the isobaric process.

17. Find the bulk modulus of gas for the isothermal, adiabatic, isobaric and isochoric process.

18. State the 1st Law of Thermodynamics. What are the limitations of the first law of thermodynamics?

19. A gas of heat capacity 1200J/kg absorbs 1500 Cal of heat and does 6300J of work. Find the increase in temperature of the system.

20. A gas is compressed from V_1 to V_2. In which casework is done will be more isothermal compression or adiabatic compression?

21. A refrigerator is to maintain eatables kept inside at 9^0C. If the room temperature is 36^0c, calculate the coefficient of performance. What is a refrigerator draw its block diagram to explain its working?

22. Define the coefficient of performance of the refrigerator. Show the heat flow in case of an engine and refrigerator using a schematic diagram.

3 Marks questions.

23. Derive the expression for the work done by the gas during isothermal expansion.

24. Derive an expression for the work done in an adiabatic process.

25. What is a heat engine? Obtain a general expression for its efficiency. Discuss the essential parts of a Carnot heat engine.

26. Write Kelvin-Planck and Clausius statements for the second law of thermodynamics. Define coefficient of efficiency and coefficient of performance. What are the limitations of the 2nd law of thermodynamics?

27. An ideal Carnot engine is working between $227^{o}C$ and $77^{0}C$. This engine delivers the power of 10kW. Find the rate at which an engine rejects the heat to the sink.

28. An electric heater supplies heat to a system at a rate of 100W. If the system performs work at a rate of 75 Joules per second. At what rate is the internal energy increases?.

29. Establish the relation between specific heat capacity at constant volume and specific heat capacity a constant pressure.

30. State the second law of thermodynamics. No real engine can have an efficiency greater than that of a Carnot engine working between the same two temperatures. Give reason.

31. (a) Draw p - v diagram for the Carnot cycle

(b) Write the name of the thermodynamic process carried out by each part of the cycle.

(c) Label and shade the area corresponding to net work done by the engine in one cycle.

(d) Find the efficiency of Carnot's heat engine.

32. Using the first law of thermodynamics, discuss

(i) Iso thermal process (ii) Adiabatic Process

(iii) Isobaric Process (iv) Isochoric Process

(v) Cyclic Process. Also derive equation of state for isothermal and adiabatic process.