AERO ENGINEERING THERMODYNAMICS

PART-A

1. What is internal energy of the system? What is internal energy of a (1) real gas and (2) perfect gas?

2. No heat is taken in or given out of a gas in an adiabatic expansion of the gas. Does the internal energy of the gas change during this process? Does the gas do any work in this process?

3. A liquid is being converted in vapour at its melting point. What will be the specific heat of the liquid at this time?

4. Will the internal energy of an ideal gas change in an isothermal process?

5. On removing the value the air escaping from a cycle tube becomes cool. Why?

6. We have two samples of a gas, each having a volume V at temperature T. One is compressed isothermally and other adiabatically till their volumes reduces to V/4. In which process will the temperature be more?

7. Is it possible to add heat to a system without changing its temperature?

8. Why specific heat at constant pressure (Cp) for a gas is greater than its specific heat at constant volume (Cv)?

9. Why is expansion of water called anomalous?

10. "The ga s expands quasi -sta tic". Wha t do mean by i t?

11. What is an indicator diagram?

12. Name the important role-played by an indicator diagram.

13. Define triple point.

14. Wha t is carnot's cycle?

15. Wha t is carnot's principle?

16. Are dull black surfaces bad radiators?

17. Enumerate three factors upon which the amount of heat radiated per second by a surface depends.

18. Wha t is direc t outcome of Kirchoff's law?

19. Define the first law and the second law of thermodynamics. Explain carefully the significance of both of them.

20. A solid sphere of copper of radius R and a hollow sphere of the same material of inner

radius r and outer radius R are heated to the same temperature and allowed to cool in the same environment. Which of them starts cooling faster?

21. A small hole is made in a hollow sphere whose walls are at 723 C find the total energy radiated per second per cm2.

22. Pieces of glass and copper are heated to the same temperature. Why does the piece of copper feel hotter on touching?

23. Water in a metallic pot can be boiled quickly if the bottom of the pot is made black and rough. But this is not possible when the bottom is highly policed. Why?

24. Two bodies at different temperatures T1 and T2, if brought in thermal contact, do not necessarily settle to the mean temperature

25. Imagine a fireball suspended in air. Would you experience more heat above the ball or below the ball?

26. After some times of the switching-on of an electric heater, the temperature of the heater becomes constant, although current remains continuously flowing in it. Why?

27. The temperature gradient in a rod 0.5 m long is 80 c per meter. The temperature of the hotter end is 30 C. What is the temperature of the colder end?

28. On winter nights we feel warmer when clouds cover the sky than when the sky is clear. Why?

29. Calculate the efficiency of a Carnot's engine working stea m poin t ice poin t.

30. A Carnot engine whose heat sink is at 27 C has an efficiency of 40%. It is desired to increase the efficiency by 10%. By how many degrees the temperature of the heat source has to be increased?

31. Calculate the total number of degrees of freedom for a mole of diatomic gas at NTP.

32. If heat and work can expressed in the same units, why is it necessary to distinguish between them?

33. A gas performs external work during an isothermal expansion. What is the source of energy?

34. Can a system be heated without causing any rise in temperature/

35. Why animals curl into a ball in winter?

36. Why is there the word "displacemen t in wien'sdisplacemen t law?

37. Why is it impossible for a ship to use the internal energy of seawater to operate its

engine?

38. The coolant used in a car or a chemical or nuclear plant should have a large value of specific heat. Why?

39. The climate of a town near a sea more temperate than that of a town near desert, both being at same altitude. Why?

40. If the earth did not have an atmosphere, it would become intolerably cold. Why?

41. Cv of hydrogen is about 5R/2 in the temperature range of about 250K to 750K. At lower temperature the value of Cv is about 3R/2, typical of monoatomic gases. At higher temperature, it tends to a value 7R/2. Explain.

42. What is superheated water and supercooldvapour?

43. Heat is generated continuously in an electric heater but its temperature becomes constant after some times.

44. A sphere, a cube and a thin circular plate, all made of the same material and having the same mass, are initially heated to a temperature of 200 C. which of these objects will cool fasted and which one slowest when left in air at room temperature? Give reasons.

45. Pieces of glass and copper are heated to the same temperature. Why does the piece of copper feel hotter on touching?

46. Give four methods for changing the internal energy of the gas.

47. Why does a black body appear brighter than the polished surface, when both are heated to the same temperature?

48. An ink dot on a cup of porcelain appears dark. When the same cup is heated to a high temperature, the dot becomes brighter than the rest of the cup. Why?

49. The temperature gradient in a rod 0.5 m long is 80 C per meter. The temperature of the hotter end is 30 C. What is the temperature of the colder end?

50. Certain perfect gas is found to obey PV 3/2   constant during an adiabatic process. If such a gas at initial temperature T is adiabatic compressed to half the initial volume65hen calculate its final temperature.

51. An ideal gas heat engine operates Carnot cycle between 227 C and 127 C. It absorbs 6   104 calories at the higher temperature, then calculate the quantity of heat converted into work.

52. An object is at temperature of 400 c. At what temperature would it radiate energy

twice as first? The temperature of surroundings may be assumed to be negligible.

53. If wavelengths of maximum intensity of radiations emitted by sun and Moon are 0.5×10^{-6} meter and 10^{-4} meter respectively, then find the ratio of their temperatures.