Questions From Competitive Exams

4.1 Introduction

(MHT-CET 2019)

1. The equation of state for 2g of oxygen at a pressure 'P' and temperature 'T', when occupying a volume 'V' will be

a) $PV = \frac{1}{16} RT$ b) $PV = RT$ c) $PV = 2RT$ d) $PV = 16 RT$

4.2 Thermal Equilibrium and Definition of Temperature

(MHT-CET 2004)

2. The state of a thermodynamic system is represented by

a) pressure only b) volume only
c) pressure, volume and temperature d) number of moles

4.3 Zeroth Law of Thermodynamics

(MHT-CET 2003)

3. Mercury is used as thermometric liquid because

a) it has low specific heat b) it does not wet the glass tube
c) it is opaque and bright d) all the above

(MHT-CET 2005)

4. The temperature of sun is measured with

a) Resistance thermometer b) Vapour pressure thermometer
c) Radiation pyrometer d) Gas thermometer

(MHT-CET 2009)

5. Two bodies are said to be in thermal equilibrium when .... is same.

a) amount of heat b) specific heat c) temperature d) thermal capacity

4.4 Heat, Work and Internal Energy

(MHT-CET 2006)

6. A gas expands from 75 litres to 125 litres at constant pressure of 4 atmosphere. Work done by the gas during this change is (10 atm = 10^5 Nm^{-2})

a) 50 kJ b) 40 kJ c) 30 kJ d) 20 kJ

(MHT-CET 2010)

7. Heat is supplied to a diatomic gas which expands at constant pressure. The % of change in internal energy to heat supplied is

a) 71.4 b) 60.8 c) 40.9 d) 18.6

4.5 First Law of Thermodynamics

(MHT-CET 2003)

8. If 2 kcal of heat supplied to a system causes a change in the internal energy of a gas by 5030 J, and external work done is 3350 J, then what is mechanical equivalent of heat

a) 41.90 J/kcal b) 4190 J/cal c) 4.19 J/kcal d) 4.19 J/cal

(MHT-CET 2020)

9. If 'ΔQ' is the amount of heat supplied to 'n' moles of a diatomic gas at constant pressure, 'ΔU' is the change in internal energy and 'ΔW' is the work done, then $\Delta W : \Delta U : \Delta Q$ is
a) 1 : 2 : 3 b) 2 : 5 : 7 c) 2 : 3 : 4 d) 5 : 7 : 9

(MHT-CET 2021)

10. An ideal gas having pressure 'P', volume 'V' and temperature 'T' undergoes a thermodynamics process in which $dW = 0$ and $dQ < 0$. Then for the gas
a) V will increase
b) P may increase or decrease
c) T will increase
d) T will decrease

(MHT-CET 2022)

11. In a thermodynamic system, 'W' represents the work done by the system and 'ΔU' is the increase in internal energy. Which of the following statements is TRUE ?
a) In an isothermal process, $\Delta U = -W$
b) In an adiabatic process, $\Delta U = W$
c) In an isothermal process, $\Delta U = W$
d) In an adiabatic process, $\Delta U = -W$

4.6 Thermodynamic State Variables
4.7 Thermodynamics Process

(MHT-CET 2003)

12. In any reversible process the entropy of system and surrounding will
a) increase b) decrease c) remain same d) uncertain

(MHT-CET 2004)

13. A gas expands adiabatically at constant pressure such that its temperature $T \propto 1/\sqrt{V}$. The value of C_p/C_v of the gas is
a) 1.30 b) 1.50 c) 1.67 d) 2.00

(MHT-CET 2005)

14. With same initial conditions, an ideal gas expands from volume V_1 to V_2 in three different ways. The work done by the gas is W_1 if the process is isothermal, W_2 if isobaric and W_3 if adiabatic, then
a) $W_2 > W_1 > W_3$
b) $W_2 > W_3 > W_1$
c) $W_1 > W_2 > W_3$
d) $W_1 > W_3 > W_2$

(MHT-CET 2006)

15. Which statement is INCORRECT ?
a) all reversible cycles have same efficiency
b) reversible cycle has more efficiency than an irreversible one
c) Carnot cycle is a reversible one
d) Carnot cycle has the maximum efficiency of all the cycles

(MHT-CET 2007)

16. We consider a thermodynamic system. If ΔU represents the increase in its internal energy and W the work done by the system, which of the following statements is true ?
a) $\Delta U = -W$ is an adiabatic process
b) $\Delta U = W$ in an isothermal process
c) $\Delta U = -W$ in an isothermal process
d) $\Delta U = W$ in an adiabatic process

23. An ideal gas at pressure 'P' is adiabatically compressed so that its density becomes twice that of the initial. If $\gamma = \frac{c_p}{c_v} = \frac{7}{5}$, then final pressure of the gas is

a) P b) 2 P c) $\frac{7}{5}$ P d) 2.63 P

24. One mole of an ideal gas expands adiabatically at constant pressure such that its temperature $T \propto \frac{1}{\sqrt{V}}$. The value of γ for the gas is $\left(\gamma = \frac{C_P}{C_V}, V = \text{Volume of the gas}\right)$

a) 1.8 b) 1.5 c) 1.3 d) 1.4

25. A monoatomic gas is suddenly compressed to $(1/8)^{th}$ of its initial volume adiabatically. The ratio of the final pressure to initial pressure of the gas is $(\gamma = 5/3)$

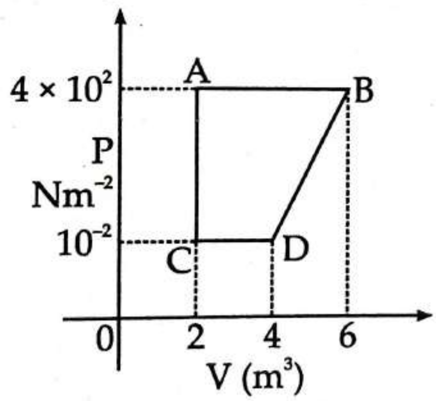
a) 32 b) 8 c) $\frac{40}{3}$ d) $\frac{24}{5}$

26. In thermodynamic processes which of the following statements is 'NOT CORRECT' ?
a) In an isochoric process pressure remains constant.
b) In an adiabatic process, PV^{γ} = constant, where symbols have usual meaning.
c) In an isothermal process, the temperature remains constant.
d) In an adiabatic process, the system is insulated from surroundings.

27. Which one of the following statements is NOT correct for an isochoric process ?
a) The volume remains constant.
b) The energy exchanged is used to change internal energy.
c) The temperature of the system changes.
d) The work done is positive.

(MHT-CET 2022)

28. For a given cycle as shown in figure the work done during isobaric process is



a) 400 J b) 1600 J c) 200 J d) 800 J

29. In an adiabatic process the state of a gas is changed from P_1, V_1, T_1 to P_2, V_2, T_2. Out of the following relations, the correct one is

a) $P_1V_1^{\gamma} = P_2T_2^{\gamma}$ b) $T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}$ c) $P_1V_1^{\gamma-1} = P_2V_2^{\gamma-1}$ d) $T_1V_1^{\gamma} = T_2V_2^{\gamma}$

30. In which thermodynamic process, there is no exchange of heat between the system and surroundings ?

a) Adiabatic b) Isobaric c) Isothermal d) Isochoric

31. In an adiabatic expansion of a gas initial and final temperatures are T_1 and T_2 respectively. Then the change in internal energy of the gas is (R = gas constant, γ = adiabatic ratio)

a) $R(T_1 - T_2)$ b) zero c) $\frac{R}{\gamma-1}(T_2 - T_1)$ d) $\frac{R}{\gamma-1}(T_1 - T_2)$

4.8 Heat Engines

(MHT-CET 2019)

32. If α is the coefficient of performance of a refrigerator and 'Q_1' is heat released to the hot reservoir, then the heat extracted from the cold reservoir 'Q_2' is

a) $\frac{\alpha Q_1}{\alpha - 1}$ b) $\frac{\alpha Q_1}{1+\alpha}$ c) $\frac{1+\alpha}{\alpha} Q_1$ d) $\frac{\alpha - 1}{\alpha} Q_1$

(MHT-CET 2020)

33. For a heat engine operating between temperatures t_1 °C and t_2 °C, its efficiency will be

a) $\frac{t_1 - t_2}{t_2}$ b) $\frac{t_1 - t_2}{t_1 + 273}$ c) $\frac{t_1}{t_2}$ d) $1 - \frac{t_2}{t_1}$

4.9 Refrigerators and Heat Pumps
4.10 Second Law of Thermodynamics

(MHT-CET 2001)

34. Heat cannot by itself flow from a body at lower temperature to a body at higher temperature is a statement of

a) 1^{st} law of thermodynamics b) 2^{nd} law of thermodynamics
c) zeroth law of thermodynamics d) 4^{th} law of thermodynamics

(MHT-CET 2004)

35. What is the value of sink temperature when efficiency of engine is 100% ?

a) 0 K b) 300 K c) 273 K d) 400 K

(MHT-CET 2007)

36. A measure of the degree of disorder of a system is known as

a) isobaric b) isotropy c) enthalpy d) entropy

(MHT-CET 2011)

37. A scientist says that the efficiency of his heat engine which operates at source temperature 127°C and sink temperature 27°C is 26%, then

a) it is impossible b) it is possible but less probable
c) it is quite probable d) data is incomplete

38. In a mechanical refrigerator, the low temperature coils are at a temperature of -23°C and the compressed gas in the condenser has a temperature of 27°C. The theoretical coefficient of performance is

a) 5 b) 8 c) 6 d) 6.5

(MHT-CET 2013)

39. When you make ice cubes, the entropy of water

a) does not change
b) increases
c) decreases
d) may either increase or decrease depending on the process used

(MHT-CET 2014)

40. Choose the incorrect statement from the following

i) The efficiency of a heat engine can be 1, but the coefficient of performance of a refrigerator can never be infinity

ii) The first law of thermodynamics is basically the principle of conservation of energy

iii) The second law of thermodynamics does not allow several phenomena consistent with the first law

iv) A process, whose sole result is the transfer of heat from a colder object to a hotter object, is impossible

a) i b) iii c) ii d) iv

(MHT-CET 2016)

41. An ideal heat engine works between the temperatures 327°C (source) and 27°C (sink). What is its efficiency ?

a) 100% b) 75% c) 50% d) 25%

4.11 Carnot Cycle and Carnot Engine

(MHT-CET 2002)

42. A Carnot engine absorbs an amount Q of heat from a reservoir at an absolute temperature T and rejects heat to a sink at a temperature of T/3. The amount of heat rejected is

a) Q / 4 b) Q / 3 c) Q / 2 d) 2Q / 3

(MHT-CET 2005)

43. The efficiency of Carnot's engine operating between reservoirs, maintained at temperatures 27°C and –123°C, is

a) 50% b) 24% c) 0.75% d) 0.4%

(MHT-CET 2007)

44. Efficiency of a Carnot engine is 50% when temperature of outlet is 500 K. In order to increase efficiency up to 60% keeping temperature of inlet the same what is temperature of outlet ?

a) 200 K b) 400 K c) 600 K d) 800 K

(MHT-CET 2009)

45. For which combination of working temperatures the efficiency of Carnot's engine is highest ?

a) 80 K, 60 K b) 100 K, 80 K c) 60 K, 40 K d) 40 K, 20 K

(MHT-CET 2011)

46. The efficiency of Carnot's heat engine is 0.5 when the temperature of the source is T_1 and that of sink is T_2. The efficiency of another Carnot's heat engine is also 0.5. The temperatures of source and sink of the second engine are respectively

a) $2T_1, 2T_2$ b) $2T_1, \frac{T_2}{2}$ c) $T_1 + 5, T_2 - 5$ d) $T_1 + 10, T_2 - 10$

(MHT-CET 2013)

47. A Carnot engine operating between temperatures T_1 and T_2 has efficiency $\frac{1}{6}$. When T_2 is lowered by 62 K, its efficiency increases to $\frac{1}{3}$. Then T_1 and T_2 are, respectively

a) 372 K and 310 K b) 372 K and 330 K c) 330 K and 268 K d) 310 K and 248 K