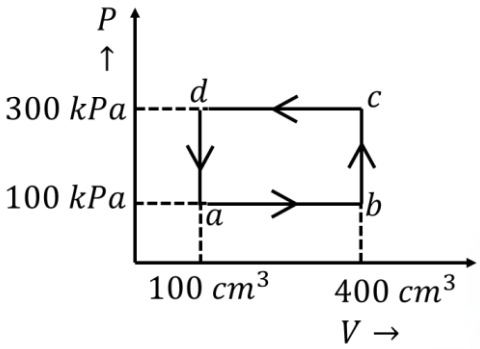
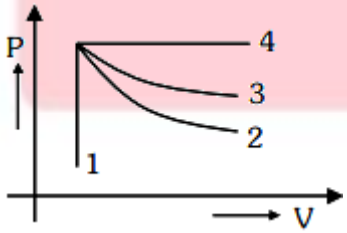
1. A thermodynamic system is taken through the cycle abcda. The work done by the gas along the path bc is. **(2024)**



(a) 30 J (b) -90 J
(c) -60 J (d) Zero

2. A Carnot engine has an efficiency of 50% when its source is at a temperature 327°C. The temperature of the sink is: **(2023)**
(a) 200°C (b) 27°C
(c) 15°C (d) 100°C

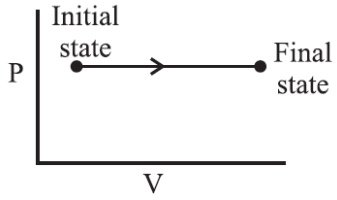
3. An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal. isobaric and isochoric. The curve which represents the adiabatic process among 1,2,3 and 4 is **(2022)**



(a) 2 (b) 3
(c) 4 (d) 1

4. The efficiency of a carnot engine depends upon **(2020)**
(a) The temperatures of the source and sink
(b) The volume of the cylinder of the engine
(c) The temperature of the source only
(d) The temperature of the sink only

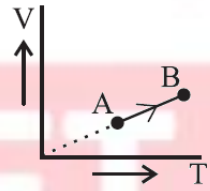
5. The P-V diagram for an ideal gas in a piston cylinder assembly undergoing a thermodynamic process is shown in the figure. The process is **(2020)**



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

6. In which of the following processes, heat is neither absorbed nor released by a system? **(2020)**
(a) Isothermal (b) Adiabatic
(c) Isobaric (d) Isochoric

7. The volume (V) of a monoatomic gas varies with its temperature (T), as shown in the graph. The ratio of the work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to State B, is **(2018)**

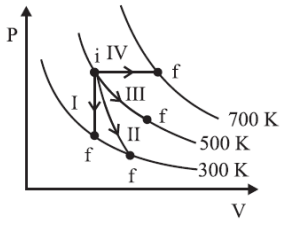


(a) $\frac{1}{3}$ (b) $\frac{2}{3}$
(c) $\frac{2}{5}$ (d) $\frac{2}{7}$

8. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is: **(2018)**
(a) 6.25% (b) 20%
(c) 26.8% (d) 12.5%

9. A sample of 0.1 g of water at 100°C and normal pressure ($1.013 \times 10^5\ Nm^{-2}$) requires 54 cal of heat energy to convert to steam at 100°C. If the volume of the steam produced is 167.1 cc, the change in internal energy of the sample, is: **(2018)**
(a) 42.2 J (b) 208.7 J
(c) 104.3 J (d) 84.5 J

10. Thermodynamic processes are indicated in the following diagram. **(2017-Delhi)**



Match the following:

Column-1		Column-2	
P.	Process I	a.	Adiabatic
Q.	Process II	b.	Isobaric
R.	Process III	c.	Isochoric
S.	Process IV	d.	Isothermal

(a) P→c, Q→a, R→d, S→b
(b) P→c, Q→d, R→b, S→a
(c) P→d, Q→b, R→a, S→c
(d) P→a, Q→c, R→d, S→b

11. A carnot engine having an efficiency of 1/10 as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is: **(2017-Delhi)**

(a) 90 J (b) 99 J
(c) 100 J (d) 1 J

12. The volume of 1 mole of an ideal gas with the adiabatic exponent γ is changed according to the relation $V = \frac{b}{T}$ where $b =$ constant. The amount of heat absorbed by the gas in the process if the temperature is increased by ΔT will be: **(2017-Gujarat)**

(a) $\left(\frac{1-\gamma}{\gamma+1}\right)R\Delta T$ (b) $\frac{R}{\gamma-1}\Delta T$
(c) $\left(\frac{2-\gamma}{\gamma-1}\right)R\Delta T$ (d) $\frac{R\Delta T}{\gamma-1}$

13. One mole of a gas obeying the equation of state P(V – b) = RT is made to expand from a state with coordinates (P_1, V_1) to a state with (P_2, V_2) along a process that is depicted by a straight line on a P-V diagram. Then, the work done is given by: **(2017-Gujarat)**

(a) $\frac{1}{2}(P_2 - V_1)(V_2 + V_1 + 2b)$
(b) $\frac{1}{2}(P_1 + P_2)(V_2 - V_1)$
(c) $\frac{1}{2}(P_2 - P_1)(V_2 - V_1)$
(d) $\frac{1}{2}(P_1 + P_2)(V_2 - V_1 + 2b)$

14. The temperature inside a refrigerator is $t_2°C$ and the room temperature is $t_1°C$. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be: **(2016-II)**

(a) $\frac{t_1°+273}{t_1°+t_2°}$
(b) $\frac{t_1°+t_2°}{t_1°+273}$
(c) $\frac{t_1°}{t_1°+t_2°}$
(d) $\frac{t_2°+273}{t_1°+t_2°}$

15. A body cools from a temperature 3T to 2T in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be: **(2016-II)**

(a) $\frac{4}{3}T$ (b) T
(c) $\frac{7}{4}T$ (d) $\frac{3}{2}T$

16. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then: **(2016-II)**

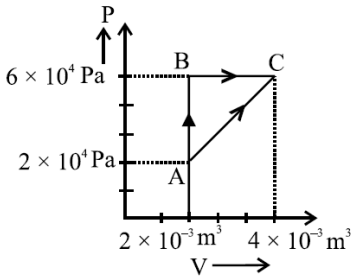
(a) Compressing the gas isothermally will require more work to be done
(b) Compressing the gas through adiabatic process will require more work to be done
(c) Compressing the gas isothermally or adiabatically will require the same amount of work
(d) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas

17. A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is (Take 1 cal = 4.2 joules): **(2016-I)**

(a) 2.365 W
(b) 23.65 W
(c) 236.5 W
(d) 2365 W

18. Figure below shows two paths that may be taken by a gas to go from a state A to a state C. In process AB, 400 J of heat is added to the system and in process BC, 100 J of heat is added to the system. The heat absorbed by the system in the process AC will be:

(2015)

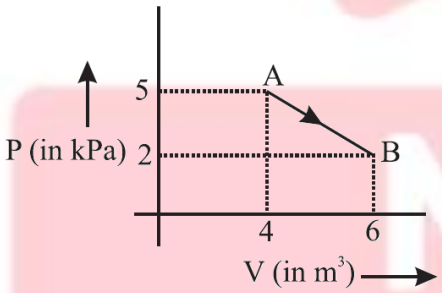


(a) 500 J (b) 460 J
(c) 300 J (d) 380 J

19. Carnot engine, having an efficiency of $\eta = \frac{1}{10}$, as heat system is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is: **(2015)**

(a) 99 J (b) 90 J
(c) 1 J (d) 100 J

20. One mole of an ideal diatomic gas undergoes a transition from A to B along a path AB as shown in the figure, **(2015)**



The change in internal energy of the gas during the transition is:

(a) –20 kJ (b) 20 J
(c) –12 kJ (d) 20 kJ

21. An ideal gas is compressed to half its initial volume by means of several processes. Which of the process results in the maximum work done on the gas?

(2015 Re)

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

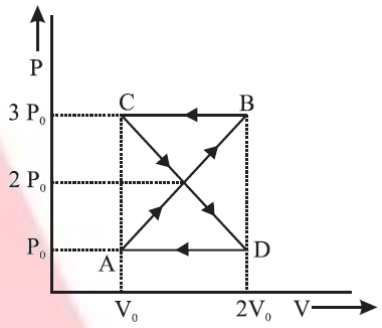
22. The coefficient of performance of a refrigerator is 5. If the temperature inside freezer is −20°C, the temperature of the surroundings to which it rejects heat is:

(2015 Re)

(a) 21°C (b) 31°C
(c) 41°C (d) 11°C

23. A thermodynamic system undergoes cyclic process ABCDA as shown in figure. The work done by the system in the cycle is:

(2014)

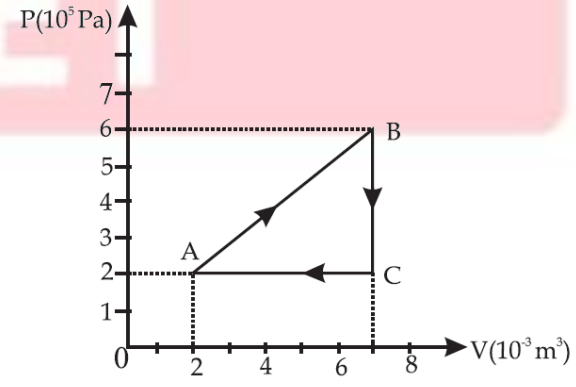


(a) P_0V_0 (b) $2P_0V_0$
(c) $\frac{P_0V_0}{2}$ (d) Zero

24. A monoatomic gas at a pressure P, having a volume V expands isothermally to a volume 2 V and then adiabatically to a volume 16 V. The final pressure of the gas is (take $\gamma = 5/3$): **(2014)**

(a) 64 P (b) 32 P
(c) P/64 (d) 16 P

25. A gas is taken through the cycle A → B → C → A, as shown. What is the net work done by the gas? **(2013)**



(a) –2000 J
(b) 2000 J
(c) 1000 J
(d) Zero

26. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its temperature. The ratio of $\frac{C_P}{C_V}$ for the gas is: **(2013)**

(a) 3/2 (b) 2

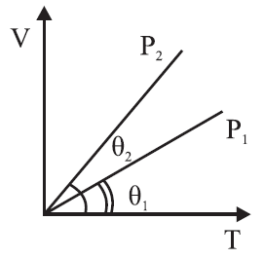
(c) 4/3 (d) 5/3

27. The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_p and C_v respectively. If $\gamma = \frac{C_p}{C_v}$ and R is the universal gas constant, then C_v is equal to: **(2013)**

(a) γR (b) $\frac{1+\gamma}{1-\gamma}$

(c) $\frac{R}{(\gamma-1)}$ (d) $\frac{(\gamma-1)}{R}$

28. In the given (V-T) diagram, what is the relation between pressures P_1 and P_2? **(2013)**



(a) Cannot be predicted

(b) $P_2 = P_1$

(c) $P_2 > P_1$

(d) $P_2 < P_1$