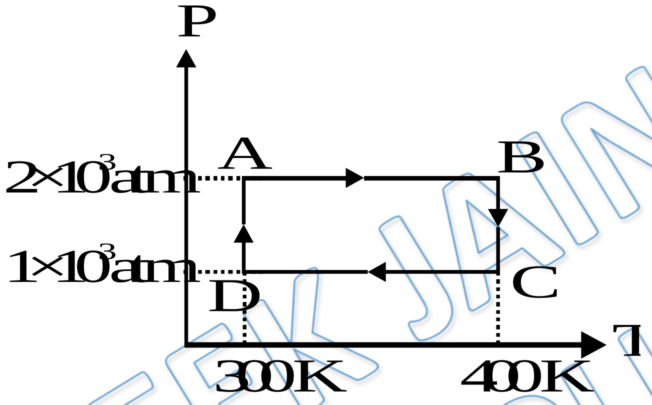
# DPP – 4 (Thermodynamics)

Video Solution on Website:- https://physicsaholics.com/home/courseDetails/60

Video Solution on YouTube:- https://youtu.be/zghuOgPWEPU

Written Solution on Website:- https://physicsaholics.com/note/notesDetalis/78

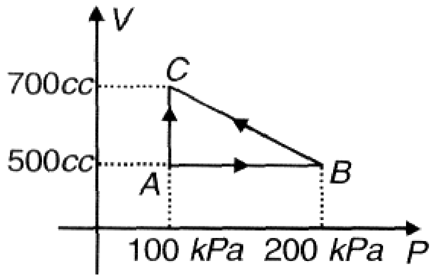
Q 1. 1/R (R is universal gas constant) moles of an ideal gas ($\gamma$=1.5) undergoes a cyclic process (ABCDA) as shown in fig. Assuming the gas to be ideal. If the net heat exchanger is 10x Joules, find the value of x ? [In 2 = 0.7].




Q 2. One mole of an ideal gas (mono-atomic) at temperature $T_0$ expands slowly according to law P = cV (c is constant). If final temperature is $2T_0$. heat supplied to gas is

(a) $2RT_0$ (b) (3/2) $RT_0$
(c) $RT_0$ (d) (1/2) $RT_0$

Q 3. A gas is taken through cyclic process ABCA is shown in figure. If 2.4 cal. of heat is given in the process, what is value of J ?

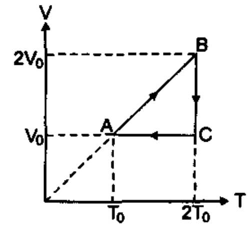



(a) 4.17J/cal (b) 4.4J/cal
(c) 4.1 J/cal (d) None of these

Q 4. Heat is supplied to a diatomic gas at constant pressure. The ratio of $\Delta Q : \Delta U : W$ is:

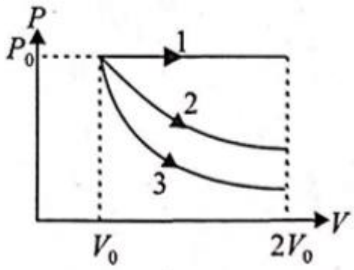
(a) 5 : 3 : 2 (b) 5 : 2 : 3
(c) 7 : 5 : 2 (d) 7 : 2 : 5

Q 5. An ideal monoatomic gas undergoes a cyclic process ABCA as shown in the figure. The ratio of heat absorbed during AB to the work done on the gas during BC is:\




(a) $\frac{5}{2In2}$  (b) $\frac{5}{3}$  (c) $\frac{5}{4In2}$  (d) $\frac{5}{6}$

Q 6. A gas is expanded from volume $V_0$ to $2V_0$ under three different processes. Process 1 is isobaric, process 2 is isothermal and process 3 is adiabatic. Let $\Delta Q_1$, $\Delta Q_2$ and $\Delta Q_3$ be the heat absorbed by gas in these three processes. Then:




(a) $\Delta Q_1 > \Delta Q_2 > \Delta Q_3$
(b) $\Delta Q_1 < \Delta Q_2 < \Delta Q_3$
(c) $\Delta Q_2 < \Delta Q_1 < \Delta Q_3$
(d) $\Delta Q_2 > \Delta Q_3 > \Delta Q_1$

Q 7. Certain amount of an ideal gas are contained in a closed vessel. The vessel is moving with a constant velocity v. The molar mass of gas is M. The rise in temperature of the gas when the vessel is suddenly stopped is : ($\gamma$ = adiabatic constant)
(a) $\frac{Mv^2}{2R(\gamma+1)}$  (b) $\frac{Mv^2(\gamma-1)}{2R}$
(c) $\frac{Mv^2}{2R\gamma}$  (d) $\frac{Mv^2\gamma}{2R(\gamma-1)}$



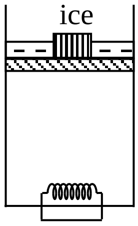
Q 8. A monoatomic gas undergoes a process given by 2dU + 3dW = 0, then the process is:
(a) isobaric  (b) adiabatic
(c) isothermal  (d) none

Q 9. STATEMENT – 1
Adiabatic expansion is always accompanied by fall in temperature.
**because**
STATEMENT – 2
In adiabatic process, volume is inversely proportional to temperature.

Q 10. *n* moles of an ideal monatomic gas undergoes a process in which the temperature changes with volume as $T = KV^2$. If the temperature of the gas changes from $T_0$ to $4T_0$ then
(a) work done by the gas is $3nRT_0$

(b) heat supplied to the gas is $4nRT_0$
(c) work done by the gas is $(3/2)nRT_0$
(d) heat supplied to the gas is $\frac{3}{2}nRT_0$

Q 11. A block of ice mass 10 gm is in thermal equilibrium with a water bath containing 10 gm of water which is kept on a conducting movable massless piston on a cylinder containing 3 moles of an ideal diatomic gas in thermal equilibrium with water. The walls of cylinder are adiabatic and heat lost to surroundings is negligible. The gas is heated slowly by a heater. (Latent heat = 80 cal/gm, specific heat of water = 1 cal/gm, $R$ = 25/3 J/mol $K$, mechanical equivalent of heat = 4.2 J/cal)

ice


| Column I | Column II |
|---|---|
| I. Work done by the gas till ice melts | A. 6250 J |
| II. Change in internal energy of the gas till the water starts boiling | B. 2500 J |
| III. Work done by the gas till water starts boiling | C. zero |
| IV. Net heat supplied by heater till the water starts boiling | D. 20510 J |



# Answer Key

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|---|---|---|---|---|
| **Q.1 7** | **Q.2 a** | **Q.3 a** | **Q.4 c** | **Q.5 c** |
| **Q.6 a** | **Q.7 b** | **Q.8 d** | **Q.9 c** | **Q.10 c** |
| **Q.11 I – C, II – A, III – B, IV – D** | | | | |