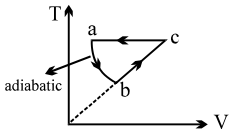
IIT – ian's PACE

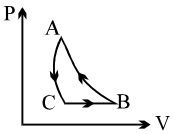
216 - 217 ,2nd floor , Shopper's point , S. V. Road. Andheri (West) Mumbai – 400058 . Tel: 26245223 / 09

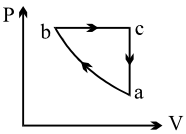
DIWALI ASSIGNMENT ON THERMODYNAMICS

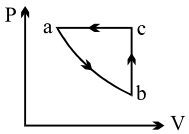
(All "* "marked questions have more than one option may be correct)

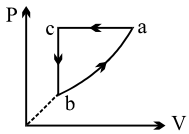
Q.1 PV curve for the process whose VT curve is



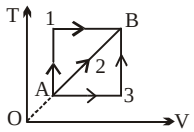
(A) 

(B) 

(C) 

(D) 

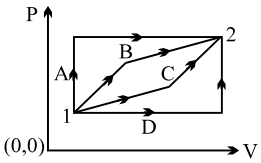
Q.2 A given mass of a gas expands from a state A to the state B by three paths 1, 2 and 3 as shown in T-V indicator diagram. If W_1, W_2 and W_3 respectively be the work done by the gas along the three paths, then



(A) $W_1 > W_2 > W_3$ (B) $W_1 < W_2 < W_3$

(C) $W_1 = W_2 = W_3$ (D) $W_1 < W_2$, $W_1 > W_3$

Q.3* An ideal gas is taken from state 1 to state 2 through optional path A, B, C



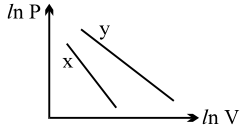
& D as shown in P-V diagram. Let Q, W and U represent the heat supplied, work done & internal energy of the gas respectively. Then

(A) $Q_B - W_B > Q_C - W_C$ (B) $Q_A - Q_D = W_A - W_D$

(C) $W_A < W_B < W_C < W_D$ (D) $Q_A > Q_B > Q_C > Q_D$

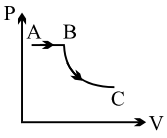
Q.4*For two different gases X and Y, having degrees of freedom f_1 and f_2 and molar heat capacities at constant volume C_{V_1} and C_{V_2} respectively, the *l*n P versus *l*n V graph is plotted for adiabatic process, as shown

(A) $f_1 > f_2$ (B) $f_2 > f_1$

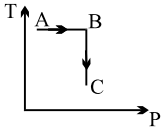


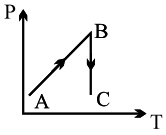
(C) $C_{V_2} > C_{V_1}$ (D) $> C_{V_2}$

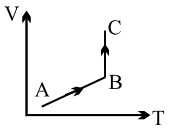
Q.5 A process is shown in the diagram. Which of the following

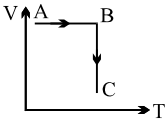


curves may represent the same process ?

(A) 

(B) 

(C) 

(D) 

Q.6 The ratio of average translational kinetic energy to rotational kinetic energy of a diatomic molecule at temperature T is

(A) 3 (B) 7/5 (C) 5/3 (D) 3/2

Q.7 A student records ΔQ, ΔU & ΔW for a thermodynamic cycle $A \rightarrow B \rightarrow C \rightarrow A$. Certain entries are missing. Find correct entry in following options.

	AB	BC	CA
ΔW	40J		30J
ΔU		50J	
ΔQ	150J	10J	

(A) $W_{BC} = -70$ J (B) $\Delta Q_{CA} = 130$ J

(C) $\Delta U_{AB} = 190$ J (D) $\Delta U_{CA} = -160$ J

Q.8 According to kinetic theory of gases, which of following statement will be true.

(A) Ideal gases can not be liquified

(B) The molecules of ideal gas do not obey newtons laws of motion.

(C) Pressure of gas is always inversely proportional to its volume

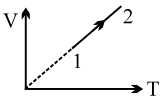
(D) molecules of gas never move in straight line.

Q.9 Find the approx. number of molecules contained in a vessel of volume 7 litres at 0°C at 1.3×10^5 pascal

(A) 2.4×10^{23} (B) 3×10^{23} (C) 6×10^{23} (D) 4.8×10^{23}

Q.10 A diatomic gas follows equation PV^m = constant, during a process. What should be the value of m such that its molar heat capacity during process = R

(A) 2/3 (B) 1 (C) 1.5 (D) 5/3

Q.11 An ideal gas undergoes the process $1 \rightarrow 2$ as shown in the figure, the heat supplied and work done in the process is ΔQ and ΔW respectively. The ratio $\Delta Q : \Delta W$ is 

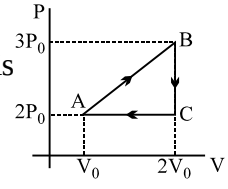
(A) $\gamma : \gamma - 1$ (B) γ

(C) $\gamma - 1$ (D) $\gamma - 1/\gamma$

Q.12 Two moles of monoatomic gas is expanded from (P_0, V_0) to $(P_0, 2V_0)$ under isobaric condition. Let ΔQ_1, be the heat given to the gas, ΔW_1 the work done by the gas and ΔU_1 the change in internal energy. Now the monoatomic gas is replaced by a diatomic gas. Other conditions remaining the same. The corresponding values in this case are ΔQ_2 , ΔW_2 , ΔU_2 respectively, then

(A) $\Delta Q_1 - \Delta Q_2 = \Delta U_1 - \Delta U_2$ (B) $\Delta U_2 + \Delta W_2 > \Delta U_1 + \Delta W_1$

(C) $\Delta U_2 > \Delta U_1$ (D) All of these

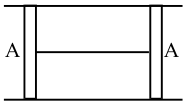
Q.13 In the above thermodynamic process, the correct statement is 

Diwali Assignment on Thermodynamics

(A) Heat given in the complete cycle ABCA is zero
(B) Work done in the complete cycle ABCA is zero
(C) Work done in the complete cycle ABCA is (1/2 P_0V_0)
(D) None

Q.14 For an ideal gas
(A) The change in internal energy in a constant pressure process from temperature T_1 to T_2 is equal to
$n C_v (T_2 - T_1)$ where C_v is the molar specific heat at constant volume and n is the number of the moles of the gas.
(B) The change in internal energy of the gas and the work done by the gas are equal in magnitude in an adiabatic proces.
(C) The internal energy does not change in an isothermal process.
(D) A, B and C

Q.15 A cylindrical tube of cross-sectional area A has two air tight frictionless pistons at its two ends. The pistons are tied with a straight two ends. The pistons are tied with a straight piece of metallic wire. The tube contains a gas at atmospheric pressure P_0 and temperature T_0. If temperature of the gas is doubled then the tension in the wire is

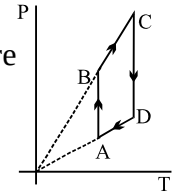


(A) $4 P_0 A$ (B) $P_0A/2$
(C) $P_0 A$ (D) $2 P_0 A$

Q.16 According to kinetic theory of gases,
(A) The velocity of molecules decreases for each collision
(B) The pressure exerted by a diatomic gas is proportional to the mean velocity of the molecule.
(C) The K.E. of the gas decreases on expansion at constant temperature.
(D) The mean translational K.E. of a diatomic gas increases with increase in absolute temperature.

Q.17 An ideal gas mixture filled inside a balloon expands according to the relation $PV^{2/3}$ = constant. The temperature inside the balloon is
(A) increasing (B) decreasing (C) constant (D) can't be said

Q.18 Pressure versus temperature graph of an ideal gas is shown in figure

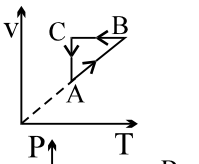


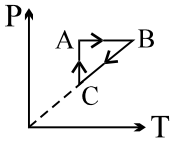
(A) During the process AB work done by the gas in positive
(B) during the process CD work done by the gas is negative
(C) during the process BC internal energy of the gas is increasing
(D) None

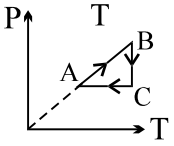
Q.19 One mole of an ideal gas at temperature T_1 expends according to the law $\frac{P}{V^2}$ = a (constant). The work done by the gas till temperature of gas becomes T_2 is :

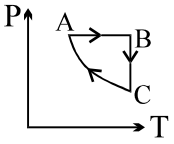
(A) $\frac{1}{2}R(T_2 - T_1)$ (B) $\frac{1}{3}R(T_2 - T_1)$ (C) $\frac{1}{4}R(T_2 - T_1)$ (D) $\frac{1}{5}R(T_2 - T_1)$

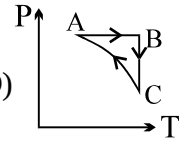
Q.20 An ideal gas undergoes a thermodynamics cycle as shown in figure.
Which of the following graphs represents the same cycle?



(A) 

(B) 

(C) 

(D) 

Q.21 A reversible adiabatic path on a P-V diagram for an ideal gas passes through state A where $P=0.7\times10^5$ N/m^{-2} and v = 0.0049 m^3. The ratio of specific heat of the gas is 1.4. The slope of path at A is :
(A) 2.0×10^7 Nm^{-5} (B) 1.0×10^7 Nm^{-5} (C) -2.0×10^7 Nm^{-5} (D) -1.0×10^7 Nm^{-5}

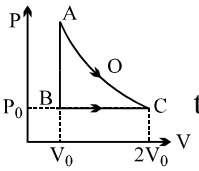
Q.22 An ideal gas at pressure P and volume V is expanded to volume 2V. Column I represents the thermodynamic processes used during expansion. Column II represents the work during these processes in the random order.

Column I	**Column II**
(p) isobaric	(x) $\frac{PV(1-2^{1-\gamma})}{\gamma-1}$
(q) isothermal	(y) PV
(r) adiabatic	(z) PV *l*n 2

The correct matching of column I and column II is given by :
(A) p-y, q-z, r-x (B) p-y, q-x, r-z (C) p-x, q-y, r-z (D) p-z, q-y, r-x

Q.23 An ideal gas expands in such a way that PV^2 = constant throughout the process.
(A) The graph of the process of T-V diagram is a parabola.
(B) The graph of the process of T-V diagram is a straight line.
(C) Such an expansion is possible only with heating.
(D) Such an expansion is possible only with cooling.

Q.24 An ideal gas is taken from point A to point C on P-V diagram



through two process AOC and ABC as shown in the figure. Process AOC is isothermal
(A) Process AOC requires more heat than process ABC.
(B) Process ABC requires more heat than process AOC.
(C) Both process AOC & ABC require same amount of heat.
(D) Data is insufficient for comparison of heat requirement for the two processes.

Q.25 One mole of an ideal gas at STP is heated in an insulated closed container until the average speed of its molecules is doubled. Its pressure would therefore increase by factor.
(A) 1.5 (B) $\sqrt{2}$ (C) 2 (D) 4

Diwali Assignment on Thermodynamics

ANSWER KEYS

THERMODYNAMICS

Q.1	A	Q.2	A	Q.3	B, D	Q.4	B, C	Q.5	C
Q.6	D	Q.7	D	Q.8	A	Q.9	A	Q.10	D
Q.11	A	Q.12	D	Q.13	C	Q.14	D	Q.15	C
Q.16	D	Q.17	A	Q.18	C	Q.19	B	Q.20	A
Q.21	C	Q.22	A	Q.23	D	Q.24	A	Q.25	D