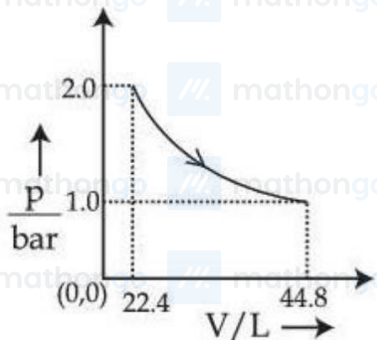


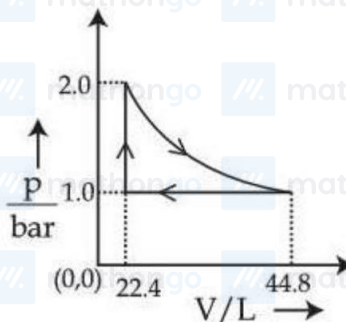
Q1. 21 January Shift 1

Which of the following graphs between pressure 'p' versus volume 'V' represents the maximum work done?

(1)



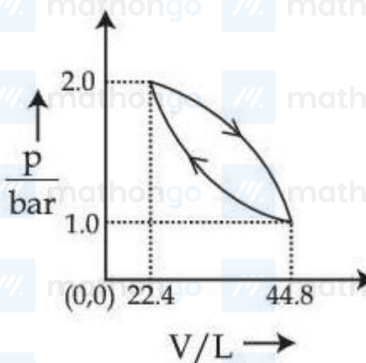
(2)



(3)



(4)



Q2. 21 January Shift 1

Use the following data :

Substance	$\Delta_f H^\ominus(500 \text{ K})$ $\text{kJ mol}^{-1}$	$S^\ominus(500 \text{ K})$ $\text{JK}^{-1} \text{mol}^{-1}$
AB( g)	32	222
A <sub>2</sub> (g)	6	146
B <sub>2</sub> (g)	$x$	280

One mole each of A<sub>2</sub>( g) and B<sub>2</sub>( g) are taken in a 1 L closed flask and allowed to establish the equilibrium at 500

K. A<sub>2</sub>( g) + B<sub>2</sub>( g)  $\rightleftharpoons$  2AB( g) The value of  $x$  (in  $\text{kJ mol}^{-1}$ ) is \_\_\_\_\_. (Nearest integer) (Given :

$\log K = 2.2$   $R = 8.3 \text{ J K}^{-1} \text{mol}^{-1}$ )

Q3. 21 January Shift 2

Consider the following data:

$\Delta_f H^\ominus$  (methane, g) =  $-X \text{ kJ mol}^{-1}$

Enthalpy of sublimation of graphite =  $Y \text{ kJ mol}^{-1}$

Dissociation enthalpy of H<sub>2</sub> =  $Z \text{ kJ mol}^{-1}$

The bond enthalpy of C – H bond is given by :

(1)  $\frac{-X+Y+Z}{4}$

(2)  $\frac{X+Y+4Z}{2}$

(3)  $\frac{X+Y+2Z}{4}$

(4)  $X + Y + Z$

Q4. 22 January Shift 1

Match the LIST-I with LIST-II

	List-I (Thermodynamic Process)		List-II (Magnitude in kJ)
A.	Work done in reversible, isothermal expansion of 2 mol ideal gas from 2 dm <sup>3</sup> to 20 dm <sup>3</sup> at 300 K	I.	4
B.	Work done in irreversible isothermal expansion of 1 mol ideal gas from 1 m <sup>3</sup> to 3 m <sup>3</sup> at 300 K against constant pressure 3 kPa	II.	11.5
C.	Change in internal energy for adiabatic expansion of 1 mol ideal gas, $\Delta T = 320$ K, $\bar{C}_V = \frac{3}{2}R$	III.	6
D.	Change in enthalpy at constant pressure of 1 mol ideal gas, $\Delta T = 337$ K, $\bar{C}_p = \frac{5}{2}R$	IV.	7

Choose the correct answer from the options given below:

- (1) A-II, B-III, C-I, D-IV  
(2) A-III, B-II, C-IV, D-I  
(3) A-II, B-I, C-III, D-IV  
(4) A-I, B-II, C-III, D-IV

Q5. 22 January Shift 2

If the enthalpy of sublimation of Li is 155 kJ mol<sup>-1</sup>, enthalpy of dissociation of F<sub>2</sub> is 150 kJ mol<sup>-1</sup>, ionization enthalpy of Li is 520 kJ mol<sup>-1</sup>, electron gain enthalpy of F is -313 kJ mol<sup>-1</sup>, standard enthalpy of formation of LiF is -594 kJ mol<sup>-1</sup>. The magnitude of lattice enthalpy of LiF is \_\_\_\_ kJmol<sup>-1</sup>. (Nearest Integer)

Q6. 23 January Shift 1

A cup of water at 5°C (system) is placed in a microwave oven and the oven is turned on for one minute during which the water begins to boil. Which of the following option is true ?

- (1)  $q = +ve, w = 0, \Delta U = +ve$   
(2)  $q = +ve, w = -ve, \Delta U = +ve$   
(3)  $q = -ve, w = -ve, \Delta U = -ve$   
(4)  $q = +ve, w = -ve, \Delta U = +ve$

Q7. 24 January Shift 1

Match the LIST-I with LIST-II

List-I	Isothermal process for ideal gas system	List-II	Work done ( $V_f > V_i$ )
A.	Reversible expansion	I.	$w = 0$
B.	Free expansion	II.	$w = -nRT \ln \frac{V_f}{V_i}$
C.	Irreversible expansion	III.	$w = -p_{\text{ex}}(V_f - V_i)$
D.	Irreversible compression	IV.	$w = -p_{\text{ex}}(V_i - V_f)$

Choose the correct answer from the options given below:

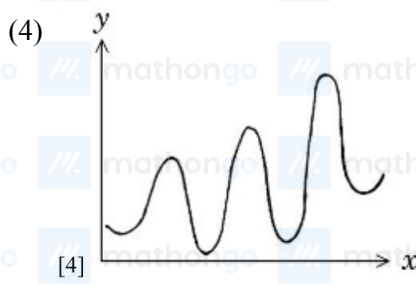
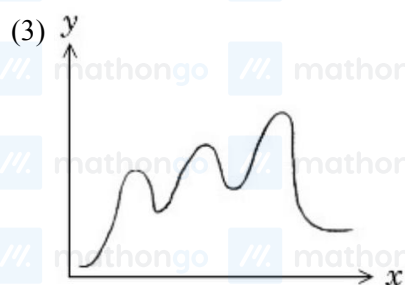
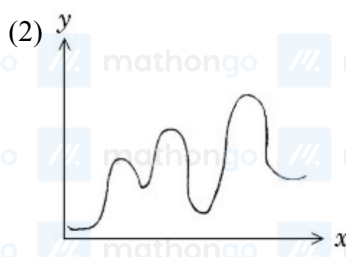
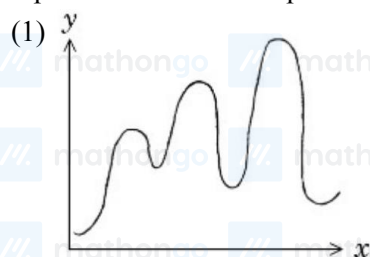
- (1) A-I, B-III, C-II, D-IV  
(2) A-II, B-I, C-III, D-IV  
(3) A-IV, B-I, C-III, D-II  
(4) A-IV, B-II, C-III, D-I

Q8. 24 January Shift 1

A  $\rightarrow$  D is an endothermic reaction occurring in three steps (elementary).

- (i)  $A \rightarrow B \Delta H_i = +ve$   
(ii)  $B \rightarrow C \Delta H_{ii} = -ve$   
(iii)  $C \rightarrow D \Delta H_{iii} = -ve$

Which of the following graphs between potential energy (y-axis) vs reaction coordinate (x-axis) correctly represents the reaction profile of A  $\rightarrow$  D ?



Q9. 24 January Shift 2

The heat of atomisation of methane and ethane are 'x'  $\text{kJmol}^{-1}$  and 'y'  $\text{kJmol}^{-1}$  respectively. The longest wavelength ( $\lambda$ ) of light capable of breaking the C – C bond can be expressed in SI unit as:

- (1)  $\frac{N_A hc}{250(4y-6x)}$   
(2)  $\frac{hc}{1000} \left( \frac{y-6x}{4} \right)^{-1}$   
(3)  $\frac{N_A hc}{250(y-6x)}$   
(4)  $N_A hc \left( y - \frac{6x}{4} \right)^{-1}$

**Q10. 28 January Shift 1**

20.0 dm<sup>3</sup> of an ideal gas 'X' at 600 K and 0.5 MPa undergoes isothermal reversible expansion until pressure of the gas is 0.2 MPa. Which of the following option is correct?

(Given:  $\log 2 = 0.3010$  and  $\log 5 = 0.6989$ )

- (1)  $w = -9.1 \text{ kJ}$ ,  $\Delta U = 0$ ,  $\Delta H = 0$ ,  $q = 9.1 \text{ kJ}$
- (2)  $w = +4.1 \text{ kJ}$ ,  $\Delta U = 0$ ,  $\Delta H = 0$ ;  $q = -4.1 \text{ kJ}$
- (3)  $w = 9.1 \text{ J}$ ,  $\Delta U = 9.1 \text{ J}$ ,  $\Delta H = 0$ ;  $q = 0$
- (4)  $w = -3.9 \text{ kJ}$ ,  $\Delta U = 0$ ,  $\Delta H = 0$ ;  $q = 3.9 \text{ kJ}$

**Q11. 28 January Shift 2**

The plot of  $\log_{10} K$  vs  $\frac{1}{T}$  gives a straight line. The intercept and slope respectively are (where K is equilibrium constant).

- (1)  $\frac{\Delta S^\circ}{2.303R}$ ,  $-\frac{\Delta H^\circ}{2.303R}$
- (2)  $-\frac{\Delta S^\circ R}{2.303}$ ,  $\frac{\Delta H^\circ R}{2.303}$
- (3)  $\frac{2.303R}{\Delta H^\circ}$ ,  $\frac{2.303R}{\Delta S^\circ}$
- (4)  $-\frac{\Delta H^\circ}{2.303R}$ ,  $\frac{\Delta S^\circ}{2.303R}$

**ANSWER KEYS**

- 1. (1)      2. 70      3. (3)      4. (1)      5. 1031      6. (4)      7. (2)      8. (1)
- 9. (1)      10. (1)      11. (1)