

Exercise # 1

- Q.1** Identify the intensive quantity from the following –
[1] Enthalpy and temperature [2] Volume and temperature
[3] Enthalpy and volume [4] Temperature and refractive index
- Q.2** For an adiabatic process which of the following relations is correct
[1] $\Delta E = 0$ [2] $P\Delta V = 0$ [3] $\Delta q = 0$ [4] $q = + W$
- Q.3** A thermodynamic quantity is that :
[1] Which is used in thermochemistry [2] Which obeys all laws of thermodynamics
[3] Quantity whose value depends only upon the state of the system
[4] Quantity which is used in measuring thermal change
- Q.4** Which one is a state function –
[1] Heat supplied at constant pressure [2] Heat supplied at constant volume
[3] Enthalpy [4] All of the above
- Q.5** Which represent largest amount of energy :
[1] Calorie [2] Joule [3] Erg [4] Electron volt
- Q.6** A system has internal energy equal to E_1 , 450 J of heat is taken out of it and 600 J of work is done on it. The final energy of the system will be -
[1] $(E_1 + 150)$ [2] $(E_1 + 1050)$ [3] $(E_1 - 150)$ [4] None of these
- Q.7** The work done by 100 calorie of heat is
[1] 418.4 J [2] 4.184 J [3] 41.84 J [4] None
- Q.8** Thermodynamics is concerned with
[1] Total energy of a system [2] Energy changes in a system
[3] Rate of a chemical change [4] Energy change of system and surrounding
- Q.9** A well stoppered thermas flask contains some ice cubes. This is an example of -
[1] Closed system [2] Open system [3] Isolated system [4] Non-thermodynamic system
- Q.10** When a gas is compressed adiabatically and reversibly, the final temperature is
[1] Higher than the initial temperature [2] Lower than the initial temperature
[3] The same as initial temperature [4] Dependent upon the rate of compression
- Q.11** Specific heat may be defined as :
[1] Heat capacity at constant volume [2] Heat capacity at constant pressure
[3] Heat capacity mol^{-1} [4] Heat capacity g^{-1}
- Q.12** If work done by the system is 300 joule when 100 cal. heat is supplied to it. The change in internal energy during the process is –
[1] – 200 Joule [2] 400 Joule [3] 720 Joule [4] 120 Joule
- Q.13** In endothermic reactions the reactants :
[1] Have more energy than products [2] Have as much energy as the products
[3] Are at lower temperature than products [4] Have less energy than the products
- Q.14** The work done by a system is 8J when 40J heat is supplied to it. The change in internal energy of the system during the process :
[1] 32 J [2] 40 J [3] 48 J [4] –32 J

- Q.15** Internal energy change during a reversible isothermal expansion of an ideal gas is –
 [1] Always negative [2] Always positive [3] Zero [4] May be positive or neative
- Q.16** Which of the following statements is correct for the reaction :
 $\text{CO(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)}$ at constant temperature and pressure
 [1] $\Delta H = \Delta E$ [2] $\Delta H < \Delta E$ [3] $\Delta H > \Delta E$ [4] None of the above
- Q.17** For the gaseous reaction involving the complete combustion of isobutane at 373K –
 [1] $\Delta H = \Delta E$ [2] $\Delta H > \Delta E$ [3] $\Delta H = \Delta E = 0$ [4] $\Delta H < \Delta E$
- Q.18** If total enthalpy of reactants and products is H_R and H_P respectively, then for exothermic reaction -
 [1] $H_R = H_P$ [2] $H_R < H_P$ [3] $H_R > H_P$ [4] $H_R - H_P = 0$
- Q.19** The enthalpy of vaporization of water at 100°C is 40.63 kJ mol⁻¹. The value ΔE for this process would be -
 [1] 37.53 kJ mol⁻¹ [2] 39.08 kJ mol⁻¹ [3] 42.19 kJ mol⁻¹ [4] 43.73 kJ mol⁻¹
- Q.20** For the system $\text{S(s)} + \text{O}_2\text{(g)} \rightarrow \text{SO}_2\text{(g)}$: -
 [1] $\Delta H = \Delta E$ [2] $\Delta H > \Delta E$ [3] $\Delta E > \Delta H$ [4] $\Delta H = 0$
- Q.21** The difference in ΔH and ΔE for the combustion of methane at 25°C would be
 [1] Zero [2] $2 \times 298 \times -2$ cal [3] $2 \times 298 \times -3$ cal [4] $2 \times 25 \times -3$ cal
- Q.22** For $\text{CaCO}_3\text{(s)} \rightarrow \text{CaO(s)} + \text{CO}_2\text{(g)}$ at 977°C, $\Delta H = 174$ KJ/mol; then ΔE is –
 [1] 160 KJ [2] 163.6 KJ [3] 186.4 KJ [4] 180 KJ
- Q.23** Heat of formation of $\text{H}_2\text{O(g)}$ at 25°C is – 243 KJ. ΔE for the reaction $\text{H}_2\text{(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightarrow \text{H}_2\text{O(g)}$ at 25°C is –
 [1] 241.8 KJ [2] –241.8 KJ [3] –243 KJ [4] 243 KJ
- Q.24** On heating 128 g of oxygen from 0°C to 100°C, C_V and C_P on an average are 5 and 7 cal mol⁻¹ degree⁻¹ the value of ΔE and ΔH are respectively :
 [1] 2800 cal, 2000 cal [2] 2000 cal, 2800 cal
 [3] 280 cal, 200 cal [4] None of these
- Q.25** ΔS for the reaction; $\text{MgCO}_3\text{(s)} \rightarrow \text{MgO(s)} + \text{CO}_2\text{(g)}$ will be :
 [1] 0 [2] –ve [3] +ve [4] ∞
- Q.26** Which has the least entropy :
 [1] Graphite [2] Diamond [3] $\text{N}_2\text{(g)}$ [4] $\text{N}_2\text{O(g)}$
- Q.27** The total entropy change for a system & its surroundings increases if the process is –
 [1] Reversible [2] Irreversible [3] Exothermic [4] Endothermic
- Q.28** Molar heat capacity of water in equilibrium with ice at constant pressure is –
 [1] Zero [2] Infinity [3] 40.50 KJ K⁻¹ mol⁻¹ [4] 75.48 JK⁻¹ mol⁻¹
- Q.29** Change in entropy is negative for
 [1] Bromine (l) \rightarrow Bromine (g) [2] $\text{C(s)} + \text{H}_2\text{O(g)} \rightarrow \text{CO(g)} + \text{H}_2\text{(g)}$
 [3] $\text{N}_2\text{(g, 10 atm)} \rightarrow \text{N}_2\text{(g, 1 atm)}$ [4] $\text{Fe(at 400 K)} \rightarrow \text{Fe(at 300K)}$
- Q.30** In which reaction ΔS is positive –
 [1] $\text{H}_2\text{O(l)} \rightarrow \text{H}_2\text{O(s)}$ [2] $3\text{O}_2\text{(g)} \rightarrow 2\text{O}_3\text{(g)}$ [3] $\text{H}_2\text{O(l)} \rightarrow \text{H}_2\text{O(g)}$ [4] $\text{N}_2\text{(g)} + 3\text{H}_2\text{(g)} \rightarrow 2\text{NH}_3\text{(g)}$

- Q.31** When the egg is hard boiled, there -
[1] Increase in disorder [2] Decrease in disorder
[3] No change in disorder [4] ΔG is negative
- Q.32** 5 mole of an ideal gas expand reversibly from a volume of 8 dm^3 to 80 dm^3 at a temperature of 27°C . The change in entropy is -
[1] 41.57 JK^{-1} [2] -95.73 JK^{-1} [3] 95.73 JK^{-1} [4] -41.57 JK^{-1}
- Q.33** What is the sign of ΔG for the process in ice melting at 283 K
[1] $\Delta G > 0$ [2] $\Delta G = 0$ [3] $\Delta G < 0$ [4] None of these
- Q.34** The temperature at which the reaction $\text{Ag}_2\text{O}(\text{s}) \rightarrow 2\text{Ag}(\text{s}) + \frac{1}{2}\text{O}_2(\text{g})$ is at equilibrium is,
Given $\Delta H = 30.5 \text{ KJ mol}^{-1}$ and $\Delta S = 0.066 \text{ KJK}^{-1} \text{ mol}^{-1}$:
[1] 462.12 K [2] 362.12 K [3] 262.12 K [4] 562.12 K
- Q.35** The spontaneous nature of a reaction is impossible if :
[1] ΔH is +ve, ΔS is also +ve [2] ΔH is -ve; ΔS is also -ve
[3] ΔH is -ve ; ΔS is +ve [4] ΔH is +ve; ΔS is -ve
- Q.36** For a reaction at 25°C enthalpy change (ΔH) and entropy change (ΔS) are $-11.7 \times 10^3 \text{ Jmol}^{-1}$ and $-105 \text{ J mol}^{-1} \text{ K}^{-1}$ respectively. The reaction is :
[1] Spontaneous [2] Non spontaneous [3] At equilibrium [4] Can't say anything
- Q.37** At a certain temperature T , the endothermic reaction $\text{A} \rightarrow \text{B}$ proceeds almost to completion. The entropy change is :
[1] $\Delta S = 0$ [2] $\Delta S < 0$ [3] $\Delta S > 0$ [4] Cannot be predicted
- Q.38** If the equilibrium constant for a reaction is 10, then the value of ΔG° will be ($R = 8 \text{ JK}^{-1} \text{ mol}^{-1}$, $T = 300 \text{ K}$)
[1] $+ 5.527 \text{ KJ mol}^{-1}$ [2] $-5.527 \text{ KJ mol}^{-1}$ [3] $+55.27 \text{ KJ mol}^{-1}$ [4] $-55.27 \text{ KJ mol}^{-1}$
- Q.39** If $\Delta G^\circ > 0$ for a reaction then :
[1] $K_p > 1$ [2] $K_p < 1$
[3] The products predominate in the equilibrium mixture [4] None
- Q.40** A reaction $\text{A} + \text{B} \rightarrow \text{C} + \text{D} + \text{q}$ is found to have a positive entropy change, the reaction will be -
[1] Possible at high temperature [2] Possible only at low temperature
[3] Not possible at any temperature [4] Possible at any temperature
- Q.41** The enthalpy of vaporization for water is $186.5 \text{ KJ mol}^{-1}$, the entropy of its vaporization will be -
[1] $0.5 \text{ KJK}^{-1} \text{ mol}^{-1}$ [2] $1.0 \text{ KJK}^{-1} \text{ mole}^{-1}$ [3] $1.5 \text{ KJ K}^{-1} \text{ mole}^{-1}$ [4] $2.0 \text{ KJK}^{-1} \text{ mol}^{-1}$
- Q.42** The enthalpy of vaporisation of per mole of ethanol (b.p. = 79.5°C and $\Delta S = 109.8 \text{ JK}^{-1} \text{ mol}^{-1}$) is
[1] 27.35 KJ/mol [2] 32.19 KJ/mol [3] 38.70 KJ/mol [4] 42.37 KJ/mol
- Q.43** Calculate the entropy of $\text{Br}_2(\text{g})$ in the reaction $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightarrow 2\text{HBr}(\text{g})$, $\Delta S^\circ = 20.1 \text{ JK}^{-1}$ given, entropy of H_2 and HBr is 130.6 and 198.5 JK^{-1} .
[1] 246.3 JK^{-1} [2] 123.15 JK^{-1} [3] 24.63 JK^{-1} [4] 20 KJK^{-1}
- Q.44** Which of the following provide exceptions to third law of thermodynamics
[1] CO [2] ice [3] CO_2 [4] All the above

- Q.45** Evaporation of water is :
 [1] A process in which neither heat is evolved nor absorbed
 [2] A process accompanied by chemical reaction
 [3] An exothermic change [4] An endothermic change
- Q.46** For the process, $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$
 [1] Both ΔH and ΔS are +ve [2] ΔH is negative and ΔS is +ve
 [3] ΔH is +ve and ΔS is -ve [4] Both ΔH and ΔS are -ve
- Q.47** Enthalpy change during a reaction does not depend upon :
 [1] Condition of a reaction [2] Initial and final concentration
 [3] Physical state of reactants and product [4] Number of steps in the reaction
- Q.48** For the reactions
 (i) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g}) + x\text{KJ}$ (ii) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{l}) + y\text{KJ}$
 Which one of the following statement is correct :
 [1] $x > y$ [2] $x < y$ [3] $x = y$ [4] More data required
- Q.49** Enthalpy of formation of an atom is zero while the enthalpy of formation of a compound is
 [1] Zero [2] -ve [3] +ve [4] May be +ve or -ve
- Q.50** If $\text{H}_2(\text{g}) = 2\text{H}(\text{g})$; $\Delta H = 104 \text{ Kcal}$, than heat of atomisation of hydrogen is :
 [1] 52 Kcal [2] 104 Kcal [3] 208 Kcal [4] None of these

Answer Key - 1

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	3	3	4	1	1	1	2	3	1	4	4	4	1	3	2	2	3	1	1
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	2	2	2	2	3	2	2	2	4	3	1	3	3	1	4	2	3	2	3	4
Qus.	41	42	43	44	45	46	47	48	49	50										
Ans.	1	3	1	1	4	1	4	2	4	1										

Exercise # 2

- Q.1** Two atoms of hydrogen combine to form a molecule of hydrogen gas, the energy of the H_2 molecule is :
[1] Greater than that of separate atoms [2] Equal to that of separate atoms
[3] Lower than that of separate atoms [4] Some times lower and some times higher
- Q.2** Which of the following values of heat of formation indicates that the product is least stable
[1] -94 K cal [2] -231.6 K cal [3] $+21.4$ K cal [4] $+64.8$ K cal
- Q.3** The enthalpy of formation of ammonia is -46.0 KJ mol^{-1} . The enthalpy change for the reaction $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$ is :
[1] 46.0 KJ mol^{-1} [2] 92.0 KJ mol^{-1} [3] -23.0 KJ mol^{-1} [4] -92.0 KJ mol^{-1}
- Q.4** Given that standard heat enthalpy of CH_4 , C_2H_4 and C_3H_8 are -17.9 , 12.5 , -24.8 Kcal/mol. The ΔH for $CH_4 + C_2H_4 \rightarrow C_3H_8$ is
[1] -55.2 Kcal [2] -30.2 Kcal [3] 55.2 K cal [4] -19.4 Kcal
- Q.5** From the following data, the heat of formation of $Ca(OH)_2$ (s) at $18^\circ C$ is Kcal.
 $CaO(s) + H_2O(l) = Ca(OH)_2(s)$; $\Delta H_{18^\circ C} = -15.26$ Kcal (i)
 $H_2O(l) = H_2(g) + \frac{1}{2}O_2(g)$; $\Delta H_{18^\circ C} = 68.37$ Kcal (ii)
 $Ca(s) + \frac{1}{2}O_2(g) = CaO(s)$; $\Delta H_{18^\circ C} = -151.80$ Kcal (iii)
[1] -98.69 [2] -235.43 [3] 194.91 [4] 98.69
- Q.6** If $S + O_2 \rightarrow SO_2$; $\Delta H = -298.2$
 $SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$; $\Delta H = -98.7$
 $SO_3 + H_2O \rightarrow H_2SO_4$; $\Delta H = -130.2$
 $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$; $\Delta H = -287.3$
Then the enthalpy of formation of H_2SO_4 at 298 K is -
[1] -814.4 KJ [2] -650.3 KJ [3] -320.5 KJ [4] -433.5 KJ
- Q.7** Given than :
 $Zn + \frac{1}{2}O_2 \rightarrow ZnO + 84000$ cal1
 $Hg + \frac{1}{2}O_2 \rightarrow HgO + 21700$ cal 2
The heat of reaction (ΔH) for $Zn + HgO \rightarrow ZnO + Hg$ is -
[1] 105700 cal [2] 62300 cal [3] -105700 cal [4] -62300 cal
- Q.8** Given that
 $2C(s) + 2O_2(g) \rightarrow 2CO_2(g)$ $\Delta H = -787$ KJ
 $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$ $\Delta H = -286$ KJ
 $C_2H_2(g) + \frac{5}{2}O_2(g) \rightarrow 2CO_2(g) + H_2O(l)$ $\Delta H = -1310$ KJ
Heat of formation of acetylene is -
[1] $+1802$ KJ [2] -1802 KJ [3] -800 KJ [4] $+237$ KJ
- Q.9** The heat of reaction for
 $A + \frac{1}{2}O_2 \rightarrow AO$ is -50 K cal and
 $AO + \frac{1}{2}O_2 \rightarrow AO_2$ is 100 Kcal. The heat of reaction for $A + O_2 \rightarrow AO_2$ is -
[1] -50 K cal [2] $+50$ K cal [3] 100 K cal [4] 150 K cal.

- Q.10** $C(s) + O_2(g) \rightarrow CO_2(g) + 94.0 \text{ K cal.}$
 $CO(g) + \frac{1}{2} O_2(g) \rightarrow CO_2(g) \Delta H = -67.7 \text{ Kcal.}$
 from the above reactions find how much heat (Kcal mole⁻¹) would be produced in the following reaction :
 $C(s) + \frac{1}{2} O_2(g) \rightarrow CO(g)$
 [1] 20.6 [2] 26.3 [3] 44.2 [4] 161.6
- Q.11** The enthalpy of vapourisation of liquid water using the data :
 $H_2(g) + 1/2 O_2(g) \rightarrow H_2O(l) ; \Delta H = -285.77 \text{ KJ mol}^{-1}$
 $H_2(g) + 1/2 O_2(g) \rightarrow H_2O(g) ; \Delta H = -241.84 \text{ KJ mol}^{-1}$
 [1] +43.93 KJ mol⁻¹ [2] -43.93 KJ mol⁻¹ [3] +527.61 KJ mol⁻¹ [4] -527.61 KJ mol⁻¹
- Q.12** $H_2(g) + \frac{1}{2} O_2(g) = H_2O(l) ; \Delta H_{298K} = -68.32 \text{ Kcal.}$ Heat of vapourisation of water at 1 atm and 25°C is 10.52 Kcal. The standard heat of formation (in Kcal) of 1 mole of water vapour at 25°C is
 [1] 10.52 [2] -78.84 [3] +57.80 [4] -57.80
- Q.13** The heat of combustion of $CH_4(g)$, $C(s)$ and $H_2(g)$ at 25°C are -212.4 K cal, -94.0 K cal and 68.4 K cal respectively, the heat of formation of CH_4 will be -
 [1] +54.4 K cal [2] -18.4 K cal [3] -375.2 K cal [4] +212.8 K cal
- Q.14** The heats of combustion of C_2H_4 , C_2H_6 and H_2 are -1409.5 KJ, -1558.3 KJ and -285.6 KJ. The heat of hydrogenation of ethene is -
 [1] -136.8 KJ [2] -13.68 KJ [3] 273.6 KJ [4] 1.368 KJ
- Q.15** When two atoms of hydrogen combine to form a molecule of hydrogen gas, the energy of the molecule is
 [1] Greater than that of separate atoms [2] Equal to that of separate atoms
 [3] Lower than that of separate atoms [4] Sometimes lower and some times higher
- Q.16** The enthalpy of combustion of cyclohexane, cyclohexene and H_2 are respectively -3920, -3800 and -241 KJ mol⁻¹. The heat of hydrogenation of cyclohexene is -
 [1] -121 KJ mol⁻¹ [2] 121 KJ mol⁻¹ [3] -242 KJ mol⁻¹ [4] 242 KJ mol⁻¹
- Q.17** The bond energies of F_2 , Cl_2 , Br_2 and I_2 are 155.4, 243.6, 193.2 and 151.2 KJ mol⁻¹ respectively. The strongest bond is :
 [1] F-F [2] Cl-Cl [3] Br-Br [4] I-I
- Q.18** The enthalpy change for the reaction
 $H_2(g) + C_2H_4(g) \rightarrow C_2H_6(g)$ is the bond energies are ,
 $H-H = 103$, $C-H = 99$, $C-C=80$ & $C=C 145 \text{ K cal mol}^{-1}$
 [1] -10 K cal mol⁻¹ [2] +10 K cal mol⁻¹ [3] -30 K cal mol⁻¹ [4] +30 K cal mol⁻¹
- Q.19** Calculate the heat of formation of HI if the bond energies of I_2 , H_2 and HI are a, b & c KJ/mol respectively -
 [1] $\frac{2c - (b + a)}{2}$ KJ/mol [2] $(b + a) - 2c$ KJ/mol [3] $\frac{a + b - 2c}{2}$ KJ/mol [4] $2c - (b + a)$ KJ/mol
- Q.20** Form the reactions :
 $C(s) + 2H_2(g) \rightarrow CH_4(g), \Delta H = -X \text{ Kcal}$ $C(g) + 4H(g) \rightarrow CH_4(g), \Delta H = -X_1 \text{ Kcal}$
 $CH_4(g) \rightarrow CH_3(g) + H(g), \Delta H = + Y(\text{Kcal})$ Bond energy of C-H bond is -
 [1] $\frac{X}{4}$ K cal. mol⁻¹ [2] Y K cal. mol⁻¹ [3] $\frac{X_1}{4}$ K cal. mol⁻¹ [4] X_1 K cal. mol⁻¹

- Q.21** The inversion temperature for vander Waal's gas is :
 [1] $T_i = 2a/Rb$ [2] $T_i = a / Rb$ [3] $T_i = a/ 2Rb$ [4] $T_i = 0.5 T$ Boyle
- Q.22** The enthalpy changes at 298K in successive breaking of O–H bonds of water are
 $H_2O \rightarrow H(g) + OH(g); \Delta H = 498 \text{ KJ mol}^{-1}$
 $OH(g) \rightarrow H(g) + O(g); \Delta H = 428 \text{ KJ mol}^{-1}$ the bond enthalpy (energy) of O–H bond is
 [1] 498 KJ mol⁻¹ [2] 428 KJ mol⁻¹ [3] 70 KJ mol⁻¹ [4] 463 KJ mol⁻¹
- Q.23** The standard heats of formation of NO₂(g) and N₂O₄(g) are 8.0 and 2.0 Kcal mol⁻¹ respectively the heat of dimerization of NO₂ in KCal is
 [1] 10.0 [2] -6.0 [3] -12.0 [4] -14.0
- Q.24** The heat of neutralization of HCl by NaOH is -55.9 KJ/mol. If the heat of neutralization of HCN by NaOH is -12.1 KJ/mol. The energy of dissociation of HCN is
 [1] -43.8 KJ [2] 43.8 KJ [3] 68 KJ [4] -68KJ
- Q.25** When a certain amount of ethylene was burnt 6226 KJ heat was evolved. If heat of combustion of ethylene is 1411 KJ, the volume of O₂(at NTP) that entered into the reaction is –
 [1] 296.5 ml [2] 296.5 litre [3] 6226 x 22.4 litre [4] 22.4 litre
- Q.26** The heat evolved during the combustion of 112 litre of water gas (mixture of equal volume of H₂ and CO) is :
 Given $H_2(g) + \frac{1}{2} O_2(g) = H_2O(g); \Delta H = -241.8 \text{ KJ}$
 $CO(g) + \frac{1}{2} O_2(g) = CO_2(g); \Delta H = -283 \text{ KJ}$
 [1] 241.8 KJ [2] 283 KJ [3] 29338.8 KJ [4] None of these
- Q.27** A person requires 2870 Kcal of energy of lead normal daily life. If heat of combustion of cane sugar is -1349 Kcal, then his daily consumption of sugar is :
 [1] 728 g [2] 0.728 g [3] 342 g [4] 0.342 g
- Q.28** If water is formed from H⁺ ions and OH⁻ the enthalpy of formation of water is :
 [1] -13.7 Kcal [2] 13.7 Kcal [3] -63.4 Kcal [4] More data required
- Q.29** Equal volumes of 1M HCl and 1 M H₂SO₄ are neutralised by dilute NaOH solution and x and y K cal of heat are liberated respectively. Which of the following is true :
 [1] x = y [2] x = 0.5 y [3] x = 0.4 y [4] None
- Q.30** Heat of dissociation of benzene to elements is 5535 KJ mol⁻¹. The bond enthalpies of C–C, C=C and C–H are 347.3, 615.0 and 416.2 KJ respectively. Resonance energy of benzene is
 [1] 1.51 KJ [2] 15.1 KJ [3] 151 KJ [4] 1511 KJ
- Q.31** One mole of anhydrous salt AB dissolves in water and liberates 21.0 J mol⁻¹ of heat. The value of $\Delta H_{(\text{hydration})}$ of AB is -29.4J mol⁻¹. The heat of dissolution of hydrated salt AB. 2H₂O(s) is –
 [1] 50.4 J mol⁻¹ [2] 8.4 mol⁻¹ [3] -50.4 J mol⁻¹ [4] -8.4 J mol⁻¹
- Q.32** On complete combustion of 2gm methane 26575 cal heat is generated. The heat of formation of methane will be (given heat of formation of CO₂ and H₂O are -97000 and -68000 cal respectively) :
 [1] + 20400 cal [2] +20600 cal [3] -20400 cal [4] -2000 cal
- Q.33** The heat of combustion of solid benzoic acid at constant volume is -321.30 KJ at 27°C. The heat of combustion at constant pressure is –
 [1] -321.30 - 300 R [2] -321.30 + 300 R [3] -321.30 - 150 R [4] -321.30 + 900 R
- Q.34** Heat of formation, ΔH_f° of an explosive compounds like NCl₃ is –
 [1] Positive [2] Negative [3] Zero [4] Positive or negative
- Q.35** If ΔH_f° of ICl(g), Cl(g), and I(g) is 17.57, 121.34 and 106.96 J mol⁻¹ respectively. Then bond dissociation energy of ICl bond is –
 [1] 35.15 J mol⁻¹ [2] 106.69 J mol⁻¹ [3] 210.73 mol⁻¹ [4] 420.9 J mol⁻¹

- Q.36** $q = -w$ is not true for –
 [1] Isothermal process [2] Adiabatic process [3] Cyclic process [4] 1 and 3 both
- Q.37** For which change $\Delta H \neq \Delta E$ –
 [1] $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$ [2] $\text{HCl}(\text{l}) + \text{NaOH}(\text{l}) \rightarrow \text{NaCl}(\text{s}) + \text{H}_2\text{O}(\text{l})$
 [3] $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$ [4] $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
- Q.38** The heat change during the reaction 24g C and 128g S following the change $\text{C} + \text{S}_2 \rightarrow \text{CS}_2$; $\Delta H = 22\text{K cal}$
 [1] 22 K cal [2] 11 K cal [3] 44 K cal [4] 32 K cal
- Q.39** The value of ΔH for the combustion of $\text{C}(\text{s})$ is -94.4 Kcal . The heat of formation of $\text{CO}_2(\text{g})$ is –
 [1] -49.5 K cal [2] -94.4 K cal [3] -188.0 K cal [4] More data required
- Q.40** The Gibbs free energy change of a reaction at 27°C is -26K. Cals. and its entropy change is -60 Cals/K. ΔH for the reaction is
 [1] -44 K cal [2] -18 K. Cals [3] 34 K. Cals [4] -24 K. Cals.
- Q.41** If $\text{CH}_3\text{COOH} + \text{OH}^- = \text{CH}_3\text{COO}^- + \text{H}_2\text{O} + q_1$, and $\text{H}^+ + \text{OH}^- = \text{H}_2\text{O} + q_2$, then the enthalpy change for the reaction $\text{CH}_3\text{COOH} = \text{CH}_3\text{COO}^- + \text{H}^+$ is equal to –
 [1] $q_1 + q_2$ [2] $q_1 - q_2$ [3] $q_2 - q_1$ [4] $-(q_1 + q_2)$
- Q.42** One mole of a gas occupying 3dm^3 expands against a constant external pressure of 1 atm to a volume of 13 lit. The workdone is –
 [1] -10 atm dm^3 [2] -20 atm dm^3 [3] -39 atm dm^3 [4] -48 atm dm^3
- Q.43** M is a metal that forms an oxide M_2O , $\frac{1}{2}\text{M}_2\text{O} \rightarrow \text{M} + \frac{1}{4}\text{O}_2$ $\Delta H = 120\text{ K. Cal.}$
 When a sample of metal M reacts with one mole of oxygen what will be the ΔH in that case
 [1] 240 K. Cal. [2] -240 K. Cal [3] 480 K. Cal [4] -480 K. Cal
- Q.44** For a reaction $2\text{X}(\text{s}) + 2\text{Y}(\text{s}) \rightarrow 2\text{Z}(\text{s}) + \text{D}(\text{g})$
 The $q_{(\text{p})}$ at 27°C is $-28\text{ K cal. mol}^{-1}$. The $q_{(\text{v})}$ is ----- K. Cal. mol^{-1}
 [1] -27.4 [2] $+27.4$ [3] -28.6 [4] 28.6
- Q.45** If $\text{C}_6\text{H}_{12}\text{O}_6(\text{s}) + 9\text{O}_2(\text{g}) \rightarrow 6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g})$; $\Delta H = -680\text{ Kcal}$ The weight of $\text{CO}_2(\text{g})$ produced when 170 Kcal of heat is evolved in the combustion of glucose is –
 [1] 265 gm [2] 66 gm [3] 11 gm [4] 64 gm
- Q.46** If a gas absorbs 100J of heat and expands by 500cm^3 against a constant pressure of $2 \times 10^5\text{ Nm}^{-2}$, the change in internal energy is –
 [1] -300 J [2] -100 J [3] $+100\text{ J}$ [4] None of these
- Q.47** Heat of neutralisation of oxalic acid is -106.7 KJmol^{-1} using NaOH hence ΔH of :
 $\text{H}_2\text{C}_2\text{O}_4 \rightarrow \text{C}_2\text{O}_4^{2-} + 2\text{H}^+$ is :
 [1] 5.88 KJ [2] -5.88 KJ [3] -13.7 K cal [4] 7.5 KJ

Answer Key - 2

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Ans.	3	4	2	4	2	1	2	4	2	2	1	4	3	1	3	1	2	3	3	1	
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
Ans.	1	4	2	2	2	3	1	1	2	3	4	3	3	1	3	4	4	3	2	1	
Qus.	41	42	43	44	45	46	47														
Ans.	3	1	4	3	2	4	4														

Exercise # 3

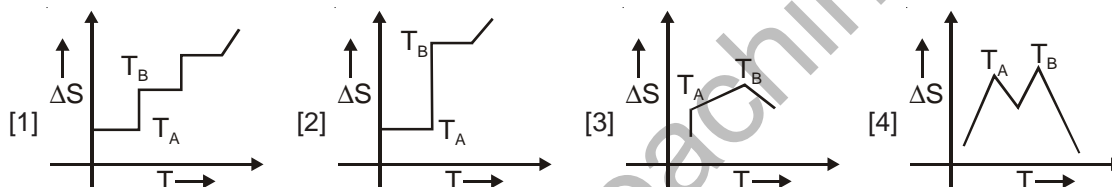
- Q.1** Heat of formation in the reaction $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl} + 44 \text{ Kcal}$ is— **[MPPMT 1995]**
[1] 44 Kcal [2] 44000 Kcal [3] 22 Kcal [4] 11 kcal
- Q.2** In an exothermic reaction ΔH is **[MP PMT 1995, CPMT 1999]**
[1] Positive [2] Negative [3] Zero [4] Both positive or negative
- Q.3** Decrease of free energy of a reacting system indicates to a/an **[MP PET 1993, 95]**
[1] Exothermic reaction [2] Equilibrium reaction
[3] Spontaneous reaction [4] Slow reaction
- Q.4** In a spontaneous process, the entropy of the system and its surroundings **[MP PET 1996]**
[1] Equals zero [2] Decreases [3] Increases [4] Remains constant
- Q.5** The bond dissociation energies of gaseous H_2 , Cl_2 and HCl are 104, 58 and 103 kcal respectively. The enthalpy of formation of HCl gas would be **[MP PET 1997, MP PMT 1999, 2001]**
[1] -44 kcal [2] 44 kcal [3] -22 kcal [4] 22 kcal
- Q.6** Mark the correct statement **[MP PET 1997]**
[1] For a chemical reaction to be feasible, ΔG should be zero
[2] Entropy is a measure of order in a system
[3] For a chemical reaction to be feasible, ΔG should be positive
[4] The total energy of an isolated system is constant
- Q.7** The heat of reaction at constant pressure is given by — **[MP PMT 1997]**
[1] $E_p - E_R$ [2] $E_R - E_p$ [3] $H_p - H_R$ [4] $H_R - H_p$
- Q.8** The positive value of ΔS indicates that **[MP PMT 1997]**
[1] The system becomes less disordered [2] The system becomes more disordered
[3] The system is in equilibrium position [4] The system tends to reach at equilibrium position
- Q.9** What is the free energy change ΔG when 1.0 mole of water at 100°C and 1 atm pressure is converted into steam at 100°C and 1 atm pressure? **[MP PET/PMT 1998]**
[1] 540 cal [2] -9800 cal [3] .9800 cal [4] 0 cal
- Q.10** In an endothermic reaction, the value of ΔH is **[CBSE 1999, AIIMS 1998, BHU 2000 MP PMT 2000]**
[1] zero [2] Positive [3] Negative [4] Constant
- Q.11** The free energy change $\Delta G = 0$ when **[AIIMS 1996]**
[1] The reactants are completely consumed [2] A catalyst is added
[3] The system is at equilibrium [4] The reactants are initially mixed
- Q.12** $\text{C} + \frac{1}{2}\text{O}_2 \rightarrow \text{CO}; \Delta H = -42 \text{ kJ}$ $\text{CO} + \frac{1}{2}\text{O}_2 \rightarrow \text{CO}_2; \Delta H = -24 \text{ kJ}$
The heat of formation of CO_2 is **[CPMT 1996]**
[1] -16 kJ [2] +66 kJ [3] +16 kJ [4] -66 kJ
- Q.13** Molar heat capacity of water in equilibrium with ice at constant pressure is **[IIT 1997]**
[1] Zero [2] Infinity (∞) [3] $40.45 \text{ kJ K}^{-1} \text{ mol}^{-1}$ [4] 75.48 JK^{-1}
- Q.14** Standard molar enthalpy of formation of CO_2 is equal to **[IIT 1997, BHU 2001]**
[1] Zero
[2] The standard molar enthalpy of combustion of gaseous carbon
[3] The sum of standard molar enthalpies of formation of CO and O_2
[4] The standard molar enthalpy of combustion of carbon (graphite)

- Q.27** Work done during isothermal expansion of one mole of an ideal gas from 10 atm to 1atm at 300 K is (Gas constant = 2) **[AIIMS 2000]**
 [1] 938.8 cal [2] 1138.8 cal. [3] 1381.8 cal. [4] 1581.8 cal
- Q.28** Following data is known about melting of a compound AB. $\Delta H = 9.2 \text{ kJ mol}^{-1}$, $\Delta S = 0.008 \text{ kJ K}^{-1} \text{ mol}^{-1}$. Its melting point is **[Pb. PMT 2000; AIIMS 2000]**
 [1] 736 K [2] 1050 K [3] 1150 K [4] 1150°C
- Q.29** The first ionization energy for Li is 5.4 eV and electron affinity of Cl is 3.61 eV. The ΔH (in kJ/mol) for the reaction $\text{Li(g)} + \text{Cl(g)} \rightarrow \text{Li}^+ + \text{Cl}^-$ is (if resulting ions do not combine with each other) ($1\text{eV} = 1.6 \times 10^{-19}\text{J}$) **[MP PMT 2000, 03]**

[1] 70 [2] 100 [3] 170 [4] 270

- Q.30** The enthalpy of combustion of $\text{C}_6\text{H}_6(\text{l})$ is -3250 kJ . When 0.39 g of benzene is burnt excess of oxygen in an open vessel, the amount of heat evolved is : **[Karnataka CET 2000; AFMC 2000; DEC 2000]**
 [1] 16.25 J [2] 16.25 kJ [3] 32.5 J [4] 32.5 kJ

- Q.31** If for a given substance melting point is T_B and freezing point is T_A , then correct variation shown by graph between entropy change and temperature is : **[DEC 2001]**



- Q.32** The heat of neutralization of HCl by NaOH under certain condition is -55.9 kJ and that of HCN by NaOH is -12.1 kJ , the heat of ionization of HCN is : **[MP PET 2001]**

[1] $-68.0 \text{ kJ mol}^{-1}$ [2] $-43.8 \text{ kJ mol}^{-1}$ [3] 68.0 kJ mol^{-1} [4] 43.8 kJ mol^{-1}

- Q.33** Free energy change for a reversible process is : **[MP PET 2001]**

[1] More than zero [2] Less than zero [3] Equal to zero [4] None of these

- Q.34** Spontaneity of a chemical reaction is decided by the negative change in : **[MP PET 2001]**

[1] Internal energy [2] Enthalpy [3] Entropy [4] Free energy

- Q.35** The heat of neutralization of HCl and NaOH is : **[MP PET 2001]**

[1] Zero [2] -57.3 kJ [3] $+57.3 \text{ kJ}$ [4] None of these

- Q.36** For melting of 3 moles of water at 0°C the ΔG° is : **[MP PMT 2001]**

[1] Zero [2] + ve [3] - ve [4] Unpredictable

- Q.37** For conversion $\text{C (graphite)} \rightarrow \text{C (diamond)}$ the ΔS is : **[MP PMT 2001; MP PET 2003]**

[1] Zero [2] Positive [3] Negative [4] Unknown

- Q.38** Which of the following is correct criteria for spontaneity : **[MP PET 2002]**

[1] $\Delta H = +ve$ $T.\Delta s = +ve$ ($T.\Delta s > \Delta H$) [2] $\Delta H = +ve$ $T.\Delta s = +ve$ ($T.\Delta s < \Delta H$)
 [3] $\Delta H = -ve$ $T.\Delta s = +ve$ ($T.\Delta s > \Delta H$) [4] $\Delta H = -ve$ $T.\Delta s = -ve$ ($T.\Delta s > \Delta H$)

- Q.39** If the heat of combustion of carbon monoxide at constant volume and at 17°C is -283.3 kJ , then its heat of combustion at constant pressure ($R = 8.314 \text{ J degree}^{-1} \text{ mol}^{-1}$) : **[CPMT 2001]**

[1] -284.5 kJ [2] 284.5 kJ [3] 384.5 kJ [4] -384.5 kJ

- Q.40** The standard entropies of $\text{CO}_2(\text{g})$, $\text{C}(\text{s})$ and $\text{O}_2(\text{g})$ are 213.5, 5.690 and 205 JK^{-1} respectively. The standard entropy of formation of $\text{CO}_2(\text{g})$ is : **[CPMT 2001]**
 [1] 1.86 JK^{-1} [2] 1.96 JK^{-1} [3] 2.81 JK^{-1} [4] 2.86 JK^{-1}
- Q.41** An adiabatic expansion of an ideal gas, always has : **[MP PMT 2002]**
 [1] Increase in temperature [2] $\Delta H = 0$
 [3] $q = 0$ [4] $W = 0$
- Q.42** The heat of neutralisation will be highest in : **[MP PMT 2002]**
 [1] NH_4OH and CH_3COOH [2] NH_4OH and HCl
 [3] KOH and CH_3COOH [4] KOH and HCl
- Q.43** Gibbs free energy G , enthalpy H and entropy S are interrelated as in : **[MP PMT 2002]**
 [1] $G = H + TS$ [2] $G = H - TS$ [3] $G - TS = H$ [4] $G = S = H$
- Q.44** If an endothermic reaction is non-spontaneous at freezing point of water and becomes feasible at its boiling point, then : **[AIEEE 2002]**
 [1] ΔH is -ve, ΔS is +ve [2] ΔH and ΔS both are +ve
 [3] ΔH and ΔS both are -ve [4] ΔH is +ve, ΔS is -ve
- Q.45** A heat engine absorbs heat Q_1 at temperature T_1 and heat Q_2 at temperature T_2 . Work done by the engine is ($Q_1 + Q_2$). This data : **[AIEEE 2002]**
 [1] Violates 1st law of thermodynamics [2] Violates 1st law of thermodynamics if Q_1 is -ve
 [3] Violates 1st law of thermodynamics if Q_2 is -ve
 [4] Does not violate 1st law of thermodynamics
- Q.46** The entropy changed involved in the conversion of 1 mole of liquid water at 373 K to vapour at the same temperature will be : [$\Delta H_{\text{vap}} = 2.257 \text{ kJ/gm}$] **[MP PET 2002]**
 [1] 0.119 kJ [2] 0.109 kJ [3] 0.129 kJ [4] 0.120 kJ
- Q.47** Which of the following reactions is not exothermic : **[MP PMT 2002]**
 [1] $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$ [2] $\text{C}(\text{s}) + 2\text{S}(\text{s}) \rightarrow \text{CS}_2(\text{g})$
 [3] $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$ [4] $\text{CO}(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
- Q.48** The correct relationship between free energy change in a reaction and the corresponding equilibrium constant K_C is : **[AIEEE 2003]**
 [1] $\Delta G = RT \ln K_C$ [2] $-\Delta G = RT \ln K_C$ [3] $\Delta G^\circ = RT \ln K_C$ [4] $-\Delta G^\circ = RT \ln K_C$
- Q.49** In an irreversible process taking place at constant T and P and in which only pressure-volume work is being done, the change in Gibbs free energy (dG) and change in entropy (dS), satisfy the criteria : **[AIEEE 2003]**
 [1] $(dS)_{V,E} < 0$, $(dG)_{T,P} < 0$ [2] $(dS)_{V,E} > 0$, $(dG)_{T,P} < 0$
 [3] $(dS)_{V,E} = 0$, $(dG)_{T,P} = 0$ [4] $(dS)_{V,E} = 0$, $(dG)_{T,P} > 0$
- Q.50** Which of the reaction defines ΔH_f° **[IIT Scr. 2003]**
 [1] $\text{C}_{(\text{diamond})} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$ [2] $\frac{1}{2} \text{H}_2(\text{g}) + \frac{1}{2} \text{F}_2(\text{g}) \rightarrow \text{HF}(\text{g})$
 [3] $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$ [4] $\text{CO}(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
- Q.51** One gram sample of NH_4NO_3 is decomposed in a bomb calorimeter. The temperature of the calorimeter increases by 6.12 K the heat capacity of the system is 1.23 kJ/g/deg. What is the molar heat of decomposition for NH_4NO_3 : **[AIIMS 2003]**
 [1] -7.53 kJ/mol [2] -398.1 kJ/mol [3] -16.1 kJ/mol [4] -602 kJ/mol

- Q.52** For complete neutralization of HCl with NaOH, the heat of neutralization is : **[MP PET 2003]**
 [1] + 13.70 kJ mol⁻¹ [2] - 13.70 kJ mol⁻¹ [3] - 57.32 kJ mol⁻¹ [4] + 57.32 kJ mol⁻¹
- Q.53** The enthalpies of combustion of carbon and carbon monoxide are -393.5 and -283 kJ mol⁻¹ respectively. The enthalpy of formation of carbon monoxide per mole is : **[AIEEE 2004]**
 [1] -110.5 KJ [2] 676.5 KJ [3] -676.5 KJ [4] 110.5 KJ
- Q.54** Which of the following pairs of a chemical reaction is certain to result in a spontaneous reaction ? **[CPMT 2005]**
 [1] Exothermic and increasing disorder [2] Exothermic and decreasing disorder
 [3] Endothermic and increasing disorder [4] Endothermic and decreasing disorder
- Q.55** A reaction occurs spontaneously if **[CPMT 2005]**
 [1] $T\Delta S < \Delta H$ and both ΔH and ΔS are +ve [2] $T\Delta S > \Delta H$ and ΔH is +ve and ΔS is -ve
 [3] $T\Delta S > \Delta H$ and both ΔH and ΔS are +ve [4] $T\Delta S = \Delta H$ and both ΔH and ΔS are +ve
- Q.56** The absolute enthalpy of neutralisation of the reaction ;
 $\text{MgO}_{(s)} + 2\text{HCl}_{(aq)} \rightarrow \text{MgCl}_{2(aq)} + \text{H}_2\text{O}_{(l)}$ will be **[CPMT 2005]**
 [1] -57.33 kJ mol⁻¹ [2] Greater than -57.33 kJ mol⁻¹
 [3] Less than -57.33 kJ mol⁻¹ [4] 57.33 kJ mol⁻¹
- Q.57** For a spontaneous reaction the ΔG , equilibrium constant (K) and E_{cell}° will be respectively. **[AIEEE 2005]**
 [1] -ve, >1, +ve [2] +ve, >1, -ve [3] -ve, <1, -ve [4] -ve, >1, -ve
- Q.58** Consider the reaction : $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ carried out at constant temperature and pressure. If ΔH and ΔU are the enthalpy and internal energy changes for the reaction, which of the following expressions is true ? **[AIEEE 2005]**
 [1] $\Delta H = 0$ [2] $\Delta H = \Delta U$ [3] $\Delta H < \Delta U$ [4] $\Delta H > \Delta U$
- Q.59** If the bond dissociation energies of XY, X₂ and Y₂ (all diatomic molecules) are in the ratio of 1 : 1 : 0.5 and ΔH_f for the formation of XY is -200 kJ mol⁻¹. The bond dissociation energy of X₂ will be **[AIEEE 2005]**
 [1] 100 kJ mol⁻¹ [2] 200 kJ mol⁻¹ [3] 800 kJ mol⁻¹ [4] 400 kJ mol⁻¹
- Q.60** Assume each reaction is carried out in an open container, for which reaction will $\Delta H = \Delta E$? **[CPMT 2006]**
 [1] $\text{PCl}_5(\text{g}) \rightarrow \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$ [2] $2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g})$
 [3] $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightarrow 2\text{HBr}(\text{g})$ [4] $\text{C}(\text{s}) + 2\text{H}_2\text{O}(\text{g}) \rightarrow 2\text{H}_2(\text{g}) + \text{CO}_2(\text{g})$
- Q.61** Identify the correct statement for change of Gibbs energy for a system (ΔG_{system}) at constant temperature and pressure ; **[CPMT 2006]**
 [1] If $\Delta G_{\text{system}} = 0$, the system is still moving in a particular direction
 [2] If $\Delta G_{\text{system}} < 0$, the process is not spontaneous
 [3] If $\Delta G_{\text{system}} > 0$, the process is spontaneous
 [4] If $\Delta G_{\text{system}} = 0$, the system has attained equilibrium
- Q.62** The enthalpy and entropy change for the reaction ; **[CPMT 2006]**
 $\text{Br}_2(\text{l}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{BrCl}(\text{g})$
 are 30 kJ mol⁻¹ and 105 JK⁻¹ mol⁻¹ respectively. The temperature at which the reaction will be in equilibrium is
 [1] 450 K [2] 300 K [3] 285.7 K [4] 273 K
- Q.63** The enthalpy of hydrogenation of cyclohexene is -119.5 kJ mol⁻¹. If resonance energy of benzene is -150.4 kJ mol⁻¹, its enthalpy of hydrogenation would be - **[CPMT 2006]**
 [1] -269.9 kJ mol⁻¹ [2] -358.5 kJ mol⁻¹ [3] -508.9 kJ mol⁻¹ [4] -208.1 kJ mol⁻¹

- Q.64** The standard enthalpy of formation ($\Delta_f H^0$) at 298 K for methane, $\text{CH}_4(\text{g})$, is $-74.8 \text{ kJ mol}^{-1}$. The additional information required to determine the average energy for C – H bond formation would be [AIEEE 2006]
 [1] Latent heat of vapourization of methane
 [2] The first four ionization energies of carbon and electron gain enthalpy of hydrogen
 [3] The dissociation energy of hydrogen molecule, H_2
 [4] The dissociation energy of H_2 and enthalpy of sublimation of carbon
- Q.65** The enthalpy changes for the following processes are listed below ;
 $\text{Cl}_2(\text{g}) = 2\text{Cl}(\text{g}), \quad 242.3 \text{ kJ mol}^{-1}$
 $\text{I}_2(\text{g}) = 2\text{I}(\text{g}), \quad 151.0 \text{ kJ mol}^{-1}$
 $\text{ICl}(\text{g}) = \text{I}(\text{g}) + \text{Cl}(\text{g}), \quad 211.3 \text{ kJ mol}^{-1}$
 $\text{I}_2(\text{s}) = \text{I}_2(\text{g}), \quad 62.76 \text{ kJ mol}^{-1}$
 Given that the standard states for iodine and chlorine are $\text{I}_2(\text{s})$ & $\text{Cl}_2(\text{g})$, the standard enthalpy of formation for $\text{ICl}(\text{g})$ is [AIEEE 2006]
 [1] $-16.8 \text{ kJ mol}^{-1}$ [2] $+16.8 \text{ kJ mol}^{-1}$ [3] $+244.8 \text{ kJ mol}^{-1}$ [4] $-14.6 \text{ kJ mol}^{-1}$
- Q.66** ($\Delta H - \Delta U$) for the formation of carbone monoxide (CO) from its elements at 298 K is [AIEEE 2006]
 ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)
 [1] $1238.78 \text{ J mol}^{-1}$ [2] $-2477.57 \text{ J mol}^{-1}$ [3] $2477.57 \text{ J mol}^{-1}$ [4] $-1238.78 \text{ J mol}^{-1}$
- Q.67** The reaction A to B is not feasible but on changing entropy through series of steps $\text{A} \rightarrow \text{C} \rightarrow \text{D} \rightarrow \text{B}$ ΔS ($\text{A} \rightarrow \text{C}$) = 50 eu; ΔS ($\text{C} \rightarrow \text{D}$) = 30 eu; ΔS ($\text{B} \rightarrow \text{D}$) = 20 eu
 The entropy change for $\text{A} \rightarrow \text{B}$ would be - [IIT 2006]
 [1] 100 eu [2] 60 eu [3] -60 eu [4] -100 eu
- Q.68** The energies of activation for forward and reverse reactions for $\text{A}_2 + \text{B}_2 \rightleftharpoons 2\text{AB}$ are 180 kJ mol^{-1} and 200 kJ mol^{-1} respectively. The presence of a catalyst lowers the activation energy of both (forward and reverse) reactions by 100 kJ mol^{-1} . The enthalpy change of the reaction ($\text{A}_2 + \text{B}_2 \rightarrow 2\text{AB}$) in the presence of catalyst will be (in kJ mol^{-1}) [AIEEE 2007]
 [1] 280 [2] 20 [3] 300 [4] 120
- Q.69** Assuming that water vapour is an ideal gas, the internal energy change (ΔU) when 1 mol of water is vapourised at 1 bar pressure and 100°C , (Given : Molar enthalpy of vapourisation of water at 1 bar and $373 \text{ K} = 41 \text{ kJ mol}^{-1}$ and $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$) will be [AIEEE 2007]
 [1] $37.904 \text{ kJ mol}^{-1}$ [2] $41.00 \text{ kJ mol}^{-1}$ [3] $4.100 \text{ kJ mol}^{-1}$ [4] $3.7904 \text{ kJ mol}^{-1}$
- Q.70** In conversion of lime-stone to lime, $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ the values of ΔH^0 and ΔS^0 are $+179.1 \text{ kJ mol}^{-1}$ and 160.2 J/K respectively at 298 K and 1 bar. Assuming that ΔH^0 and ΔS^0 do not change with temperature, temperature above which conversion of limestone to lime will be spontaneous is [AIEEE 2007]
 [1] 845 K [2] 1118 K [3] 1008 K [4] 1200 K

Answer Key - 3

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	3	2	3	3	3	4	3	2	4	2	3	4	2	4	1	4	2	3	1	4	4	2	1	4	1
Qus.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	1	3	3	3	2	1	4	3	4	2	1	3	1	1	3	3	4	2	2	4	2	2	4	2	2
Qus.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70					
Ans.	1	3	1	1	3	3	1	3	3	3	4	3	4	4	2	1	2	2	1	2					