CHEMISTRY

BOOKS - KUMAR PRAKASHAN KENDRA CHEMISTRY (GUJRATI ENGLISH)

THERMODYNAMICS

Section A Questions 6 1 Thermodynamic Terms

1. Explain the difference between the system and surrounding.

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2. What is system ? Explain types of system.

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3. Explain the internal energy as a state function.

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4. Explain a change in internal energy on the base of work.

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Section A Questions 6 2 Applications

1. Explain mechanical work.

OR

Explain pressure volume work.

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2. Explain free expansion.

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3. Which of the following is correct for free expansion of ideal gas under isothermal condition :-

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4. Explain : Enthalpy : state function. OR $\Delta H = q_p$ Or Prove : "The change in enthalpy of the system in which chemical reaction occurs is equal to value of heat gain by system."

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5. Explain the relation of change in heat at constant pressure and constant temperature.

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6. Explain extensive property and intensive property.

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7. Explain Heat Capacity.

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8. Prove the relationship between C_p and C_p for an ideal gas.

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Section A Questions 6 3 Measurement Of Delta U And Delta H Calorimetry

1. Explain the measurement of ΔU and ΔH by calorimetry.

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2. Explain the measurement of ΔU calorimetery

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3. Explain the measurement of ΔH calorimetetry

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Section A Questions 6 4 Enthalpy Change Delta R H Of Reaction Reaction Enthalpy

1. Explain change in enthalpy related to reaction.

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2. Explain the standard enthalpy of reactions.

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3. Explain enthalpy changes during phase transformations.

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4. Explain standard enthalpy of formation

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5. Thermochemical equations.

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6. Prove Hess.s law of constant heat summation.

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Section A Questions 6 5 Enthalpies For Different Types Of Reactions

1. Explain the standard enthalpy of combustion $\Delta_C H^{\Theta}$.

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2. Explain Enthalpy of atomization $\left(\Delta_a H^{\Theta}\right)$.

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3. Write the notes on diatomic molecules and polyatomic molecules.

OR

Explain the bond enthalpy.

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4. Explain Enthalpy of Solution $\left(\Delta_{\text{sol}} H^{\Theta}\right)$.

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5. Explain the Born-Haber Cycle.

OR

Lattice Enthalpy.

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6. Explain the enthalpy of dilution.

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Section A Questions 6 6 Spontaneity

1. Explain entropy and spontaneity of reactions.

OR

Explain entropy and spontaneity.

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2. What is entropy ? Explain its spontaneity.

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3. Describe Gibbs energy and spontaneity.

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4. Describe the absolute entropy and third law of thermodynamics.

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Section A Questions 6 7 Gibbs Energy Change And Equilibrium

1. Describe about Gibbs energy change and equilibrium.

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Section A Questions

1. Express the change in internal energy of a system when

(i) No heat is absorbed by the system from the surroundings, but work (w) is done on the system. What type of wall does the system have ?

(ii) No work is done on the system, but q amount of heat is taken out from the system and given to the surroundings. What type of wall does the system have?.

(iii) w amount of work is done by the system and q amount of heat is supplied to the system. What type of system would it be ?

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2. In a process, 701 J of heat is absorbed by a system and 394 J of work is done by the system. What is the change in internal energy for the process ?

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3. Two liters of an ideal gas at a pressure of 10 atm. expands isothermally into a vacuum until its total volume is 10 liters. How much heat is absorbed and how much work is done in the expansion ?

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4. Consider the same expansion, but this time against a constant external pressure of 1 atm.

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5. Consider the same expansion, to a final volume of 10 liters conducted reversibly.

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6. If water vapour is assumed to be a perfect gas, molar enthalpy change for vapourisation of 1 mol of water at 1 bar and 100°C is 41 kJ mol^{-1}.

Calculate the internal energy change, when

(i) 1 mol of water is vaporised at 1 bar pressure and 100°C.

(ii) 1 mol of water is converted into ice.

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7. 1 g of graphite is burnt in a bomb calorimeter in excess of oxygen at 298 K and 1 atmospheric pressure according to the equation

$C_{(\text{graphite})} + O_{2(g)} \rightarrow CO_{2(g)}$

During the reaction, temperature rises from 298 K to 299 K. If the heat capacity of the bomb calorimeter is 20.7 kJ/K, what is the enthalpy change for the above reaction at 298 K and 1 atm ?

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8. Calculate the number of kJ of heat necessary to raise the temperature of 60.0 g of aluminium from 35°C to 55°C. Molar heat capacity of Al is 24 J $\text{mol}^{-1}\text{K}^{-1}$

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9. A swimmer coming out from a pool is covered with a film of water weighing about 18g. How much heat must be supplied to evaporate this water at 298 K ? Calculate the internal energy of vaporization at 100°C.

$\Delta_{\text{vap}} H^{\Theta}$ for water at 373 $K = 40.66\text{kJ mol}^{-1}$

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10. The reaction of cyanamlde, $NH_2CN_{(s)}$, with dioxygen was carried out in a bomb calorimeter, and ΔU was found to be -742.7kJ mol^{-1} at 298 K. Calculate enthalpy change for the reaction at 298 K.

$$NH_2CN_{(g)} + \frac{3}{2}O_{2(g)} \rightarrow N_{2(g)} + CO_{2(g)} + H_2O_{(l)}$$

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11. The combustion of one mole of benzene takes place at 298 K and 1 atm. After combustion, $CO_{2(g)}$ and $H_2O_{(l)}$ are produced and 3267.0 kJ

of heat is liberated. Calculate the standard enthalpy of formation, $\Delta_r H^{\ominus}$ of benzene. Standard enthalpies of formation of $CO_{2(g)}$ and $H_2O_{(l)}$ are -393.5 kJ "mol"^(-1) and -285.83 "kJ mol"^(-1)` respectively.

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12. Calculate the enthalpy change on freezing of 1.0 mol of water at 10.0°c to ice at -10.0°c.

$\Delta_{\text{fus}}H = 6. \ -03\text{kJ mol}^{-1}\text{at} \ \ 0^{\circ}$ C

$C_p\left[H_2O_{(l)}\right] = 75.3\text{J mol}^{-1}K$

$C_p\left[H_2O_{(s)}\right] = 36.8\text{J mol}^{-1}K$

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13. Enthalpy of combustion of carbon to CO_2 is -393.5kJ mol^{-1}. Calculate the heat released upon formation of 35.2 g of CO_2 from carbon and dioxygen gas.

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14. Enthalpies of formation of $CO_{(g)}$, $CO_{2(g)}$, $N_2O_{(g)}$ and $N_2O_{4(g)}$ are -100, $-393, 81$ and 9.7kJ mol^{-1} respectively. Find the value of $\Delta_r H$ for the reaction :

$N_2O_{4(g)}, 3CO_{(g)} \rightarrow N_2O_{4(g)} + 3CO_{2(g)}$

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15. Given $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}, \Delta_r H^\circ = -92.4\text{kJ mol}^{-1}$

What is the standard enthalpy of formation of NH_3 gas ?

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16. Calculate the standard enthalpy of formation of $CH_3OH_{(l)}$ from the following data :

$CH_3OH_{(l)} + \frac{3}{2}O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}$,

$\Delta_r H^\Theta = -726\text{kJ mol}^{-1}$

$C_{(\text{graphite})} + O_{2(g)} \rightarrow CO_{2(g)}, \Delta_r H^{\Theta} = -393\text{kJ mol}^{-1}$

$H_{2(g)} + \frac{1}{2}O_{(g)} \rightarrow H_2O_{(l)}, \Delta_f H^{\Theta} = -286\text{kJ mol}^{-1}$

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17. Comment on the thermodynamic stability of $NO_{(g)}$, given:

$\frac{1}{2}N_{2(g)}, + \frac{1}{2}O_{2(g)} \rightarrow NO_{(g)}, \Delta_r H^{\Theta} = 90\text{kJ mol}^{-1}$

$NO_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow NO_{2(g)}, \Delta_r H^{\Theta} = -74\text{kJ mol}^{-1}$

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18. Predict in which of the following, entropy increases/decreases:

(i) A liquid crystallizes into a solid.

(ii) Temperature of a crystalline solid is raised from 0 K to 115 K.

(iii) $2NaHCO_{3(s)} \rightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(g)}$

(iv) $H_{2(g)} \rightarrow 2H_{(g)}$

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19. For oxidation of iron, $4Fe_{(s)} + 3O_{2(g)} \rightarrow 2Fe_2O_{3(s)}$ entropy change is $-549.4\text{JK}^{-1}\text{mol}^{-1}$ at 298 K. Inspite of negative entropy change of this reaction, why is the reaction spontaneous ? $\Delta_r H^{\Theta}$ for this reaction is $1648 \times 10^3 \text{J mol}^{-1}$

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20. Calculate the enthalpy change for the process $\text{CCI}_{4(g)} + C_{(g)} + 4CI_{(g)}$ and calculate bond enthalpy of $C - CI$ in $\text{CC}_{4(g)}$

$\Delta_{\text{vap}} H^{\Theta}(\text{CCI}_4) = 30.5\text{kJ mol}^{-1}$

$\Delta_f H^{\Theta}(\text{CCI}_4) = -135.5\text{kJ mol}^{-1}$

$\Delta_a H^{\Theta}(C) = 715.0\text{kJ mol}^{-1}$

where $\Delta_a H^{\Theta}$ is enthalpy of atomisation $\Delta_a H^{\Theta}(CI_2) = 242\text{kJ mol}^{-1}$

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21. For an isolated system, $\Delta U = 0$, what will be ΔS?

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22. For the reaction at 298 K, $2A + B \rightarrow C \Delta H = 400 \text{kJ mol}^{-1}$ and $\Delta S = 0.2 \text{kJ K}^{-1} \text{mol}^{-1}$ At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range.

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23. For the reaction

$2CI_{(g)} \rightarrow CI_{2(g)}$

What are the sign of ΔH and ΔS ?

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24. Calculate the entropy change in surroundings when 1.00 mol of $H_2O_{(l)}$ is formed under standard conditions. $\Delta_f H^{\Theta} = -286 \text{kJ mol}^{-1}$.

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25. Calculate ΔG^{Θ} for conversion of oxygen to ozone, $\frac{3}{2}O_{2(g)} \rightarrow O_{3(g)}$ at $298K$. If K_p for this conversion is 2.47×10^{-29}.

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26. Find out the value of equilibrium constant for the following reaction at 298 K.

$2NH_{3(g)} + CO_{2(g)} \Leftrightarrow NH_2CONH_{2(aq)} + H_2O_{(l)}$

Standard Gibbs energy change, $\Delta_r G^{\Theta}$ at the given temperature is -13.6kJ mol^{-1}.

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27. At 60°C, dinitrogen tetroxide is fifty percent dissociated. Calculate the standard free energy change at this temperature and at one atmosphere.

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28. For the reaction $2A_{(g)} + B_{(g)} \rightarrow 2D_{(g)}$

$\Delta U^{\Theta} = -10.5\text{kJ}$ and $S^{\Theta} = -44.1\text{JK}^{-1}$ Calculate ΔG^{Θ} for the reaction, and predict whether the reaction may occur spontaneously.

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29. The equilibrium constant for a reaction is 10. What will be the value of ΔG^{Θ} ? $R = 8.314\text{JK}^{-1}\text{mol}^{-1}, T = 300K$

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Section A Try Your Self 1

1. A system receives 224 Joule heat and does work of 156 Joule. Calculate the change in internal energy.

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2. A system receives 100 calory heat at that time 50 calory work is done by system. Calculate the change in internal energy.

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Section A Try Your Self 2

1. At the one bar pressure the volume of gas is 0.6 litre. If the gas receives 122 Joule of heat at 1 atmosphere pressure, the volume become . 2 liter the calculate its internal energy. (1 litre bar = 101.32 Joule)

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2. Volume of 100 liter gas increases to 120 liter at constant temperature and 10 bar external pressure. Calculate the work done by the system [1 liter bar = 24.21 calory]

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3. At 1 bar pressure a gas having volume 0.6 lit. If this gas gained 122 Joule heat at 1 bar pressure its volume become 2 lit. Then calculate the its internal heat change. [1 lit. bar= 101.32 Joule]

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4. The heat associated with combustion of liquid benzene, at constant volume is -3268 kilo Joule/mole^{-1} calculate the change in enthalpy, when this reaction occurs at 300 K, temperature (R=8.314 Joule)

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Section A Try Your Self 3

1. 20 calory heat is needed to increase the temperature from 25°C to 30°C of Al metal piece having 15 gram weight. Final the heat capacity, specific

heat capacity and molar heat capacity for the Al piece. (Al = 27 gram/mole)

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Section A Try Your Self 4

1. Find the difference between the values of ΔH and ΔU for the combustion n - octane at 25°C.

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2. If the ratio of enthalpy of formation of CO_2 and SO_2 is $4:3$ and enthalpy of formation of CS_2 is 26 K.cal/mol. Find the enthalpy of formation of $SO_{2(g)}$ on the basis of above reaction

$$CS_{2(l)} + 3O_{2(g)} \rightarrow CO_{2(g)} + 2SO_{2(g)}$$

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Section A Try Your Self 5

1. The value of bond enthalpy of H_2, CI_2 and HCI are 104, 58 and 103 kilogram respectively. Than find the enthalpy of formation of $HCI_{(g)}$.

reaction : $\frac{1}{2}H_{2(g)} + \frac{1}{2}CI_{2(g)} \rightarrow HCI_{(g)}$

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2. $C_6H_{6(l)} + 7.5O_{2(g)} \rightarrow 6CO_{2(g)} + 3H_2O_{(g)}\, \Delta H = -326.7$ kj

In this reaction, the standard enthalpy of formation of $CO_{2(g)}$ and $H_2O_{(g)}$ are -393.5 and -285.85 kilo Joule\mole $^{-1}$ respectively calculate the standard heat of formation of benzene.

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3. Calculate the formation heat for propen from given equations.

(i) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}, \Delta H_1 = -94.05$ k.cal/mole

(ii) $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}, \Delta H_2 = -68.32$ k.cal/mole

(iii) $C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(l)}, \Delta H_3 = -530.61$ k.cal/mole

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4. Formation heat of H_2O is -68 k.cal/mole then, find the formation heat of OH^-

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5. Find the formation enthalpy of SO_3 from the enthalpy of given reactions.

$S_{8(s)} + 8O_{2(g)} \rightarrow 8SO_{2(g)}, \Delta H = -2775$ kj/mol

$2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}, \Delta H = -198$ kj/mol

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Section A Try Your Self 6

1. The enthalpy of vaporizations of benzene is 30. 779 KJ /mol. and its boiling point is 353 K. Find the change in entropy for the conversion of liquid benzene to its vapour at that temperature.

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2. 3 moles of water is boiled at 373 K and is changed to vapour state having the same temperature. What will be the change in entropy of the system ? [The molecules heat of vaporizations of water is 40.668 KJ/mol]

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3. $\Delta U = -10.5$ Kj and $\Delta S^{\circ} = -44.2$ J/Kelvin for the reaction $2x_{(g)} + y_{(g)} \rightarrow 2z_{(g)}$ at 298 K temperature. Find the $\Delta_f G^{\circ}$ for the reaction. Reaction will be spontaneous or not ? Why ?

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4. AB, A_2 and B_2 are diatomic molecule. Enthalpies of AB A_2 and B_2 are in the ratio of $1:1:0.5$ the value. Enthalpy of formation of AB, $\Delta_f H -$ 100 KJ mol-1. Find the dissociation enthalpy of A_2 ?

Reaction : $\frac{1}{2}A_2 + \frac{1}{2}B_2 \rightarrow AB$

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5. Will ice having temperature 273 K placed in a surrounding having temperature 298K will give water having temperature 273 K ? Prove this statement. The molecular enthalpy of fusing of ice is 6.025

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6. Find the bond enthalpy of N - H bond in ammonia by using the change in enthalpy for the reaction given below.

$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}, \Delta H = -23$ k.cal

Bond energy $N \equiv N = 226, H - H = 103$ k.cal

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Section A Try Your Self 7

1. The equilibrium constant of the following given reaction is $K_p = 6.022 \times 10^{-5}$ at 298 K temperature.

$PCI_{5(g)} \Leftrightarrow PCI_{3(g)} + CI_{2(g)}$

Calculate the value of $\Delta_f G^{\Theta}$.

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2. Find the equilibrium constant for below reaction at 25°

$H_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow H_2O_{(g)} [\Delta G^{\circ} = -54.64 \text{ K.cal}]$

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3. The equilibrium constant for the following reaction is $K_p = 3.44 \times 10^{24}$ at $25^{\circ}C$. Calculate the value of $\Delta G_f^{\circ}(SO_2)$. If the

value of $\Delta G_f^\circ(SO_3)$ is -88.52 Kcal/mol.

$2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$

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4. Find the equilibrium constant for below reaction at 298 K temperature.

$2NOCI_{(g)} \Leftrightarrow 2NO_{(g)} + CI_{2(g)}$

$[\Delta H^\circ = 18.4512$ Kcal, $\Delta S^\circ = 29.16$ Cal$]$

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Section B Objective Questions

1. What is system ? Explain types of system.

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2. When will the total heat absorbed by system during the process is completely used up in work?

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3. Calculate ΔS for ice at 275 K temperature.

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4. If $\Delta H < T\Delta S$ at $298K$ temperature, what will be the value of equilibrium constant ?

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5. What is free expansion ?

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6. Which of the following is an extensive property?

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7. What is calorimerty ?

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8. When will $\Delta H = \Delta u$ for chemical reaction?

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9. What is heat capacity ?

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10. Mention the equation of entropy change for the expansion of an ideal gas in vacuum.

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11. Mention the limitations of second Law of thermodynamics.

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12. Write the symbolic equation of first law of thermodynamics.

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13. What is standard state ?

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14. Mention the units of specific heat capacity and molar heat capacity.

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15. Which functions are needed to understand the second law of thermodynamics ?

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16. Write the mathematical formula for change in entropy.

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17. What is molar enthalpy of vaporization ?

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18. What is entropy ? Explain its spontaneity.

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19. Mention the third law of thermodynamics.

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20. State the criteria of ΔG for spontaneity at constant temperature and pressure.

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21. On which factors the enthalpy of dilution is depended?

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22. Mention the characteristics of entropy.

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23. Mention the relation between free energy change in entropy and change in enthalpy.

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24. What is absolute entropy ?

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25. Write the formula of relation between equilibrium constant K and ΔG°.

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26. Calculate the value of ΔG for the system of water in atmosphere having 100 K temperature.

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27. State Hess.s Law of constant heat summation.

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28. Which law of thermodynamics is known as a defination of temperature ?

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29. Entropy increases with the increase of temperature. Why ?

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30. Give examples of specific heat capacity.

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Section C Multiple Choice Questions Mcqs Mcqs From Textual Exercise

1. Choose the correct answer. A thermodynamic state function is a quantity....

A. used to determine heat changes.

B. whose value is independent of path.

C. used to determine pressure volume work.

D. whose value depends on temperature only.

Answer: B

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2. For the process to occur under adiabatic conditions, the correct condition is :

A. $\Delta T = 0$

B. $\Delta p = 0$

C. $q = 0$

D. $w = 0$

Answer: C

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3. The enthalpies of all elements in their standard states are :

A. unity

B. zero

C. < 0

D. different for each element

Answer: B

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4. ΔU° of combustoin of methane is $-XKJmol^{-1}$ The value of ΔH° is :-

A. $= \Delta U^{\Theta}$

B. $> \Delta U^{\Theta}$

C. $< \Delta U^{\Theta}$

D. $= 0$

Answer: C

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5. The enthalpy of combustion of methane, graphite and dihydrogen at 298 K are, -890.3 kj mol^{-1} -393.5 kj mol^{-1}, and -285.8 kj mol^{-1}

respectively. Enthalpy of formation of $CH_{4(g)}$ will be.....

A. -74.8kj mol^{-1}

B. -52.27kj mol^{-1}

C. $+74.8\text{kJ mol}^{-1}$

D. $+52.26$ "kJ mol"^(-1)`

Answer: A

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6. A reaction, $A+B \rightarrow C+D+q$ is found to have a positive entropy change. The reaction will be

A. possible at high temperature.

B. possible only at low temperature.

C. not possible at any temperature.

D. possible at any temperature.

Answer: D

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7. Water is bounded in liquid state because of .. .. bond of water in liquid state.

A. van-der-Walls attraction force

B. H-bond

C. Ionic bond

D. Covalent bond

Answer: B

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8. Enthalpy for the reaction $C + O_2 \rightarrow CO_2$ is....

A. $+ve$

B. $-ve$

C. zero

D. none of above

Answer: B

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9. Which equation from the following is right ?

A. $\Delta U = q - w$

B. $w = \Delta U + q$

C. $\Delta U = w + q$

D. none of above

Answer: C

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10. Change in heat at constant volume $(q_v) =$ .....

A. ΔU

B. ΔH

C. RT

D. ΔG

Answer: A

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11. For isothermal process ..... .

A. $q = 0$ and $\Delta E = 0$

B. $q \neq 0$ and $\Delta E = 0$

C. $q = 0$ and $\Delta E \neq 0$

D. $q \neq 0$ and $\Delta E \neq 0$

Answer: B

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12. For the reaction $2Cl_{(g)} \rightarrow Cl_{2(g)}$, the signs of ΔH and ΔS respectively are

A. $+, -$

B. $+, +$

C. $-, -$

D. $-, +$

Answer: C

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13. If the enthalpy of water is 386 kJ, entropy of water is ..... .

A. $0.5kJ$

B. $1.3kJ$

C. $1.5kJ$

D. $22.05kJ$

Answer: B

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14. Which of the following reaction has maximum ΔS value?

A. $Ca_{(s)} + \frac{1}{2}O_{2(g)} \rightarrow CaO_{(s)}$

B. $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$

C. $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

D. $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$

Answer: B

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15. Enthalpy of vaporization of water is 186.5 kJ/mol. What will be the entropy of vaporization of water ?

A. 0.5 J/K mol

B. 1.0 J/K mol

C. 1.5 J/K mol

D. 2.0 J/K mol

Answer: A

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16. What is the correct from the following for the reaction $H_2O_{(l)} \Leftrightarrow H_2O_{(g)}$ at $100^\circ C$ and 1 atm. Pressure ?

A. $\Delta E = 0$

B. $\Delta H = 0$

C. $\Delta H = \Delta E$

D. $\Delta H = T\Delta S$

Answer: D

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17. Given $C_s + O_{2(g)} \rightarrow CO_{2(g)}, \Delta H = -94.2Kcal$

$H_{2(g)} + ½O_{2(g)} \rightarrow H_2O_{(g)}, \Delta = -68.3Kcal$

$CH_{4(g)} + 2O_{2(g)} \rightarrow 2H_2O + CO_2 = -210.8Kcal$

what will be heat of formation of CH_4 in (Kcal) ?

A. 47.3 K.Cal

B. $20.0K.\ Cal$

C. $45.9K.\ Cal$

D. $-47.3K.\ Cal$

Answer: B

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18. Which of the following reaction is endothermic reaction ?

A. $CaCO_3 \rightarrow CaO + CO_2$

B. $Fe + S \rightarrow FeS$

C. $NaOH + HCI \rightarrow NaCI + H_2O$

D. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Answer: A

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19. Enthalpy of formation of SO_2 is 298 kJ calculate combustion enthalpy of 4 gm S.

A. $+37$ kJ

B. -37.25 kJ

C. $+298$ kJ

D. 18.6 kJ

Answer: B

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20. $H^+ + OH^{-1} \rightarrow H_2O + 13.7$ K Cal calculate the enthalpy of neutrilisation reaction of 1 mole H_2SO_4 with base.

A. 13.7 K. Cal

B. 27.4 K. Cal

C. 6.85 K. Cal

D. 3.425 K. Cal

Answer: B

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21. Fermentation reaction is ..... .

A. Exothermic

B. Endothermic

C. Isothermic

D. Reversible

Answer: A

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22. How many moles of water is produced during combustion of 8 gm of CH_4 ?

A. 0.5

B. 1

C. 2

D. 18

Answer: B

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23. Which of the following has maximum neutralization enthalpy ?

A. NH_4 and CH_3COOH

B. NH_4OH and HCI

C. KOH and CH_3COOH

D. KOH and HCI

Answer: D

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24. Which of the following gas has maximum heat of combustion?

A. Methane

B. Ethane

C. Ethelene

D. Acetytene

Answer: B

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25. Calculate the heat produced during neutrilisation reaction of 36.5 gm HCl and 40 gm NaOH.

A. 13.7 K. Cal

B. 108 K. Cal

C. 713.7 K. Cal

D. 76.5 K. Cal

Answer: A

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26. For which of the following reaction $\Delta H \neq \Delta E$?

A. $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

B. $C_{(s)} + O_{2(g)} \Leftrightarrow CO_{2(g)}$

C. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$

D. $HCI_{(aq)} + NaOH_{(aq)} \Leftrightarrow NaCI_{(aq)} + H_2O_{(l)}$

Answer: C

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27. State the unit of molar entropy.

A. Joule/ Kelvin

B. KJ / kelvin mole

C. Joule/Kelvin mole

D. Calory / Kelvin

Answer: C

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28. Work is not done during the expansion of ideal gas in vacuum. Why ?

A. $q = 0$

B. $p = 0$

C. $\Delta U = 0$

D. $\Delta S = 0$

Answer: B

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29. $S + \frac{3}{2}O_2 \rightarrow SO_3 + y \ \text{kJ}$

$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3 + 2x \ \text{kJ}$ calculate the enthalpy of formation SO_2.

A. $2x + y$

B. $x + y$

C. $y - 2x$

D. $\frac{y}{2x}$

Answer: C

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30. Calculate the enthalpy of formation of CO from the given information.

$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}, \Delta H^\circ = -x \ \text{kJ}$

$2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}, \Delta H^\circ = -y \ \text{kJ}$

A. $\frac{2x - y}{2}$

B. $\frac{y - 2x}{2}$

C. $2x - y$

D. $y - 2x$

Answer: B

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31. If $\Delta H > \Delta G$ for the given process, then .....

A. $q_{\text{rev}} > 0$

B. $q_{\text{rev}} = 0$

C. $q_{\text{rev}} < 0$

D. $q_{\text{rev}} \leq 0$

Answer: A

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32. If the system does not lose heat or does not receive heat, then the process is called ..... .

A. Isobaric process

B. Adiabatic process

C. Isothermic process

D. reversible process

Answer: B

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33. Value of ΔG is -ve for ice to water system at ..... temperature.

A. 260 K

B. 280 K

C. 270 K

D. 250 K

Answer: B

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34. In which of the following reaction, entropy is decreasing ?

A. Melting of ice

B. Crystalisation of sucrose from solution

C. Vaporisation of camphor

D. Rusting of iron

Answer: B

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35. Conversation of graphite into diamond is .. .. reaction.

A. Endothermic

B. Exothermic

C. Heat conductor

D. Electric

Answer: A

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36. Value of C_v for mono atomic and diatomic gas are respectively ..... .

A. $\frac{1}{2}R, \frac{3}{2}R$

B. $\frac{3}{2}R, \frac{5}{2}R$

C. $\frac{5}{2}R, \frac{7}{2}R$

D. $\frac{3}{2}R, \frac{3}{2}R$

Answer: B

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Section C Multiple Choice Questions Mcqs Darpan S Exam Oriented Mcqs

1. ..... is correct for endothermic reaction.

A. $\Delta H < 0$

B. $\Delta H > 0$

C. $\Delta H = 0$

D. $\Delta H < \ < 0$

Answer: B

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2. Change in entropy for the expansion of 1 mole ideal gas in vacuum is .....

A. 1 Joule

B. 2 Joule

C. 10 Joule

D. Zero

Answer: D

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3. ..... is net state function.

A. Work

B. Enthalpy

C. Internal energy

D. Entropy

Answer: A

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4. For the spontaneous reactions ..... .

A. $\Delta H = -ve, \Delta S = +ve$

B. $\Delta H = +ve, \Delta S = -ve$

C. $\Delta H = +ve, \Delta S = -ve$

D. $\Delta H = -ve, \Delta S = +ve$

Answer: A

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5. Standard enthalpy of ..... is not zero.

A. graphite

B. $Na_{(s)}$

C. $N_{2(l)}$

D. Rhombic sulphur

Answer: C

View Text Solution

6. For adiabatic change .....

A. $\Delta U \neq w_{ad}$

B. $\Delta U > w_{ad}$

C. $\Delta U = w_{ad}$

D. $\Delta U < w_{ad}$

Answer: C

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7. Choose the correct option for the reaction given below.

$C_6H_{12}O_{6(s)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$

A. $\Delta H < \Delta U$

B. $\Delta H > \Delta U$

C. $\Delta H = \Delta U$

D. $\Delta H \leq \Delta U$

Answer: C

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8. Find the ΔH for the reaction given below.

$PCI_{5(g)} \rightarrow PCI_{3(g)} + CI_{2(g)}$

A. $\Delta U - RT$

B. $\Delta U + 2RT$

C. $\Delta U + RT$

D. $\Delta U - 2RT$

Answer: C

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9. The instrument measuring heat changes at constant pressure .....

A. pH meter

B. calorie meter

C. galvano meter

D. hydro meter

Answer: B

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10. From below, ... is not intensive property.

A. Heat capacity

B. Density

C. Mass

D. Volume

Answer: B

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Section C Multiple Choice Questions Mcqs Mcqs Asked In Competitive Exam

1. ..... is correct for endothermic reaction.

A. Zero

B. $-ve$

C. $+ve$

D. B and C both

Answer: C

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2. Which of the following has maximum neutralization enthalpy ?

A. NH_4 and CH_3COOH

B. NH_4OH and HCI

C. $NaOH$ and CH_3COOH

D. $NaOH$ and HCI

Answer: D

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3. Combustion enthalpy of carbon, Hydrogen and Methane at 25°C temperature are 395.5 KJ mol^{1-}, -284.8 kJ mol $^{-1}$ and $-890.4 \text{kJ mol}^{-1}$ respectively. Calculate the standard enthalpy of formation of methane for the same temperature.

A. 890.4 Kj mol^{-1}

B. -298.8 KJ mol^{-1}

C. -74.7 KJ mol^{-1}

D. -107.7 KJ mol^{-1}

Answer: C

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4. Change in entropy for one mole water from liquid from to vapour at 373 K is ..... Joule/ Kelvin. $(\Delta H_{\text{vap}} = 2.257\text{KJ/gm})$

A. 105.9

B. 107.9

C. 108.9

D. 109.9

Answer: C

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5. Which of the following is an extensive property?

A. mass

B. volume

C. $\frac{\text{mass}}{\text{volume}}$

D. Enthalpy

Answer: C

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6. For the reaction

$C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CI_{2(g)} + 4H_2O_{(l)}, \Delta H - \Delta K = \ldots\ldots\ldots$

A. RT

B. $-3RT$

C. $3RT$

D. $-RT$

Answer: B

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7. ..... has given $\Delta G = \Delta H - T\Delta S$.

A. Faraday

B. Kirchof

C. Einstein

D. Gibs helm holtz

Answer: D

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8. Change in entropy during adsorption of gas on the solid substance is..... .

A. Increasing

B. decreasing

C. constant

D. infinite

Answer: B

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9. When 1 mole Zn powder is reacted with 1 mole sulphuric acid in bomb calorimeter (closed isolated system),.....

A. $\Delta U < 0, w = 0$

B. $\Delta U > 0, w = 0$

C. $\Delta U < 0, w < 0$

D. $\Delta U > 0, w > 0$

Answer: A

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10. Change in enthalpy during neutralization reaction of one mole HCI with dilute KOH at 298 K is ..... KJ

A. 68

B. 56

C. 50

D. 65

Answer: B

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11. If $K < 1, \Delta G^{\circ} = ...$

A. $+ve$

B. $-ve$

C. Zero

D. 1

Answer: A

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12. Which of the following statement is correct for the spontaneous reaction ?

A. Entropy of the system is always increased.

B. Free energy of the system is always increased.

C. Total entropy change is always negative.

D. Total entropy change is always positive

Answer: D

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13. 723 KJ mol^{-1} heat is released when 1 molemethanol combustions in present of O_2. What amount of heat is enlisted of one mole of O_2 is used?

A. 241 kJ

B. 723 kJ

C. 482 kJ

D. 924 KJ

Answer: C

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14. Hess.s Law of integrate enthalpy is related to..... ,

A. change in enthalpy of reaction.

B. rate of reaction.

C. equilibriums constant.

D. effect of pressure an the volume of gas.

Answer: A

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15. For a reaction $\Delta H = 3$ KJ and $\Delta S = 10$ J/Kelvin at what temperature the reaction will be spontaneous ?

A. $300K$

B. $200K$

C. $273K$

D. $373K$

Answer: D

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16. Which one of the following is related to thermodynamic equilibrium ?

A. All of above

B. Thermal equilibrium

C. equilibriums. of pressure

D. Chemical equilibrium

Answer: B

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17. Which one of the following is the isobaric process ?

A. $\Delta H = 0$

B. $\Delta E = 0$

C. $\Delta P = 0$

D. $\Delta Q = 0$

Answer: C

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18. For the spontaneous reaction at each temperature ..... .

A. $\Delta G - ve, \Delta H + ve \text{ and } \Delta S + ve$

B. $\Delta G + ve, \Delta H - ve \text{ and } \Delta S + ve$

C. $\Delta G - ve, \Delta H - ve \text{ and } \Delta S - ve$

D. $\Delta G - ve, \Delta H - ve \text{ and } \Delta S + ve$

Answer: D

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19. Combustion enthalpy of carbon is .-x. kJ, Enthalpy of formation of water is .-y. kJ and combustion enthalpy of methane is .-z. kJ calculate the enthalpy of formation of methane.

A. $(-x-y+z)$ kJ

B. $(-z+2y-x)$ kJ

C. $(-x-2y+z)$ kJ

D. `(-x-2y-z) kJ

Answer: C

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20. Which one of the following has maximum entropy ?

A. Hg

B. Diamond

C. $N_{2(l)}$

D. $H_{2(g)}$

Answer: D

Watch Video Solution

21. An exothermic reaction is spontaneous reaction ..... is correct from the following.

A. $\Delta G > 0$

B. $\Delta S < 0$

C. $\Delta S > 0$

D. $\Delta H < 0$

Answer: C

View Text Solution

22. What will be the value of ΔG for the ice at 8°C temperature ?

A. zero

B. $+ve$

C. $-ve$

D. one

Answer: C

View Text Solution

23. Ice cube is melting at the room temperature this reaction belongs to which law of ?

A. $\text{Zero}^{th}\text{Law}$

B. Third Law

C. First Law

D. Second Law

Answer: C

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24. Combustion enthalpies of methane and ethane are $-210k.\ \text{cal mol}^{-1}$ and $-368k.\ \text{cal mol}^{-1}$. Combustion enthalpy of Decane is ..... .

A. $-158\text{k.}\ \text{cal}$

B. $-1632\text{k.}\ \text{cal}$

C. -1700k.cal

D. given mettre is not complete

Answer: B

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25. For the gaseous reaction, at 300 K temperature, value of $\Delta H - \Delta U = -4.98$ KJ., Then $\Delta n_{(g)} = \ldots .$

A. 1

B. 2

C. -2

D. 0

Answer: C

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26. For the reaction 298 K $A_{(g)} + B_{(g)} \rightarrow C_{(g)}$ at $298K$, $\Delta U = -5\text{cal}$ and $\Delta S = -10\text{cal}K^{-1}$. Delta G = ... "cal"`.

A. 2612

B. 2379

C. 261.2

D. -2612

Answer: B

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27. According to the first law of thermodynamics, which of the following shows change in state function ?

A. q_{rev}

B. $q_{\text{rev}} - w_{\text{rev}}$

C. $q_{\text{rev}} / w_{\text{rev}}$

D. w_{rev}

Answer:

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28. Standard entropies of x_2, y_2 and xy_3 are $60, 40$ and 50J/K mol^{-1} respectively for the reaction $\frac{1}{2}x_2 + \frac{3}{2}y_2 \rightarrow xy_3, \Delta H = -30\text{kJ}$ to be at equilibrium the temperature should be.

A. 500 K

B. 750 K

C. 1000 K

D. 1250 K

Answer: B

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29. When water freezed to ice, entropy ..... .

A. Increases

B. Decreases

C. Constant

D. Zero

Answer: B

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30. Standard enthalpy of formation is zero for ..... from following

A. $F_{2(g)}$

B. $F_{(g)}$

C. $HF_{(aq)}$

D. $F^{-}_{(q)}$

Answer: A

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31. Thermodynamically stable form of C is .....

A. Graphite

B. Diamond

C. Fulerenl

D. Cock

Answer: A

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32. $NH_3 + 3CI_2 \Leftrightarrow NCI_3 + 3HCI, \ -\Delta H_1$

$N_2 + 3H_2 \Leftrightarrow 2NH_3, \ -\Delta H_2$

$H_2 + CI_2 \Leftrightarrow r2HCI, \Delta H_3$

Calculate the enthalpy of formation of NCI_3

A. $\Delta H_f = -\Delta H_1 + \frac{\Delta H_2}{2} - \frac{3}{2}\Delta H_3$

B. $\Delta H_f = -\Delta H_2 + \frac{\Delta H_2}{2} - \frac{3}{2}\Delta H_3$

C. $\Delta H_f = -\Delta H_2 + \frac{-\Delta H_2}{2} - \frac{3}{2}\Delta H_3$

D. none of above

Answer: D

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33. Work done is ..... when 3 moles of ideal gas is expand in vacuum.

A. $+ve$

B. $-ve$

C. zero

D. can not cecide

Answer: C

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34. Which of the following is an extensive property?

A. Molar conductivily

B. Electro motive force

C. Resistance

D. Heat capacity

Answer: A

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35. Calculate the work, when 1 mole ideal gas defuse to 1 atm from 10 atm at 300. K temperature.

A. 5744.1 J

B. 6257.2 J

C. 4938.8 J

D. 4138.8 J

Answer: A

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36. At 300 K one mole ideal gas is expand freely to 100 liter from 10 liter. If $\Delta U = 0$, then $\Delta H = \ldots\ldots\ldots$

A. 20 kJ

B. 200 KJ

C. -200 KJ

D. 0

Answer: D

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37. Dissociation enthalpy of diatomic molecules XY, X_2 and Y_2 are too in the ratio of $1:1:0.5$ the value. Enthalpy of formation of XY. $\Delta_f H = -200$ kJ mol^{-1}. Final the dissociation enthalpy of X_2 ?

A. 200 kJ mol^{-1}

B. 300 kJ mol^{-1}

C. 400 kJ mol^{-1}

D. 800 kJ mol^{-1}

Answer: D

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38. Which of the following is not correct ?

A. $\frac{\Delta G_{\text{system}}}{\Delta S_{\text{total}}} = -T$

B. $w_{\text{rev.}} = -nRT\ln\frac{V_f}{V_i}$

C. $\ln K = \frac{\Delta H^\circ - T\Delta S^\circ}{RT}$

D. $K = e^{-\Delta G^\circ / RT}$

Answer: C

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39. Standard enthalpy of formation of $H_{2(g)}, CI_{2(g)}$ and $HCI_{(g)}$ are 218, 121.68 and -92.31 KJ/mole respectively. Calculate the change in

standard enthalpy for the reaction

$$\frac{1}{2}H_{2(g)} + \frac{1}{2}CI_{(g)} \rightarrow HCI_{(g)}$$

A. $+431.99$ kJ

B. -262.14 kJ

C. -431.99 kJ

D. $+247.37$ kJ

Answer: B

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40. ..... is done, when 50 gm of Fe is reacted with HCl in open vessel at 25°C temperature.

A. zero

B. -2.2 kJ

C. 2.2 kJ

D. 0.22 kJ

Answer: B

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41. Bond enthalpy of C - H bond is 350 kJ/mol. Calculate the bond enthalpy of $C \equiv C$ bond in C_2H_2.

$2C_{(s)} + H_{2(g)} \rightarrow C_2H_{2(g)}, \Delta H = 225$ kJ/mol

$2C_{(s)} \rightarrow 2C_{(g)}, \quad \Delta H = 1410$ kJ/mol

$H_{2(g)} \rightarrow 2H_{(g)}, \quad \Delta H = 330$ kJ/mol

A. 1165 kJ/mol

B. 837 kJ/mol

C. 865 kJ/mol

D. 815 kJ/mol

Answer: D

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42. Same volume of two monoatomic gases A and B is mixed at same temperature. .... Is $\frac{C_p}{C_v} = \ldots\ldots\ldots$

A. 0.83

B. 1.67

C. 3.3

D. 3.30

Answer: B

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43. Statements and reasons are given. Choose the correct option form the following. (Q.43, 44, 45)

Statement : Enthalpy of formation of gaseous oxygen molecule is zero at 1 atm pressure and 298 K.

Reason : Enthalpy of formation of oxygen molecule is zero for the same situation.

A. Statement and reason both are correct and correct explanation of statement is given by reason.

B. Statement and reason both are correct but correct explanation of statement is not given by reason.

C. Statement is correct but reason is wrong.

D. Statement and reason both are wrong.

Answer: C

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44. Statements and reasons are given. Choose the correct option form the following. (Q.43, 44, 45)

Statement : Chlorine gas become solid at absolute zero temperature but

its entropy will be zero.

Reason : Chlorine has strong small and its difficult to correct it into solid.

A. Statement and reason both are correct and correct explanation of statement is given by reason.

B. Statement and reason both are correct but correct explanation of statement is not given by reason.

C. Statement is correct but reason is wrong.

D. Statement and reason both are wrong.

Answer: B

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45. Statements and reasons are given. Choose the correct option form the following. (Q.43, 44, 45)

Statement : Absorbed energy becomes zero when ideal gas is expand in

vacuum. in isothermic process.

Reason : Volume occupied by molecules is zero.

A. Statement and reason both are correct and correct explanation of statement is given by reason.

B. Statement and reason both are correct but correct explanation of statement is not given by reason.

C. Statement is correct but reason is wrong.

D. Statement and reason both are wrong.

Answer: C

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Section C Multiple Choice Questions Mcqs Mcqs Asked In Jee Neet Aiee

1. Given that bond energies of H - H and Cl -Cl are 430kJ/mol^{-1} and 240kJ/mol^{-1} respectively and ΔH_f for HCI is

$-90\text{kJ}/\text{mol}^{-1}$, bond enthalpy of HCI is

A. 380 kJ/mol

B. 425 kJ/mol

C. 245 kJ/mol

D. 290 kJ/mol

Answer: B

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2. Which of the following is not a state functions?

A. (i) and (iv)

B. (ii), (iii) and (iv)

C. (i), (ii) and (iii)

D. (ii) and (iii)

Answer: D

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3. For the gas phase reaction,

$PCI_{5(g)} \Leftrightarrow PCI_{3(g)} + CI_{2(g)}$

Which of the following conditions are correct ?

A. $\Delta H = 0$ and $\Delta S < 0$

B. $\Delta H > 0$ and $\Delta S > 0$

C. $\Delta h < 0$ and $\Delta S < 0$

D. $\Delta H > 0$ and $\Delta S <$

Answer: B

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4. Bond dissociation enthalpy of H_2, CI_2 and HCI are $434, 242$ and 431kJ mol^{-1} respectively. Enthalpy of formation of HCl is

A. 93kJ mol^{-1}

B. -245kJ mol^{-1}

C. -93kJ mol^{-1}

D. 245kJ mol^{-1}

Answer: C

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5. The values of ΔH and ΔS for the reaction, $C_{(\text{graphite})} + CO_{2(g)} \rightarrow 2CO_{(g)}$ are 170kJ and $170JK^{-1}$, respectively. This reaction will be spontaneous at

A. 910 K

B. 1110 K

C. 510 K

D. 710 K

Answer: B

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6. Standard entropies of x_2, y_2 and xy_3 are $60, 40$ and 50J/K mol^{-1} respectively for the reaction $\frac{1}{2}x_2 + \frac{3}{2}y_2 \rightarrow xy_3, \Delta H = -30\text{kJ}$ to be at equilibrium the temperature should be.

A. 750 K

B. 1000 K

C. 1250 K

D. 500 K

Answer: A

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7. For vapourisation of water at 1 atm,values of $\Delta H \& \Delta S$are $40.6 Kjmol^{-1}$ and $108 JK^{-1}mol^{-1}$,respectively will be. The temperature when `DeltaG for this transition zero is :-

A. 293.4 K

B. 273.4 K

C. 393.4 K

D. 373.4 K

Answer: D

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8. The following two reactions are known :

$Fe_2O_{3(s)} + 3CO_{(g)} \rightarrow Fe_{(s)} + 3CO_{2(g)}, \Delta H = = -26.8$ kJ

$FeO2_{(s)} + CO_{(g)} \rightarrow Fe_{(s)} + CO_{2(g)}, \Delta H = -16.5$ kJ

The value ΔH for the following reaction

$Fe_2O_{3(s)} + CO_{(g)} \rightarrow 2FeO_{(s)} + CO_{2(g)}$ is

A. $+6.2$ kJ

B. $+10.3$ kJ

C. -43.3 kJ

D. -10.3 kJ

Answer: A

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9. If the enthalpy change for the transition of liquid water to steam is 30 kJ/mol^{-1} at 27°C, the entropy change for the process would be :

A. 10 J mol$^{-1}K^{-1}$

B. 1.0 J mol$^{-1}K^{-1}$

C. 0.1 J mol$^{-1}K^{-1}$

D. 100 J mol$^{-1}K^{-1}$

Answer: D

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10. For complete combustion of ethanol, $C_2H_5OH_{(l)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$, the amount of heat produced as measured in bomb calorimeter is $1364.47\text{kJ mol}^{-1}$ at 25°C. Assuming ideality the Enthalpy of combustion, $\Delta_C H$, for the reaction will be :

$\left(R = 8.314\text{kJ mol}^{-1}\right)$

A. $-1460.50\text{kJ mol}^{-1}$

B. $-1350.50\text{kJ mol}^{-1}$

C. $-1366.95\text{kJ mol}^{-1}$

D. $-1361.95\text{kJ mol}^{-1}$

Answer: C

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11. The following reaction is performed at 298 K.

$2NO_{(g)} + O_{2(g)} \Leftrightarrow 2NO_{2(g)}$

The standard free energy of formation of $NO_{(g)}$ is 86.6 kJ/mol at 298 K.

What is the standard free energy of formation of $NO_{2(g)}$ at 298 K ?

$\left(K_p = 1.6 \times 10^{12}\right)$

A. $R(298)\text{In}\left(1.6 \times 10^{12}\right) - 86600$

B. $86600 + R(298)\text{In}\left(1.6 \times 10^{12}\right)$

C. $86600 - \dfrac{\text{In}\left(1.6 \times 10^{12}\right)}{R(298)}$

D. $0.5\left[2 \times 86600 - R(298)\text{In}\left(1.6 \times 10^{12}\right)\right.$

Answer: D

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12. The standard Gibbs energy change at 300 K for the reaction $2A \Leftrightarrow B + C$ is 2494.2 J. At a given time, the composition of the reaction

mixture is $[A] = \frac{1}{2}, [B] = 2$ and $[C] = \frac{1}{2}$. The reaction proceeds in the : $[R = 8.314\text{J/K/mol}, e = 2.718]$

A. forward direction because $Q > K_C$

B. reverse direction because $Q > K_C$

C. forward direction because $Q < K_C$

D. reverse direction because $Q < K_C$

Answer: B

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13. Which of the following statements is correct for a reversible process in a state of equilibrium ?

A. $\Delta G = -2.303\text{RT} \log \text{K}$

B. $\Delta G = 2.30$ RT log K

C. $\Delta G^\circ = -2.30$ RT log K

D. $\Delta G^{\circ} = 2.30$ RT log K

Answer: C

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14. Which of the following species contains equal number of $\sigma -$ and $\pi -$ bonds?

A. HCO_3^-

B. XeO_4

C. $(CN)_2$

D. $CH_2(CN)_2$

Answer: B

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15. The heat of combustion of carbon to CO_2 is -393.5kJ/mol. The heat released upon formation of 35.2 g of CO_2 from carbon and oxygen gas is :

A. $-630kJ$

B. $-3.15kJ$

C. $-315KJ$

D. $+315kJ$

Answer: D

View Text Solution

16. For the spontaneous reaction at each temperature ..... .

A. $\Delta H > O$ and $\Delta S < O$

B. $\Delta H < O$ and $\Delta S > O$

C. $\Delta H < O$ and $\Delta S < O$

D. $\Delta H < O$ and $\Delta S = O$

Answer: B::D

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17. For a sample of perfect gas when its pressure is changed isothermally from P_i to P_f the entropy change is given by

A. $\Delta S = nRT\text{In}\left(\frac{P_f}{P_i}\right)$

B. $\Delta S = RT\text{In}\left(\frac{P_i}{P_f}\right)$

C. $\Delta S = nR\text{In}\left(\frac{P_f}{P_i}\right)$

D. $\Delta S = nR\text{In}\left(\frac{P_i}{P_f}\right)$

Answer: D

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18. If the E°_{cell} for a given reaction has a negative value, which of the following gives the correct relationships for the values of ΔG° and K_{eq} ?

A. $\Delta G^{\circ} < 0, K_{eq} > 1$

B. $\Delta G^{\circ} < 0, K_{eq} < 1$

C. $\Delta G^{\circ} > 0, K_{eq} < 1$

D. $\Delta G^{\circ} > 0, K_{eq} > 1$

Answer: C

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19. If $\Delta H = 35.5$ kJ/mol and $\Delta S = 83.6$ J/mol K. At what temperature the reaction will be spontaneous?

A. $T > 425K$

B. Each temperature

C. $T < 298$ K

D. $T < 425K$

Answer: A

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Section C Multiple Choice Questions Mcqs Mcqs Asked In Board Exam

1. Which of the following reaction is incorrect according to thermodynamics ?

A. $\Delta G^{\circ} = -nFE^{\circ}$

B. $\Delta H = \Delta E + P\Delta V$

C. $K = e^{-\Delta G/RT}$

D. $\Delta G = \Delta H + T\Delta S$

Answer: D

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2. What will be value of ΔG° for ice at 298 K temperature?

A. $-ve$

B. 0

C. none of these

D. $+ve$

Answer: A

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3. Which of the following option is correct for the given equation ?

$4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(g)}$

A. $\Delta H = \Delta U$

B. $\Delta H < \Delta U$

C. $\Delta U > \Delta U$

D. $\Delta H \neq \Delta U$

Answer: C

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4. If the change in entropy at 353 K is 0.087 kJ mol^{-1} for benzene. Then calculate the heat of vapourisation.

A. -6.96kJ mol^{-1}

B. $6.96kJmol^{-1}$

C. $-30.711\text{kJ mol}^{-1}$

D. 30.711kJ mol^{-1}

Answer: D

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5. The change in free energy during working of pencil cell is -1372.58 cal. Calculate the equilibrium constant of the cell under standard condition $\left(R = 2\text{cal mol}^{-1}K^{-1}\right)$

A. 1.00×10^5

B. 1.00×10^2

C. 1.00×10^{10}

D. 1.00×10^1

Answer: B

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6. For which reaction ΔS can be maximum if it is occuring at constant volume ?

A. $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$

B. $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$

C. $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

D. $Mg_{(s)} + \frac{1}{2}O_{2(g)} \rightarrow MgO_{(s)}$

Answer: B

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7. There is change in volume of an ideal gas when pressure is changed at constant temperature. The change in free energy associated with this can be calculated by which of the following equation ?

A. $\Delta G = RT\text{In}\frac{P_2}{P_1}$

B. $\Delta G = -2.303RT\log\frac{P_2}{P_1}$

C. $\Delta G = nRT\text{In}\frac{V_2}{V_1}$

D. $\Delta G = nRT\text{In}\frac{P_2}{P_1}$

Answer: D

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8. A system receives 100 calory heat at that time 50 calory work is done by system. Calculate the change in internal energy.

A. -150 Joule

B. 50 Joule

C. -50 Joule

D. 150 Joule

Answer: B

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9. In which phenomenon Entropy decreases ?

A. Melting of ice

B. Crystallisation of salt

C. Evaporation of liquid

D. Diffusion

Answer: B

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10. If substance is completely pure crystalline at 273 K, which of the following state function will be zero at 273 K ?

A. Free energy

B. Entropy

C. Enthalpy

D. All the given

Answer: B

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11. Which of the following is an extensive property?

A. Boiling point

B. Elevation in boiling point

C. Density

D. Fluidity

Answer: B

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12. For a reaction value of K_c is 7.105×10^{-5}, what will be the change in free energy ?

A. $\Delta G > 0$

B. $\Delta G < 0$

C. $\Delta G = 0$

D. $\Delta G = 1$

Answer: A

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13. Joule $K^{-1}gm^{-1}$ is the unit of ....

A. Entropy

B. Enthalpy

C. Specific heat capacity

D. All the given

Answer: C

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14. For the given equation

$4NH_{3(g)} + 50_{2(g)} \Leftrightarrow 4NO_{(g)} + 6H_2O_{(l)}$

Select the correct option for change in Enthalpy.

A. $\Delta U + RT$

B. $\Delta U + 5RT$

C. $\Delta U - RT$

D. $\Delta U - 5RT$

Answer: D

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15. By mixing aqueous solutions of silver nitrate and ammonium chloride in a test tube, white precipitates are formed. In this process, test tube is ..... .

A. universe

B. surrounding

C. borderline of the system

D. system

Answer: C

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16. What will be the value of K and ΔG° for the process of transformation of ice into water at room temperature ?

A. $K = 1, \Delta G^{\circ}$ Zero

B. $K < 1, \Delta G^{\circ}$ positive

C. $K > 1, \Delta G^{\circ}$ positive

D. $K > 1, \Delta G^{\circ}$ negative

Answer: D

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17. Which law of thermodynamics gives information about exact entropy of a substance ?

A. Zeroth Law

B. Second Law

C. Third Law

D. First Law

Answer: B

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18. The level of thermal energy in a substance is known as ..... .

A. Entropy

B. Temperature

C. Heat energy

D. Quantity of Heat

Answer: B

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19. Which of the following statements is correct for absolute entropy of a substance ?

A. It is shown as S°.

B. It is the entropy of 1 mole of substance at constant temperature and standard state.

C. Its unit is Joule Kelvin Mole^{-1}.

D. It is the entropy of 1 mole of substance.

Answer: B

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20. Water always flows from higher level to lower level on its own. Which of the following statement is correct for this phenomena ?

A. Free energy increases

B. Entropy decreases

C. Free energy decreases

D. Entropy increases

Answer: C

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21. If the values of $\Delta_f H^\circ$ for H_2O_2 and H_2O are -188 and -286kJ mol^{-1}, then the value of $\Delta H^\circ = \ldots.$ kJ/mol for the following reaction - $2H_2O_{2(l)} \rightarrow 2H_2O_{(l)} + O_{2(g)}$

A. -494

B. -196

C. -98

D. $+196$

Answer: B

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22. What will be the work done by the system when one mole of an ideal gas expands in vacuum ?

A. Zero

B. 1 Joule

C. 2 Joule

D. 3 Joule

Answer: A

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23. During adiabatic process, the system ..... .

A. gains energy

B. loses energy

C. loses mass

D. neither gains nor loses energy

Answer: D

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24. Which of the following has standard Enthalpy value not equal to zero ?

A. Rhombic Sulphur

B. Graphite

C. $O_{2(l)}$

D. $Na_{(s)}$

Answer: C

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25. The reaction $A \rightarrow B$ is impossible, if..... .

A. ΔH positive, ΔS positive but $\Delta H < T\Delta S$

B. ΔH positive, ΔS negative but $\Delta H > T\Delta S$

C. ΔH negative, ΔS positive.

D. ΔH positive, ΔS negative, $\Delta G = \Delta H - T\Delta S$

Answer: B::D

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26. Heat of vaporization of benzene is 7350 cal $K^{-1}\text{mol}^{-1}$. Calculate the change in entropy for converting 1 mole gaseous benzene to liquid benzene at 77° C.

A. 21 calorie $K^{-1}\text{mol}^{-1}$

B. $-21\text{calorie}K^{-1}\text{mol}^{-1}$

C. $-21\text{calorie}K^{-1}$

D. $21 \text{calorie} K^{-1}$

Answer: B

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Section D Solutions Of Ncert Exemplar Problems Multiple Choice Questions Mcqs

1. Thermodynamics is not concerned about

A. change in energy involved in a chemical reaction.

B. the extent to which a chemical reaction proceeds.

C. the rate at which a reaction proceeds.

D. the feasibility of a chemical reaction.

Answer: C

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2. Which of the following statements is correct ?

A. The presence of reacting species in a covered beaker is an example of open system.

B. There is an exchange of energy as well as matter between the system and the surroundings in a closed system.

C. The presence of reactants in a closed vessel made up of copper is an example of a closed system.

D. The presence of reactants in a thermos flask or any other closed insulated vessel is an example of a closed system.

Answer: C

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3. The state of a gas can be described by quoting the relationship between

A. pressure, volume, temperature

B. temperature, amount, pressure

C. amount, volume, temperature

D. pressure, volume, temperature, amount

Answer: D

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4. The volume of gas is reduced to half from its original volume. The specific heat will be

A. reduce to half

B. be doubled

C. remain constant

D. increase four times

Answer: C

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5. During complete combustion of one mole of butane, 2658 kJ of heat is released. The thermochemical reaction for above change is

A.

$$2C_4H_{10(g)} + 13O_{2(g)} \rightarrow 8CO_{2(g)} + 10H_2O_{(l)}, \Delta_cH = -2658.0\text{kJ}$$

B.

$$C_4H_{10(g)} + \frac{13}{2}O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(l)}, \Delta_cH = -1329.0\text{kJ}$$

C.

$$C_4H_{10(g)} + \frac{13}{2}O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(l)}, \Delta_cH = -2658.0\text{kJ}$$

D.

$$C_4H_{10(g)} + \frac{13}{2}O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(l)}, \Delta_cH = +2658.0\text{kJ}$$

Answer: C

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6. $\Delta_C U^{\Theta}$ of formation of $CH_{4(g)}$ at certain temperature is -393kJ mol^{-1}. The value of $\Delta_f H^{\Theta}$ is

A. zero

B. $< \Delta_f U^{\Theta}$

C. $> \Delta_f U^{\Theta}$

D. equal to $\Delta_f U^{\Theta}$

Answer: B

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7. In an adiabatic process, no transfer of heat takes place between the system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.

A. $q = 0, \Delta T \neq 0, W = 0$

B. $q \neq 0, \Delta T = 0, W = 0$

C. $q = 0, \Delta T = 0, W = 0$

D. $q = 0, \Delta T < 0, W \neq 0$

Answer: C

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8. The pressure-volume work for an ideal gas can be calculated by using the expression $W = -\int_{V_i}^{V_f} P_{ex} dV$. The work can also be calculated from the pV- plot by using the area under the curve within the specified limits. When an ideal gas is compressed (A) reversibly or (B) irreversibly from volume V_i to V_f. choose the correct option.

A. W (reversible) = W (irreversible)

B. W (reversible) lt W (irreversible)

C. W (reversible) gt W (irreversible)

D. W (reversible) = W (irreversible) $+ P_{ex}. \Delta V$

Answer: B

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9. The entropy change can be calculated by using the expression $\Delta S = \frac{q_{\text{rev}}}{T}$. When water freezes in a glass beaker, choose the correct statement amongst the following :

A. ΔS (system) decreases but ΔS (surroundings) remains the same.

B. ΔS (system) increases but tiS (surroundings) decreases.

C. ΔS (system) decreases but ΔS (surroundings) increases.

D. ΔS (system) decreases and ΔS (surroundings) also decreases.

Answer: C

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10. On the basis of thermochemical equations (1), (2) and (3), find out which of the algebraic relationships given in options (A) to (D) is correct.

(1) $C_{(\text{graphite})} + O_{2(g)} \rightarrow CO_{2(g)}, \Delta_r H = x\text{kJ mol}^{-1}$

(2) $C_{(\text{graphite})} + \frac{1}{2}O_{2(g)} \rightarrow CO_{(g)}, \Delta_r H = y\text{kJ mol}^{-1}$

(3) $CO_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow CO2_{(g)}, \Delta_r H = z\text{kJ mol}^{-1}$

A. $z = x + y$

B. $x = y - z$

C. $x = y + z$

D. $y = 2x - z$

Answer: C

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11. Consider the reactions given below. On the basis of these reactions find out which of the algebraic relations given in options (A) to (D) is correct?

(1) $C_{(g)} + 4H_{(g)} \rightarrow CH_{4(g)}, \Delta_r H = x \text{kJ mol}^{-1}$

(2) $C_{(\text{graphite})} + 2H_{2(g)} \rightarrow CH_{4(g)}, \Delta_r H = \quad \text{y kJ mol}^{-1}$

A. $x = y$

B. $x = 2y$

C. $x > y$

D. $x < y$

Answer: C

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12. The enthalpies of elements in their standard states are taken as zero. The enthalpy of formation of a compound

A. is always negative

B. is always positive

C. may be positive or negative

D. is never negative

Answer: C

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13. Enthalpy of sublimation of a substance is equal to

A. enthalpy of fusion+ enthalpy of vaporisation

B. enthalpy of fusion

C. enthalpy of vaporisation

D. twice the enthalpy of vaporisation

Answer: A

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14. Which of the following is not correct ?

A. ΔG is zero for a reversible reaction

B. ΔG is positive for a spontaneous reaction

C. ΔG is negative for a spontaneous reaction

D. ΔG is positive for a non-spontaneous reaction

Answer: B

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Section D Solutions Of Ncert Exemplar Problems Mcqs More Than One Options

1. Thermodynamics mainly deals with

A. interrelation of various forms of energy and their transformation from one form to another.

B. energy changes in the processes which depend only on initial and final states of the microscopic systems containing a few molecules.

C. how and at what rate these energy transformations are carried out.

D. the system in equilibrium state or moving from one equilibrium state to another equilibrium state.

Answer: A::D

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2. In an exothermic reaction, heat is evolved, and system loses heat to the surrounding. For such system

A. q_p will be negative

B. $\Delta_r H$ will be negative

C. q_p will be positive

D. $\Delta_r H$ will be positive

Answer: A::B

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3. The spontaneity means, having the potential to proceed without the assistance of external agency. The processes which occur spontaneously are

A. flow of heat from colder to warmer body

B. gas in a container contracting into one corner.

C. gas expanding to fill the available volume

D. burning carbon in oxygen to give carbon dioxide.

Answer: C::D

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4. For an ideal gas, the work of reversible expansion under isothermal condition can be calculated by using the expression $W = nRT\text{Ln}\frac{V_f}{V_i}$. A sample containing 1.0 mol of an ideal gas is expanded isothermally and reversibly to ten times of its original volume, in two separate

experiments. The expansion is carried out at 300 K and at 600 K respectively. Choose the correct option.

A. Work done at 600 K is 20 times the work done at 300 K.

B. Work done at 300 K is twice the work done at 600 K.

C. Work done at 600 K is twice the work done at 300 K.

D. $\Delta U = 0$ in both cases.

Answer: C::D

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5. Consider the following reaction between zinc and oxygen and choose the correct options out of the options given below :

$2Zn_{(s)} + O_{2(g)} \rightarrow 2ZnO_{(s)}, \Delta H = -693.8 \text{kJ mol}^{-1}$

A. The enthalpy of two moles of ZnO is less than the total enthalpy of two moles of Zn and one mole of oxygen by 693.8 kJ.

B. The enthalpy of two moles of ZnO is more than the total enthalpy of two moles of Zn and one mole of oxygen by 693.8 kJ.

C. $693.8 \mathrm{kJ\ mol^{-1}}$ energy is evolved in the reaction.

D. $693.9 \mathrm{kJ\ mol^{-1}}$ energy is absorbed in the reaction.

Answer: A::C

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Section D Solutions Of Ncert Exemplar Problems Short Answer Type Questions

1. 18.0 g of water completely vaporises at 100°C and 1 bar pressure and the enthalpy change in the process is 40. 79 $\mathrm{kJ\ mol^{-1}}$. What will be the enthalpy change for vapourising two moles of water under the same conditions ? What is the standard enthalpy of vapourisation for water ?

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2. One mole of acetone requires less heat to vaporise than 1 mol of water. Which of the two liquids has higher enthalpy of vaporisation ?

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3. Standard molar enthalpy of formation, $\Delta_f H^{\Theta}$ is just a special case of enthalpy of reaction, $\Delta_r H^{\Theta}$. Is the $\Delta_r H^{\Theta}$ for the following reaction same as $\Delta_f H^{\Theta}$?Give reason for your answer.

$CaO_{(s)} + CO_{2(g)} \rightarrow CaCO_{3(s)}, \Delta_f H^{\Theta} = -178 \text{kJ mol}^{-1}$

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4. The value of $\Delta_f H^{\Theta}$ for NH_3 is -91.8kJ mol^{-1}. Calculate enthalpy change for the following reaction:

$2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}$

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5. Enthalpy is an extensive property. In general, if enthalpy of an overall reaction $A \rightarrow B$ along one route is $\Delta_r H$ and $\Delta_r H_1, \Delta_r H_2, \Delta_r H_3 \ldots\ldots$ represent enthalpies of intermediate reactions leading to product B. What will be the relation between $\Delta_r H$ for overall reaction and $\Delta_r H_1, \Delta_r H_2 \ldots\ldots$ etc. for intermediate reactions.

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6. The enthalpy of atomisation for the reaction $CH_{4(g)} \rightarrow C_{(g)} + 4H_{(g)}$ is 1665kJ mol^{-1}. What is the bond energy of $C - H$ bond?

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7. Use the following data to calculate $\Delta_{\text{lattice}} H^{\Theta}$ for $NaBr$. $\Delta_{\text{sub}} H^{\Theta}$ for sodium metal $= 108.4 \text{kJ mol}^{-1}$, ionization enthalpy of sodium $= 496 \text{kJ mol}^{-1}$, electron gain enthalpy of bromine $= -325 \text{kJ mol}^{-1}$, bond dissociation enthalpy of bromine $= 192 \text{kJ mol}^{-1} \Delta_f H^{\Theta}$ for $NaBr_{(s)} = -360.1 \text{kJ mol}^{-1}$.

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8. Given that $\Delta H = 0$ for mixing of two gases. Explain whether the diffusion of these gases into each other in a closed container is a spontaneous process or not ?

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9. Heat has randomising influence on a system and temperature is the measure of average chaotic motion of particles in the system. Write the mathematical relation which relates these three parameters.

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10. Increase in enthalpy of the surroundings is equal to decrease in enthalpy of the system. Will the temperature of system and surroundings be the same when they are in thermal equilibrium ?

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11. At 298 K, K_p for the reaction $NO_2O_{4(g)} \Leftrightarrow 2NO_{2(g)}$ is 0.98. Predict whether the reaction is spontaneous or not.

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12. A sample of 1.0 mol of a monoatomic ideal gas is taken through a cyclic process of expansion and compression as shown in Fig. What will be the value of ΔH for the cycle as a whole ?

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13. The standard molar entropy of $H_2O_{(l)}$ is 70 $\mathrm{JK}^{-1}\mathrm{mol}^{-1}$. Will the standard molar entropy of $H_2O_{(s)}$ be more, or less than 70 $\mathrm{JK}^{-1}\mathrm{mol}^{-1}$?

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14. Which of the following is not a state functions?

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15. The molar enthalpy of vapourisation of acetone is less than that of water. Why ?

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16. Which quantity out of $\Delta_r G$ and $\Delta_r G^{\Theta}$ will be zero at equilibrium ?

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17. Predict the change in internal energy for an isolated system at constant volume.

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18. Although heat is a path function but heat absorbed by the system under certain specific conditions is independent of path. What are those conditions ? Explain.

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19. Expansion of a gas in vacuum is called free expansion. Calculate the work done and the change in internal energy when 1 litre of ideal gas expands isothermally into vacuum until its total volume is 5 litre ?

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20. Heat capacity (C_p) is an extensive property but specific heat (c) is an intensive property. What will be the relation between C_p and c for 1 mol of water?

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21. The difference between Cp and C_v can be can be $H = U + pV$. Calculate the difference C_p and C_v for 10 moles of an ideal gas.

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22. If the combustion of 1 g of graphite produces -20. 7 kJ of heat, what will be molar enthalpy change ? Give the significance of sign also.

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23. The net enthalpy change of a reaction is the amount of energy required to break all the bonds in reactant molecules minus amount of energy required to form all the bonds in the product molecules. What will be the enthalpy change for the following reaction. $H_{2(g)} + Br_{2(g)} \rightarrow 2HBr_{(g)}$. Given that Bond energy of H_2, Br_2 and HBr is 435 kJ mol^{-1}, 192kJ mol^{-1} and 368kJ mol^{-1} respectively.

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24. The enthalpy of vaporisation of CCI_4 is 30.5 kJ mol^{-1}. Calculate the heat required for the vaporisation of 284 g of CCI_4 at constant pressure. (Molar mass of $CCI_4 = 154 g\, mol^{-1}$).

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25. The enthalpy of reaction for the reaction : $2H_{(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$ is $\Delta_r He^{\Theta} = -572 kJ\, mol^{-1}$. What will be he standard enthalpy of formation of $H_2O_{(l)}$?

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26. What will be the work done on an ideal gas enclosed in a cylinder, when it is compressed by a constant external pressure, P_{ext} in a single step as shown in Fig. Explain graphically.

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27. How will you calculate work done on an ideal gas in a compression, when change in pressure is carried out in infinite steps ?

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28. Represent the potential energy / enthalpy change in the following processes graphically.

(a) Throwing a stone from the ground to roof.

(b) $\frac{1}{2}H_{2(g)} + \frac{1}{2}CI_{2(g)} \Leftrightarrow HCI_{(g)}\, \Delta_r H^{\Theta} - 92.32\text{kJ mol}^{-1}$ In which of the processes potential energy/ enthalpy change is contributing factor to the spontaneity ?

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29. Enthalpy diagram for a particular reaction is given in Fig. Is it possible to decide spontaneity of a reaction from given diagram. Explain.

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30. 1.0 mol of a monoatomic ideal gas is expanded from state (1) to state (2) as shown in Fig. 6.4. Calculate the work done for the expansion of gas from state (1) to state (2) at 298 K.

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31. An ideal gas is allowed to expand against a constant pressure of 2 bar from 10 L to 50 L in one step. Calculate the amount of work done by the gas. If the same expansion were carried out reversibly, will the work done be higher or lower than the earlier case ? (Given that 1 L bar = 100 J)

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Section D Solutions Of Ncert Exemplar Problems Matching The Columns

1. Match the following :

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2. Match the following processes with entropy change :

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3. Match the following parameters with description for spontaneity :

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4. Match the following :

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Section D Solutions Of Ncert Exemplar Problems Assertion And Reason

1. In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A): Combustion of all organic compounds is an exothermic reaction.

Reason (R) : The enthalpies of all elements in their standard state are zero.

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: B

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2. In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A) : Spontaneous process is an irreversible process and may be reversed by some external agency.

Reason (R) : Decrease in enthalpy is a contributory factor for spontaneity.

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: B

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3. In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A) : A liquid crystallizes into a solid and is accompanied by decrease in entropy.

Reason (R) : In crystals, molecules organise in an ordered manner.

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: A

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Section D Solutions Of Ncert Exemplar Problems Long Answer Type Questions

1. Derive the relationship between ΔH and ΔU for an ideal gas. Explain each term involved in the equation.

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2. Extensive properties depend on the quantity of matter but intensive properties do not. Explain whether the following properties are extensive or intensive.

Mass, internal energy, pressure, heat capacity, molar heat capacity, density, mole fraction, specific heat, temperature and molarity.

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3. The lattice enthalpy of an ionic compound is the enthalpy when one mole of an ionic compound present in its gaseous state, dissociates into

its ions. It is impossible to determine it directly by experiment. Suggest and explain an indirect method to measure lattice enthalpy of $NaCI_{(s)}$.

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4. ΔG is net energy available to do useful work and is thus a measure of "free energy". Show mathematically that ΔG is a measure of free energy. Find the unit of ΔG. If a reaction has positive enthalpy change and positive entropy change, under what condition will the reaction be spontaneous ?

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5. Graphically show the total work done in an expansion when the state of an ideal gas is changed reversibly and isothermally from (p_i, V_i) to (P_f, V_f). With the help of a pV plot compare the work done in the above case with that carried out against a constant external pressure p_f.

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Question Paper From Module Section A Answer The Following Questions In Very Short

1. Which is not state function ?

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2. What type of the value will be of ΔG for ice poured in open vessel at 260 K temperature ?

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3. What is the change in entropy for crystalline solid while it turns into liquid ?

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