SHIKSHA CLASSES

BOARD QUESTION PAPER

Subject : Chemistry **Topic : 4. Chemical Thermodynamics** **Total Marks : 20**

Class : XII **Time : 1 Hr.**

Section (A)

Q. 1 : Select and write the most appropriate answer from the following dternatives of each sub question. **5**

i) Which of the following is not a state function?

a) pressure b) heat c) enthalpy d) entropy

ii) For which of the following substance enthalpy of formation is not equal to zero.

a) $Ca_{(s)}$ b) $Fe_{(s)}$ (c) $O_{2(g)}$ d) $CH_3OH_{(\ell)}$

iii) For which of the following reaction entropy is negative?

a) $H_2O_{(\ell)} \rightarrow H_2O_{(s)}$ b) $H_2O_{(\ell)} \rightarrow H_2O_{(g)}$

c) $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$ d) $I_{2(g)} \rightarrow 2I_{(g)}$

iv) Given reaction is $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$, $\Delta H = -92.6$ kJ, The enthalpy of formation is

(a) –92.6 kJ (b) 92.6 kJ mol^{-1}

(c) –46.3 kJ mol^{-1} (d) – 185.2 kJ mol^{-1}

v) The correct thermodynamic conditions for the spontaneous reaction at all temperatures are

(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 $\Delta S = 0$

Q. 2 : Very short answer type Question **2**

i) Write any two factors which affects the enthalpy of solution.

ii) Write any one condition for $\Delta H = \Delta U$

Section (B)

: Answer the following questions. (Any Three) **6**

Q. 3: Prove that $\Delta H = \Delta U + \Delta nRT$

Q. 4 : Write the sign conventions of q and W.

Q. 5 : Is it possible for a reaction to be spontaneous yet endothermic. Comment with example.

Q. 6 : 2 moles of an ideal gas are expanded Isothermally and reversibly from 20 L to 30 L at 300 K. Calculate the work done ($R = 8.314\ J\ k^{-1}\ mol^{-1}$)

Section (C)

: Answer the following question. (Any One) **3**

Q. 7 : Derive the expression for maximum work done during the expansion of an ideal gas in isothermal and reversible process.

Q. 8 : What is Enthalpy (H)? Derive relation between change in Enthalpy and heat transfer.

Section (D)

: Answer the following question. (Any One) **4**

Q. 9 : i) Calculate C-Cl bond enthalpy from following reaction

$CH_3Cl_{(g)} + Cl_{2(g)} \rightarrow CH_2Cl_{2(g)} + HCl_{(g)}$, $\Delta H^0 = -104kJ$ if C-H, Cl-Cl and H-Cl bond enthalpies are 414, 243 and 431 $kJ\ mol^{-1}$ respectively.

ii) Write the expression for enthalpy of reaction when enthalpies of all components are given and enthalpy of formation of all components are given.

Q. 10 : i) Write the expressions of first law of thermodyanamics for

a) Process takes place in vacuum

b) Adiabatic process

ic) Isothermal process.

ii) What is spontaneous process? State second law of thermodynamics in terms of entropy.

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