

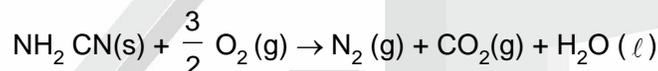
XI CHEMISTRY TEST — THERMODYNAMICS

M.M. : 30

TIME : 1 HR.

- Predict change in internal energy for an isolated system at constant volume. 1
- Is ΔH a state function? What is ΔH for a cyclical process? 1
- Write a mathematical relation which relates heat, randomising influence and temperature. 1
- Enthalpy of atomisation for reaction $\text{CH}_4(\text{g}) \rightarrow \text{C} + 4\text{H}$ is 1665 kJ/mol. What is bond energy of C—H bond? 1
- Find which relation is correct if : 1
 - $\text{C}(\text{g}) + 4\text{H}(\text{g}) \rightarrow \text{CH}_4(\text{g}) \Delta_f H = x \text{ kJ/mol}$
 - $\text{C}(\text{graphite}) + 2\text{H}_2(\text{g}) \rightarrow \text{CH}_4(\text{g}) \Delta_f H = y \text{ kJ/mol}$

a. $x = y$ b. $x = 2y$ c. $x > y$ d. $x < y$
- When water freezes in a glass beaker, what happens to ΔS (system) and ΔS (surroundings) and why? 2
- Value of $\Delta_f H$ for NH_3 is -91.8 kJ/mol . Find enthalpy change for : $2\text{NH}_3(\text{g}) \rightarrow \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$ 2
- At 298 K, ΔH for reaction $2\text{A} + \text{B} \rightarrow \text{C}$, is 400 kJ/mol and ΔS is 0.2 kJ/k/mol. At what temperature will the reaction be spontaneous if ΔH and ΔS is constant over temperature range. 2
- Find enthalpy change of reaction at 298 K, is $\Delta U = -742.7 \text{ kJ/mol}$ at 298 K. 3



- Calculate $\Delta_f H^\circ$ for Na Br. $\Delta_f H^\circ$ for sodium metal = 108.4 kJ/mol, ionisation enthalpy of sodium = 496 kJ/mol, e^- gain enthalpy of bromine = -325 kJ/mol , bond dissociation enthalpy of bromine = 192 kJ/mol, $\Delta_f H^\circ$ for NaBr (s) = -360.1 kJ/mol . 3
- Find $\Delta_f H$ for $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightarrow 2\text{HBr}(\text{g})$ 3
 - Given that B.E. of H_2 , Br_2 , HBr is 435 kJ/mol, 192 kJ/mol and 368 kJ/mol respectively.
 - What is the enthalpies of all elements in their standard state?
- Find enthalpy change on freezing 1 mol of water at 10.0°C to ice at -10°C . 4
$$\Delta_{\text{fus}} H = 6.03 \text{ kJ/mol at } 0^\circ \text{C}$$
$$C_p [(\text{H}_2\text{O}) \ell] = 75.3 \text{ J/mol / k}$$
$$C_p [(\text{H}_2\text{O}) \text{S}] = 36.8 \text{ J/mol / k}$$
- Given : $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g}) \Delta_f H = -92.4 \text{ kJ/mol}$. What is $\Delta_f H$ of NH_3 gas? 1
 - What are signs of ΔH and ΔS for reaction : $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$. 2
 - For reaction, $2\text{A}(\text{g}) + \text{B}(\text{g}) \rightarrow 2 \text{D}(\text{g}) \Delta U^\circ = -10.5 \text{ kJ}$
 $\Delta S = -44.10 \text{ J/k}$. Calculate ΔG° for reaction and predict whether reaction is spontaneous or not. 3