INDIAN SCHOOL NIZWA - WORKSHEET

CHEMISTRY

CH: 6 Thermodynamics

Name: _____ Date: 07. 12 .24 Class: XI Sec: A___

1. Calculate the internal energy change in each of the following cases;
   a) A system absorbs 15 kJ of heat and does 5kJ of work.
   b) 5kJ of work is done on the system and 15kJ of heat is given out by the system.

2. The enthalpy change (ΔH) for the reaction $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ is -92.38kJ at 298 K. What is ΔU at 298K?
3. Calculate w, q, ΔU when 0.75 mol of an ideal gas expands isothermally and reversibly at 27^0C from a volume of 15 L to 25 L. (R=8.314J/K/Mol)
4. A 5L cylinder contained 10 moles of oxygen at 27^oC. Due to sudden leakage through the hole, all the gas escaped into the atmosphere and the cylinder got empty. If the atmospheric pressure is 1 atmosphere, Calculate the work done by the gas. (R=0.0821litre atm/k/mol)
5. Calculate the enthalpy change accompanying the transformation of C(graphite) to C(diamond). Given that the enthalpies of combustion of graphite and diamond are 393.5 and 395.4 kJ/mol respectively.
6. Calculate the enthalpy of hydrogenation of ethene, given that the enthalpy of combustion of ethene, hydrogen and ethane are -1410,-286.2 and -1560.6KJ/mol respectively at 298K.
7. Calculate the enthalpy of combustion of benzene from the following data;
   a) $6C(s) + 3H_2(g) \longrightarrow C_6H_6(l)$, $\Delta H = 49.0$ kJ mole^{-1}
   b) $H_2(g) + \frac{1}{2} O_2(g) \longrightarrow H_2O(l)$, $\Delta H = -285.8$ kJ mole^{-1}
   c) $C(s) + O_2(g) \longrightarrow CO_2(g)$, $\Delta H = -389.3$ kJ mole^{-1}
8. Enthalpy and entropy changes of a reaction are 40.63 kJK^{-1} mole^{-1} and 108.8 J K^{-1}mole^{-1} respectively. Predict the feasibility of the reaction at 27^0C.
9. Rank the following in the order of increasing entropy;
   a) 1 mole of $H_2O(l)$ at 25^0C and 1 atm. Pressure
   b) 2 mole of $H_2O(s)$ at 0^0C and 1 atm. Pressure

c) 1 mole of $H_2O(v)$ at 100^0C and 1 atm. Pressure

d) 1 mole of $H_2O(l)$ at 0^0C and 1 atm. Pressure

10. At a certain temperature "T" , the endothermic reaction A $\longrightarrow$ B proceeds virtually to the end. Determine;

    a) Sign of ΔS for this reaction

    b) Sign of ΔG for the reaction B $\longrightarrow$ A at the temperature, T

    c) The possibility of the reaction B $\longrightarrow$ A proceeding at a low temperature.

11. What is the main limitation of the first law of thermodynamics?
12. State the thermodynamic conditions of spontaneous occurrence of a process.
13. Define entropy. Predict whether entropy change in the following processes would be positive or negative.

    a) $N_2O_3\ (g) \longrightarrow N_2O\ (g) + O_2\ (g)$

    b) Freezing of water

    c) $NH_3\ (g) + HCl\ (g) \longrightarrow NH_4Cl\ (s)$

14. One mole of CO_2 at 300K and 1atm.pressure is heated in a closed vessel so that the temperature is 500K and pressure is 5 atm. Then it is cooled so that the temperature is 30K and pressure is 1 atm. Pressure. What is the change in internal energy of the gas?
15. The equilibrium constant for a reaction is 10. What will be the value of ΔG^{Θ}? [Given: R = 8.314 J/K/mol, T = 300 K]
16. For the reaction: $2Cl\ (g) \rightarrow Cl_2\ (g)$, what are the signs of ΔH and ΔS?
17. Classify the following as extensive and intensive properties:
    Molar heat capacity, Temperature, Enthalpy, Surface tension, Volume, Mass and Density
18. When is the entropy of a perfectly crystalline solid zero?
19. At 298 K, What will be the change in standard internal energy change for the given reaction:
    $OF2\ (g) + H2O\ (g) \rightarrow O2\ (g) + 2HF\ (g)$, $\Delta H = -310$ KJ
20. Why is the entropy of a substance taken as zero at 0 k?

21. Calculate the standard Gibbs free energy change for the reaction:
    $N_2\ (g) + 3H_2\ (g) \leftrightarrow 2NH_3\ (g)$ at 298 K
    The value of equilibrium constant for the above reaction is 6.6×10^5. [R = 8.314 J/K/mol]
22. The enthalpy of reaction for the following reaction:
    $2H_2\ (g) + 1/2O_2\ (g) \rightarrow 2H_2O\ (l)$, $\Delta rH^{\Theta} = -572$ KJ/mol, what will be the standard enthalpy of formation of H2O (l)?

23 Calculate $\Delta_f H^{\ominus}$ of HCl if bond energy of H-H bond is 437 KJ/mol, Cl-Cl bond is 244 KJ/mol and H-Cl is 433 KJ/mol.

24. The spontaneity means, having the potential to proceed without the assistance of external agency. The process which occurs simultaneously 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.