INDIAN SCHOOL NIZWA - WORKSHEET

CHEMISTRY

CH: 6 STATES OF MATTER Class: XI

1. Define the following
   a) System
   b) surroundings
   c) internal energy
   d) adiabatic process
   e) enthalpy
   f) reversible process
   g) intensive & extensive property
   h) entropy
2. State the first law of thermodynamics
3. What happens to the internal energy of the sytem a) if work is done on the system b) work is done by the system?
4. What are spontaneous processes?
5. What is the effect of temperature on entropy?
6. What is free energy?
7. How is free energy of a process is related to its enthalpy and entropy ?
8. What is the importance of free energy concept for chemical reaction?
9. Calculate the internal energy change in each of the following cases;

   A system absorbs 15 kJ of heat and does5kJ of work.

   5kJ of work is done on the system and 15kJ of heat is given out by the system.
10. 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?
11. 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)
12. 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
13. 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.

14. 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.

15. 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) $C\ (s) + O_2\ (g) \longrightarrow CO_2\ (g)$, $\Delta H = -389.3\ kJ\ mole^{-1}$

16. 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.

17. 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

18. 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.

19. Define entropy. Predict whether entropy change in the following processes would be positive or negative. a) $N_2O_3\ (g) \rightarrow N_2O\ (g) + O_2\ (g)$ b) Freezing of water c) $NH_3\ (g) + HCl\ (g) \rightarrow NH_4Cl\ (s)$

20. a) Calculate the energy needed to raise the temperature of 10g of iron from 25^oC to 500^oC if specific heat capacity of iron is $0.45\ J/^0C/g$.

    b) What mass of gold of specific heat capacity $0.13\ J/^0C/g$ can be heated through the same temperature difference when supplied with the same amount of energy as in (a).

21. 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?

22. Calculate the enthalpy of combustion of glucose from the following data.

    i) $C(graphite) + O_2 \rightarrow CO_2\ (g)$ $\Delta H = -395.0\ kj$

    ii) $H_2\ (g) + \frac{1}{2} O_2\ (g) \rightarrow H_2O(l)$ $\Delta H = -269.4\ kj$

    iii) $6C(graphite) + 6\ H_2 + 3O_2 \rightarrow C_6H_{12}O_6(s)$ $\Delta H = -1169.8\ kj$

23. Calculate the standard Gibb's energy change for the formation of propene $C_3H_8(g)$ at 298 K . Given that $\Delta_fH^\ominus$ for propane $-103.85\ kj\ mol^{-1}$ $\Delta S^\ominus = -269.74JK^{-1}$