

## Chem12 Enthalpy/Entropy : Quiz 1-30

1) Define :

a) Entropy -

b) Enthalpy -

c) Exothermic reaction -

d) Endothermic reaction -

2) Give the sign of  $\Delta S$

a)  $\text{HCl(g)} \rightarrow \text{H(g)} + \text{Cl(g)}$

b)  $2\text{H}_2\text{(g)} + \text{O}_2\text{(g)} \rightarrow 2\text{H}_2\text{O(g)}$

c)  $\text{CaO(s)} + 2\text{NH}_4\text{Cl(s)} \rightarrow 2\text{NH}_3\text{(g)} + \text{CaCl}_2\text{(s)} + \text{H}_2\text{O(l)}$

d)  $\text{AgNO}_3\text{(aq)} + \text{NaCl(aq)} \rightarrow \text{AgCl(s)} + \text{NaNO}_3\text{(aq)}$

e)  $\text{Na}_2\text{CO}_3\text{(aq)} + 2\text{HCl(aq)} \rightarrow 2\text{NaCl(aq)} + \text{H}_2\text{O(l)} + \text{CO}_2\text{(g)}$

f)  $\text{CO}_2\text{(g)} + \text{CaO(s)} \rightarrow \text{CaCO}_3\text{(s)}$

g)  $4\text{NH}_3\text{(g)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{N}_2\text{(g)} + 6\text{H}_2\text{O(g)}$

h)  $\text{NH}_3\text{(g)} + \text{HCl(g)} \rightarrow \text{NH}_4\text{Cl(s)}$

3) Does S increase or decrease ?

a) the temperature increases

b) a liquid becomes a gas

c) a precipitate forms

d) a solid forms from a gas

e) the number of molecules in a container decreases

4) Give the sign of  $\Delta H$

a)  $\text{C}_2\text{H}_5\text{OH(l)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{CO}_2\text{(g)} + 3\text{H}_2\text{O(l)} + 1367\text{kJ}$

b)  $\text{H}_2\text{O(l)} \rightarrow \text{H}^+\text{(aq)} + \text{OH}^-\text{(aq)} \quad \Delta H = +56.2\text{kJ}$

c)  $\text{H}_2\text{O(s)} + 6.0\text{ kJ} \rightarrow \text{H}_2\text{O(l)}$

d)  $\text{CS}_2\text{(l)} + 3\text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)} + 2\text{SO}_2\text{(g)} \quad \Delta H = -1105\text{kJ}$

5) State whether the following reactions are spontaneous, non-spontaneous, or at equilibrium :

- a)  $C_7H_8(l) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$
- b)  $Ca(s) + O_2(g) + H_2(g) \rightarrow Ca(OH)_2(s) + \text{heat}$
- c)  $CaCO_3(s) + 400kJ \rightarrow CaO(s) + CO_2(g)$
- d)  $3Fe(s) + 2O_2(g) \rightarrow Fe_3O_4(s) + \text{heat}$
- e)  $SO_2(g) + \text{heat} \rightarrow S(s) + O_2(g)$

6)a) Give the equation for  $\Delta G$ .

b) What is the sign of  $\Delta G$  for a spontaneous reaction?

Answers : 1)a) The degree of disorder in a system, b) The total energy of a system, c) A reaction that releases energy, d) A reaction that absorbs energy, 2) +, -, +, -, +, -, +, -, 3) +, +, -, -, -, 4) -, +, +, -, 5) s, eq, eq, eq, ns, 6)a)  $\Delta G = \Delta H - T\Delta S$ , negative.