

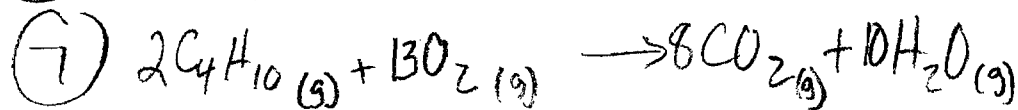
- ① (a) Enthalpy = heat flow at constant pressure.
 (b) H (c) $\frac{J}{mol}$ or $\frac{kJ}{mol}$ (d) $\Delta H = (\text{sum of enthalpies of products}) - (\text{sum of enthalpies of reactants})$
 (e) ΔH is -

- ② (a) Entropy is a measure of disorder (b) S (c) $J/K \cdot mol$
 (d) $\Delta S = (\text{sum of entropies of products}) - (\text{sum of entropies of reactants})$ (e) ΔS is +

- ③ (a) Energy that is "free" or available to do work = Gibbs free energy, (b) G
 (c) J/mol or kJ/mol (d) $\Delta G = (\text{sum of } \Delta G_f^\circ \text{ of products}) - (\text{sum of } \Delta G_f^\circ \text{ of reactants})$
 or $\Delta G = \Delta H - T\Delta S$ (e) Spont when ΔG is -; nonspont when ΔG is +

- ④ $T = 298K$ $P = 1atm$ (5) Favorable = a condition is making a spontaneous reaction likely to occur; a condition that "helps" the reaction occur.
 unfavorable = makes the rxn less likely to occur

⑥ When a hydrocarbon or carbohydrate reacts w/ O_2 to produce $CO_2 + H_2O$.



⑧ $\Delta H = [(10)(-241.82) + (8)(-393.5)] - [(13)(0) + (2)(-124.73)] =$
 $-5566.2 - (-249.46) = -5316.7 \text{ kJ/mol; favorable}$

⑨ $\Delta S = [(10)(188.83) + (8)(213.6)] - [(13)(205.0) + (2)(310.0)] =$
 $3597.1 - (2665 + 620) = 312.1 \text{ J/mol} \cdot K$ Joules!
 favorable

⑩ $\Delta G = \Delta H - T\Delta S = (-5316.7 \text{ kJ/mol}) - (298K)(0.3121 \text{ kJ/mol} \cdot K)$ kilo-joules!
 $= -5409.7 \text{ kJ/mol}$ SPONTANEOUS

⑪ BALANCED; 6,6,6,1 / $\Delta H^\circ = +28030 \text{ kJ/mol}$ unfavorable (see notes)
 ⑫ $\Delta S^\circ = -972.48 \frac{J}{K \cdot mol}$ Joules unfavorable
 \rightarrow kilojoules!

⑬ $\Delta G = 28030 \frac{kJ}{mol} - (298K)(-0.972 \frac{kJ}{mol \cdot K}) = +28320 \text{ kJ/mol}$ NON-SPONTANEOUS