

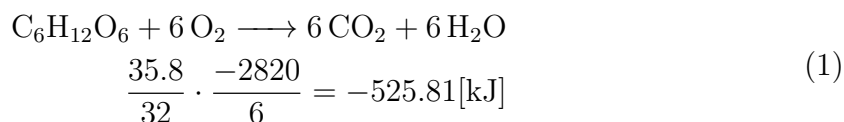
Chapter 8 & 9 – Review Set

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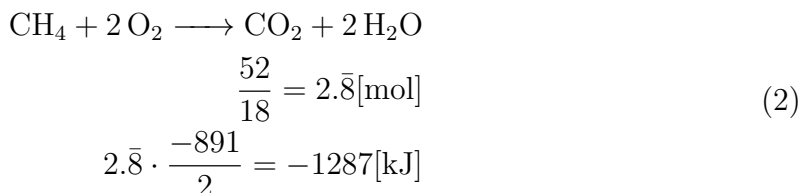
Instructor: Mr. Morgan

January 14, 2020

1. The ΔH for the combustion of $\text{C}_6\text{H}_{12}\text{O}_6$ is $2820[\text{kJ}]$. Determine ΔH if you start with 35.8 g of oxygen.



2. The enthalpy change for the combustion of CH_4 is $-891[\text{kJ}]$. Calculate the enthalpy change if you end with $52[\text{g}]$ of water.



3. Calculate the heat of formation of AlCl_3 when the enthalpy change of the reaction is $-2677[\text{kJ}]$, given $3 \text{Al} + 3 \text{NH}_4\text{ClO}_4(\Delta H = -295[\text{kJ}]) \longrightarrow \text{Al}_2\text{O}_3(\Delta H = -1676[\text{kJ}]) + \text{AlCl}_3 + 3 \text{NO}(\Delta H = 90[\text{kJ}]) + 6 \text{H}_2\text{O}(\Delta H = -242[\text{kJ}])$

$$\begin{aligned}(-1676) + x + 3(90) + 6(-242) - 3(-295) &= -2677[\text{kJ}] \\ x &= -704[\text{kJ}]\end{aligned}\tag{3}$$

4. What are the strongest attractive forces that must be overcome to:

- (a) Melt Ice – Hydrogen Bonding
- (b) Vaporize CaCl_2 – Ionic
- (c) Melt KNO_3 – Ionic

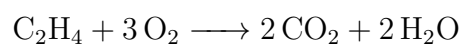
- (d) Dissolve Br₂ in CCl₄ – London
 - (e) Sublime CO₂ – London
 - (f) Boil CH₄ – London
 - (g) Melt Iodine – London
 - (h) Melt SiO₂ – Network Covalent
 - (i) Boil C₂H₅OH – Hydrogen Bonding
 - (j) Melt NH₃ – Hydrogen Bonding
5. C₈H₁₈ has a vapor pressure of 45.2mmHg] at 25[° C]. If 10[mL] ($\rho = 0.692 \left[\frac{\text{g}}{\text{mL}} \right]$) is added to a 15[L] container, how many molecules will be left in the liquid phase after equilibrium is established?

$$\begin{aligned}
 10 \cdot .692 &= 6.92[\text{g}] \\
 \frac{6.92}{130} &= .0532[\text{mol}] \\
 P &= \frac{nRT}{V} = \frac{.0532 \cdot .0821 \cdot 298}{15} \\
 &= .0868[\text{ATM}] \rightarrow 65.947[\text{mmHg}] \\
 65.947 - 45.2 &= 20.747[\text{mmHg}_{\text{liquid}}] \\
 \frac{20.747}{45.2} \cdot .0532 &= .0244[\text{mol}] \\
 .0244 \cdot 6.22 \cdot 10^{23} &= 1.51 \cdot 10^{22}[\text{molecules}]
 \end{aligned} \tag{4}$$

6. Playing tennis for half an hour consumes 225[kcal] of energy. How long would you have to play tennis to lose one pound of body fat? (one gram of body fat = 32[kJ] of energy)

$$\begin{aligned}
 225[\text{kcal}] &= 941.4[\text{kJ}] \\
 2 \cdot \frac{941.4}{32} &= 58.84 \left[\frac{\text{g}}{\text{h}} \right] \\
 58.84 \left[\frac{\text{g}}{\text{h}} \right] &= .13 \left[\frac{\text{lb}}{\text{h}} \right] \\
 .13 \cdot x &= 1 \\
 x &= 7.7[\text{h}]
 \end{aligned} \tag{5}$$

7. Calculate the ΔH using bond energies when C₂H₄ is combusted.



Broken:

$$3(\text{O}=\text{O}) = 3(498)$$

$$\text{C}=\text{C} = 612$$

$$4(\text{C}-\text{H}) = 4(414)$$

(6)

Made:

$$4(\text{C}=\text{O}) = 4(715)$$

$$4(\text{O}-\text{H}) = 4(464)$$

$$-4(715) - 4(464) + 3(498) + 612 + 4(414) = -954[\text{kJ}]$$