Gen Chem with Doc M!

Monday 11/9/15

Today: Chp 9

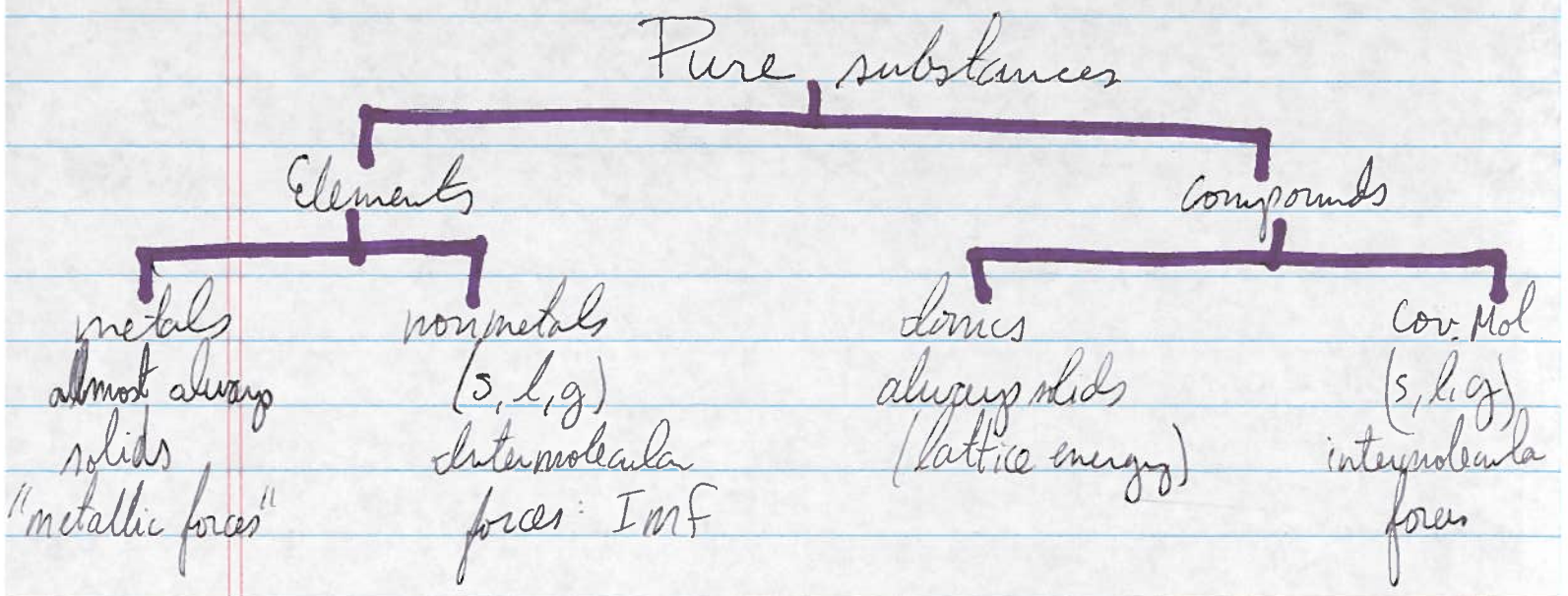
Tuesday: Expt 10

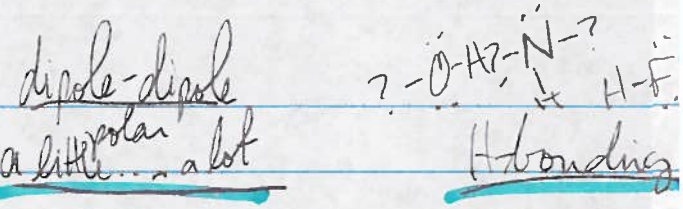
Wednesday: Chp 9

Thursday: Review at 7:00 pm in Epply 110
Chem show @ 7:30 pm

Friday: Review Chapters in class

Monday: Celebration of Knowledge 5!



	MM	nonpolar	dipole-dipole a little polar ... a lot	 H-bonding
London dispersion increase ↓ Incr	< 100 g/mol	gas	gas ... liquid	gas ... liquid
	100-200	gas ... liq	gas ... liq	liquid
	200-300	liq ... solid	liq ... solid	solid
	300+	solid	solid	solid

Chapter 9

$$\Delta E = E_f - E_i = \text{heat} + \text{work}$$

$$\text{work} = -P\Delta V$$

$$\overset{\text{heat in}}{q} \quad \overset{\text{work in}}{-P\Delta V}$$

* $\Delta E = q - P\Delta V$

* $\Delta H = \Delta E + P\Delta V = q$ (if $\Delta V = 0$, then $\Delta E = \Delta H$)

$$\Delta H = H_f - H_i = H_{products} - H_{initial\ (reactants)}$$

If $\Delta H < 0$, heat given off, exothermic

If $\Delta H > 0$, heat is absorbed, endothermic

$H_2O_{(l)} \rightarrow H_2O_{(g)}$ $\Delta H > 0$ endothermic

$H_2O_{(g)} \rightarrow H_2O_{(l)}$ $\Delta H < 0$ exothermic

$H_2O_{(l)} \rightarrow H_2O_{(s)}$ $\Delta H < 0$

$H_2O_{(s)} \rightarrow H_2O_{(l)}$ $\Delta H > 0$

$A \rightarrow 2B$ $\Delta H = -34$ kJ

or $= -34$ kJ/mol A

or $= -34$ kJ/2mol B

$2B \rightarrow A$ $\Delta H = 34$ kJ/

$= 34$ kJ/mol A

$= 34$ kJ/2mol B

$(B \rightarrow \frac{1}{2}A \quad \Delta H = 17 \text{ kJ})$

$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$ $\Delta H^\circ = -803$ kJ

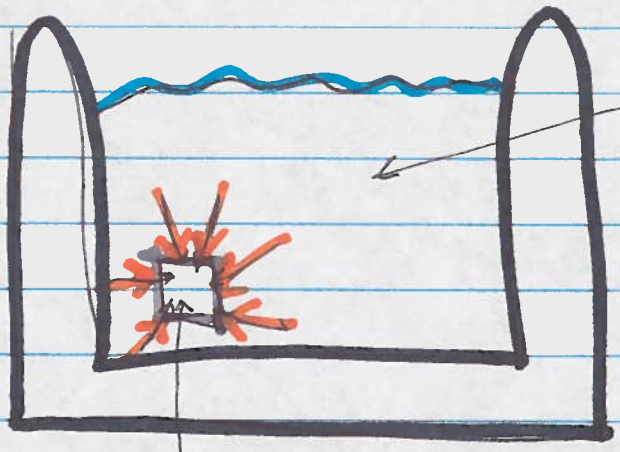
$= -803$ kJ/1mol CH_4

$= -803$ kJ/2mol O_2

$= 803$ kJ/mol CO_2

Suppose balloon contained 5.0 g CH_4.
How much heat was given off?

$$q = \frac{-803 \text{ kJ}}{\text{mol } CH_4} \Big| \frac{5.0 \text{ g } CH_4}{(12+4) \text{ g } CH_4} \Big| \frac{1 \text{ mol } CH_4}{}$$



Aluminum

$15\,g\ Al$

"system"

$20^\circ C \xrightarrow{\text{time}} 35^\circ C$

specific heat

$$q = SH * m * \Delta T$$

$\Delta T \rightarrow T_f - T_i$

$$203\,J = SH_{Al} \times 15\,g * (35 - 20)$$

$$(J) = \left(\frac{J}{g\,degree}\right)(g)(degree)$$

$$SH = \frac{.902\,J}{g\,degree}$$ ← physical property of Al

Folder Activity Chapter 7 Number 3 **9 November 2015**

Printed Name: Monika Satkauskas Chm 203 Student number: TA

Consider the reaction that we saw in the demonstration today:

$$CH_4(g) + 2\ O_2(g) \rightarrow CO_2(g) + 2\ H_2O(g) \quad \Delta H = -803\ kJ$$

1. Which of these processes are endothermic? Exothermic?

(a) melting candle wax endothermic (b) coffee cooling exothermic (c) water vapor condensing into droplets exothermic

(d) a covalent bond being broken endothermic (e) an ionic lattice forming from ions in the gas phase exothermic (f) paper burning exothermic

2. How much heat is given off if 2.25 g methane (CH_4) is burned in excess oxygen?

$$q = \frac{-803\ kJ}{1\ mol\ CH_4} \left| \frac{1\ mol\ CH_4}{(12+4)\ g\ CH_4} \right| \frac{2.25\ g\ CH_4}{} = -112.9\ kJ$$

3. Express ΔH in terms of kJ/mol H_2O formed.

$$\frac{-803\ kJ}{2\ mol\ H_2O} = -401.5\ kJ/mol\ H_2O$$

4. What is ΔH for the reverse reaction? $CO_2(g) + 2\ H_2O(g) \rightarrow CH_4(g) + 2\ O_2(g)$ $\Delta H = ?$

803 kJ

5. What is ΔH for the reaction? $\frac{1}{2}\ CO_2(g) + H_2O(g) \rightarrow \frac{1}{2}\ CH_4(g) + O_2(g)$ $\Delta H = ?$

$\frac{803}{2} =$ 401.5 kJ

~~6. Write the equation that defines ΔH_f^o for CH_4.~~

7. Suppose 125 mL hot water at 85 °C is added to 200 mL cold water at 15 °C. What is the final temperature of the water?

$q_{hot} = -q_{cold}$

$$SH_{hot} * m_{hot} * \Delta T_{hot} = -SH_{cold} * m_{cold} * \Delta T_{cold}$$

($\Delta T_{hot} = T_f - T_i$; $\Delta T_{cold} = T_f - T_i$)

$$SH_{H_2O} * 125g * (T_f - 85) = -SH_{H_2O} * 200g * (T_f - 15)$$

$$125T_f - 10625 = -200T_f + 3000$$

$$325T_f = [redacted] 13625$$

$$T_f = [redacted]$$

41.9°C