

## 7.1 Quiz

1. Turn over your quiz when you are finished and I will come collect it.
2. Work on any missing work or the 7.2 Review. (Test is next Friday)

\* Make sure you turn in your phase changes HW today!

Feb 11-7:36 AM

BR:Feb 12

Substance	Formula	$\Delta H_{\text{vap}}$ (kJ/mol)	$\Delta H_{\text{fus}}$ (kJ/mol)
Water	H <sub>2</sub> O	40.7	6.01
Ethanol	C <sub>2</sub> H <sub>5</sub> OH	38.6	4.94
Methanol	CH <sub>3</sub> OH	35.2	3.22
Acetic acid	CH <sub>3</sub> COOH	23.4	11.7
Ammonia	NH <sub>3</sub>	23.3	5.66

1. How much heat is required to warm 275g of water from 76°C to 87°C?  
 $Q = ? \text{ J}$   $C = 4.184$   $12,656.6 \text{ J}$   
 $m = 275 \text{ g}$   $\Delta T = 11^\circ \text{C}$
2. How much heat is released when 10.0g of steam condenses into water?  $g \rightarrow l$   
 $10 \text{ g} \times \frac{1 \text{ mol}}{18 \text{ g}} \times \frac{-40.7 \text{ kJ}}{1 \text{ mol}} = -22.6 \text{ kJ}$

Jan 21-9:04 AM

## Tuesday, February 12th

Objective: Students will be able to determine the standard heat of formation.

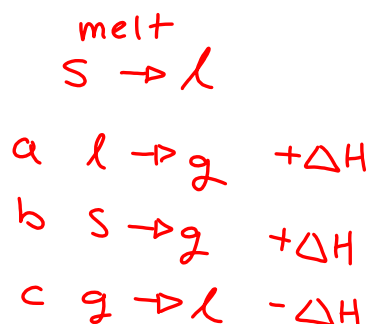
1. Bellringer
2. Notes: Hess's Law
3. Go over 7.1 Quiz

DUE: 7.2 Weekly Review

HW: Enthalpy HW, Test Corrections, Missing Work, Unit 7 Review

Jan 21-8:46 AM

## HW Questions



Feb 12-10:42 AM

## Hess's Law

- Hess's Law the overall enthalpy change in a reaction is equal to the sum of the enthalpy changes of the individual steps
- Example:
  - > Step #1:  $2S(s) + 2O_2 \rightarrow 2SO_2(g)$   $\Delta H = -594 \text{ kJ}$
  - > Step #2:  $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$   $\Delta H = +198 \text{ kJ}$

Feb 8-8:51 AM

## Standard Heat of Formation

$\Delta H_f^\circ$ : the amount of energy released when a compound is formed from its elements.

- The standard heat of formation for water,  $\Delta H_f^\circ = -285.83 \text{ kJ/mol}$
- Use the chart handed out to look up values.
- We use this information to determine the heat of formation for any reaction.

$$\Delta H_{\text{rxn}}^\circ = \sum \Delta H_f^\circ(\text{products}) - \sum \Delta H_f^\circ(\text{reactants})$$

sum of

Feb 8-8:51 AM

## Heat of Formation

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$\Delta H^\circ_{\text{rxn}} = \sum \Delta H_f(\text{products}) - \sum \Delta H_f(\text{reactants})$

- All elements in their standard states (example: oxygen gas, solid copper, liquid mercury) will have an Enthalpy of formation of zero.

$\Delta H_f^\circ$ (kJ/mol) (concentration of aqueous solutions is 1M)			
Substance	$\Delta H_f^\circ$	Substance	$\Delta H_f^\circ$
Ag(s)	0	CuCl(s)	-443.0
AgCl(s)	-127.0	Cu <sub>2</sub> SO <sub>4</sub> (s)	-1443.0
AgNO <sub>3</sub> (s)	146.0	CuI(s)	-67.8
Al <sub>2</sub> O <sub>3</sub> (s)	-1675.7	Cu <sub>2</sub> S(s)	-53.1
BaCl <sub>2</sub> (aq)	-855.0	Cu <sub>2</sub> SO <sub>4</sub> (s)	-77.4
BaSO <sub>4</sub> (s)	-1472.2	Fe(s)	0
Be(s)	-699.4	FeCl <sub>2</sub> (s)	-399.49
BiCl <sub>3</sub> (s)	-379.1	FeO(s)	-272.0
Bi <sub>2</sub> S <sub>3</sub> (s)	-143.1	FeS(s)	-100.0
Br <sub>2</sub> (l)	0	Fe <sub>2</sub> O <sub>3</sub> (s)	-824.2
CCl <sub>4</sub> (l)	-128.2	Fe <sub>3</sub> O <sub>4</sub> (s)	-1484.4
CH <sub>4</sub> (g)	-74.6	FeS <sub>2</sub> (s)	-218.0
C <sub>2</sub> H <sub>2</sub> (g)	227.4	H <sub>2</sub> (g)	0
C <sub>2</sub> H <sub>4</sub> (g)	52.4	HBr(g)	-36.3
C <sub>2</sub> H <sub>6</sub> (g)	-84.0	HCl(g)	-92.3
CO(g)	-110.5	HCl(aq)	-167.5
CO <sub>2</sub> (g)	-393.5	HClO <sub>4</sub> (aq)	-101.59
CS <sub>2</sub> (l)	89.0	HCN(aq)	108.9
Ca(s)	0	HCHO	-108.6
CaCO <sub>3</sub> (s)	-1206.9	HCOOH	-425.0
CaO(s)	-634.9	HI(g)	-273.3
Ca(OH) <sub>2</sub> (s)	-985.2	Hg(l)	38.5
Cl <sub>2</sub> (g)	0	H <sub>2</sub> O(l)	-285.8
Co <sub>2</sub> O <sub>3</sub> (s)	-891.0	H <sub>2</sub> O(g)	-241.8
Co(s)	-327.9	H <sub>2</sub> O <sub>2</sub> (l)	-187.8
Cr <sub>2</sub> O <sub>3</sub> (s)	-1139.7	H <sub>3</sub> PO <sub>4</sub> (l)	-595.4
		H <sub>2</sub> PO <sub>4</sub> (aq)	-1271.7
		H <sub>2</sub> S(g)	-20.6
		H <sub>2</sub> SO <sub>4</sub> (aq)	-608.8
		H <sub>2</sub> SO <sub>4</sub> (l)	-814.0
		Hg <sub>2</sub> Cl <sub>2</sub> (s)	-224.3
		Hg <sub>2</sub> Cl <sub>2</sub> (l)	-265.4
		Hg <sub>2</sub> SO <sub>4</sub> (s)	-783.1
		I <sub>2</sub> (s)	0
		KBr(s)	-393.8
		KMnO <sub>4</sub> (s)	-872.2
		KOH	-424.6
		LiBr(s)	-351.2
		LiOH(s)	-487.5
		Mn(s)	0
		MnCl <sub>2</sub> (aq)	-555.0
		Mn(NO <sub>2</sub> ) <sub>2</sub> (aq)	-635.5
		Mn <sub>2</sub> O <sub>3</sub> (s)	-520.0
		Mn <sub>2</sub> O <sub>4</sub> (s)	-714.2
		N <sub>2</sub> (g)	0
		NH <sub>3</sub> (g)	-45.9
		NH <sub>4</sub> Br(s)	-270.8
		NO(g)	91.3
		NO <sub>2</sub> (g)	33.2
		Na(s)	0
		NaBr(s)	-361.1
		NaCl(s)	-411.2
		NaHCO <sub>3</sub> (s)	-950.8
		NaNO <sub>2</sub> (s)	-467.8
		NaOH(s)	-425.8
		Na <sub>2</sub> CO <sub>3</sub> (s)	-1130.7
		Na <sub>2</sub> SO <sub>4</sub> (s)	-368.8
		Na <sub>2</sub> SO <sub>4</sub> (l)	-1387.1
		NH <sub>4</sub> Cl(s)	-314.4
		O <sub>2</sub> (g)	0
		P <sub>2</sub> O <sub>5</sub> (s)	-1460.1
		P <sub>4</sub> O <sub>6</sub> (s)	-2684.0
		PBr <sub>3</sub> (s)	-278.7
		PF <sub>3</sub> (s)	-339.4
		SF <sub>6</sub> (g)	-1220.5
		SO <sub>2</sub> (g)	-296.8
		SO <sub>3</sub> (g)	-395.7
		SrO(s)	-592.0
		TiO <sub>2</sub> (s)	-944.0
		Ti(s)	-123.8
		UCl <sub>4</sub> (s)	-1019.2
		UO <sub>2</sub> (s)	-1092.0
		Zn(s)	0
		ZnCl <sub>2</sub> (aq)	-415.1
		ZnO(s)	-350.5
		ZnSO <sub>4</sub> (s)	-982.8

Feb 8-8:51 AM

## Standard heat of formation

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$\Delta H^\circ_{\text{rxn}} = \sum \Delta H_f(\text{products}) - \sum \Delta H_f(\text{reactants})$

Practice:

$4\text{FeS}(s) + 7\text{O}_2(g) \rightarrow 2\text{Fe}_2\text{O}_3(s) + 4\text{SO}_2(g); \Delta H_{\text{rxn}} = ?$

$[2(-824.2) + 4(-296.8)] - [4(-100) + 7(0)]$

$-2835.6 + 400$

$-2435.6 \text{ kJ/mol}$

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## Standard heat of formation

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$\Delta H^\circ_{\text{rxn}} = \sum \Delta H_f(\text{products}) - \sum \Delta H_f(\text{reactants})$

Practice:

$\text{CH}_4(g) + 2\text{Cl}_2(g) \rightarrow \text{CCl}_4(l) + 2\text{H}_2(g); \Delta H_{\text{rxn}} = ?$

$[1(-128.2) + 2(0)] - [1(-74.6) + 2(0)] = -53.6 \text{ kJ/mol}$

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