

Chapter 16 WS

ΔH_{Phases} , ΔH_{Rxn} , & Hess's Law

Name: _____

Period: _____ Date: _____

Compound	ΔH_f (kJ/mol)	Compound	ΔH_f (kJ/mol)	Compound	ΔH_f (kJ/mol)	Phase Change (H ₂ O)	Energy (kJ/mol)
CH ₄ (g)	-74.8	NaF(s)	-569.0	NO(g)	+90.4	Vaporization	40.7
CO ₂ (g)	-393.5	NaOH(s)	-426.7	NO ₂ (g)	+33.9	Condensation	-40.7
NaCl(s)	-411.0	HCl(g)	-92.3	SnCl ₄ (l)	-545.2	Fusion	6.01
H ₂ O(l)	-285.8	H ₂ O(g)	-241.8	SnO(s)	-286.2	Solidification	-6.01
H ₂ S(g)	-20.1	SO ₂ (g)	-296.1	SnO ₂ (s)	-580.7	Sublimation	46.71
H ₂ SO ₄ (l)	-811.3	NH ₄ Cl(s)	-315.4	SO ₂ (g)	-296.1	Deposition	-46.71
MgSO ₄ (s)	-1278.2	NO(g)	+90.4	SO ₃ (g)	-395.2		
MnO(s)	-384.9	NO ₂ (g)	+33.9	ZnO(s)	-348.0		
MnO ₂ (s)	-519.7	SnCl ₄ (l)	-545.2	ZnS(s)	-202.9		
NaCl(s)	-411.0	CO(g)	-110.5				

Calculate the ΔH for each of the following phase changes for water using the table above.

- 1) How much energy must be transferred to melt 75.0 g of ice?

$$75.0 \text{ g H}_2\text{O} \left| \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \right| \left| \frac{6.01 \text{ kJ}}{1 \text{ mol H}_2\text{O}} \right| = +25.0 \text{ kJ}$$

- 2) How much energy must be transferred to boil 25.7 g of water?

$$25.7 \text{ g H}_2\text{O} \left| \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \right| \left| \frac{40.7 \text{ kJ}}{1 \text{ mol H}_2\text{O}} \right| = +58.1 \text{ kJ}$$

- 3) How much energy must be transferred to sublimate 1.00 kg of water?

$$1 \text{ kg H}_2\text{O} \left| \frac{1000 \text{ g}}{1 \text{ kg}} \right| \left| \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \right| \left| \frac{46.71 \text{ kJ}}{1 \text{ mol H}_2\text{O}} \right| = +260. \text{ kJ}$$

- 4) How much energy must be transferred to deposit 55.1 g of steam?

$$55.1 \text{ g H}_2\text{O} \left| \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \right| \left| \frac{-46.71 \text{ kJ}}{1 \text{ mol H}_2\text{O}} \right| = -143 \text{ kJ}$$

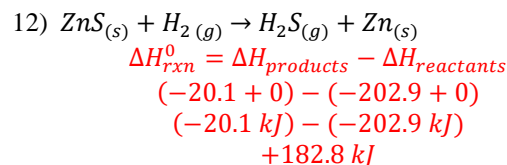
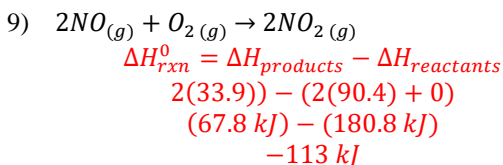
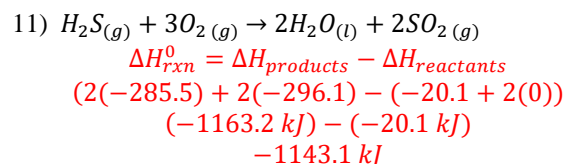
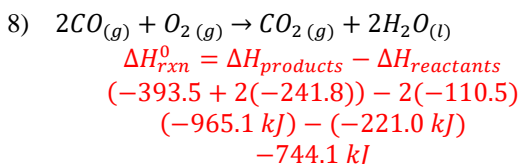
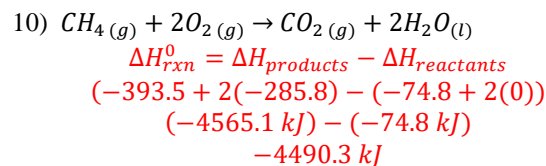
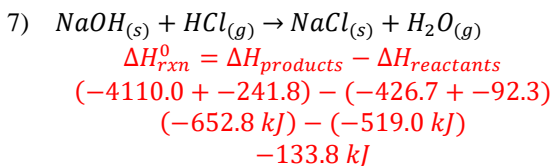
- 5) How much energy must be transferred to freeze 104 g of water?

$$104 \text{ g H}_2\text{O} \left| \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \right| \left| \frac{-6.01 \text{ kJ}}{1 \text{ mol H}_2\text{O}} \right| = -34.7 \text{ kJ}$$

- 6) How much energy must be transferred to condense 2.75 kg of steam?

$$2.75 \text{ kg H}_2\text{O} \left| \frac{1000 \text{ g}}{1 \text{ kg}} \right| \left| \frac{1 \text{ mol H}_2\text{O}}{18 \text{ g H}_2\text{O}} \right| \left| \frac{46.71 \text{ kJ}}{1 \text{ mol H}_2\text{O}} \right| = -6220 \text{ kJ}$$

Calculate the ΔH^0 for each of the following reactions using the data table above.



Calculate the ΔH for each of the following reactions using Hess's Law

