

Enthalpy Calculations Review

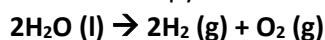
Name: _____ Period: _____

- Determine the sign (+ or -) ΔS in the processes below:
 - $\text{FeS (s)} \rightarrow \text{Fe}^{2+} \text{ (aq)} + \text{S}^{2-} \text{ (aq)}$ _____
 - $2\text{C}_2\text{H}_6 \text{ (g)} + 7\text{O}_2 \text{ (g)} \rightarrow 4\text{CO}_2 \text{ (g)} + 6\text{H}_2\text{O (g)}$ _____
 - $2\text{NH}_3 \text{ (g)} \rightarrow \text{N}_2 \text{ (g)} + 3\text{H}_2 \text{ (g)}$ _____
- Which has more entropy: a sugar cube dissolved in water or a sugar cube? Explain.

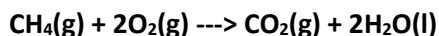
Substance	Specific Heat (J/g x °C)
H ₂ O (s)	2.03
H ₂ O (l)	4.184
H ₂ O (g)	2.01

Water
$\Delta H_{\text{fus}} = 6.01 \text{ kJ/mol}$
$\Delta H_{\text{vap}} = 40.7 \text{ kJ/mol}$

- How much energy is needed to condense 12.6 g of water?
- What is the initial temperature of a 10.5 g piece of copper ($c = 0.385$) that has a final temperature of 85.0°C and absorbs 130.2 J of energy?
- How much energy is required to melt 18.6 g of water?
- How much energy is released when the temperature of 12.2 g of water decreases from 92.5°C to 65.0°C?
- Calculate the change in enthalpy using the standard enthalpy of formation for the reaction below:



- Use the standard enthalpy of formation to calculate the enthalpy change for the reaction below.



- Estimate the enthalpy change (ΔH_{rxn}) for the reaction using bond energies: $\text{CH}_4 \text{ (g)} + 2\text{O}_2 \text{ (g)} \rightarrow \text{CO}_2 \text{ (g)} + 2\text{H}_2\text{O (l)}$

Average Bond Energies (kJ/mol)

H-H	436 kJ/mol	C-H	413 kJ/mol	C=C	614 kJ/mol
H-Cl	431 kJ/mol	C-C	348 kJ/mol	C≡C	839 kJ/mol
H-F	567 kJ/mol	C-N	293 kJ/mol	C=O	799 kJ/mol
N-H	391 kJ/mol	C-O	358 kJ/mol	O=O	495 kJ/mol
N-O	201 kJ/mol	C-F	485 kJ/mol	C≡O	1072 kJ/mol
O-H	463 kJ/mol	C-Cl	328 kJ/mol	C=N	615 kJ/mol
O-O	146 kJ/mol	C-S	259 kJ/mol	N=N	418 kJ/mol
F-F	155 kJ/mol	Cl-Cl	242 kJ/mol	N≡N	941 kJ/mol
				C≡N	891 kJ/mol

- How much heat is released when 12.5 g of ethanol burns? $\text{C}_2\text{H}_5\text{OH (l)} + 3\text{O}_2 \rightarrow 2\text{CO}_2 \text{ (g)} + \text{H}_2\text{O (g)}$ $\Delta H = -1235 \text{ kJ}$
- A reaction has a ΔH of -57 kJ and a ΔS of 21 J/K. Is the reaction spontaneous at 25 °C?