

Organic Chemistry Summer Homework 2024-25

Name: _____

This is a review of some general chemistry principles that are important and relevant to Organic Chemistry. Use whatever resources you would like. I prefer [ChemLibre](#) or [CK12](#). These are both searchable textbook collections. These concepts should be mostly review from your general Chemistry class, but I understand that it's been a while so if you're unsure about a concept, spend some time reviewing. Please complete this work and submit it on the first day of school. **This work is to be completed independently.**

Lewis Dots/Valence Electrons

1. Draw the lewis dot structure for the following elements, ions, and compounds.

Carbon

Water (H₂O)

O²⁻ (Oxygen ion)

Nitrogen

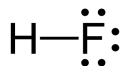
N₂

CH₄

Bonding

1. What type of bond will form between the following pairs of atoms? Show the give/take or sharing of electrons as Lewis dots.

Example: H and F



Type of Bond
covalent

Na and O

Cl and Cl

Mg and S

b. $[H^+] = 1.2 \times 10^{-2} \text{ M}$ _____

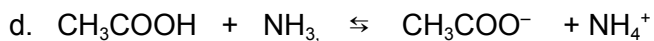
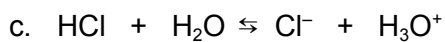
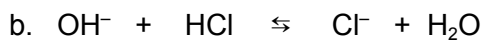
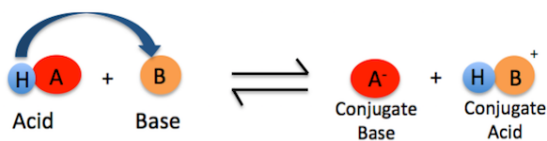
c. $[H^+] = 0.000849 \text{ M}$ _____

d. $[OH^-] = 5.2 \times 10^{-9} \text{ M}$ _____

2. Using the Bronsted Lowry definition of acids and bases, identify all acids and bases (including conjugate acids and conjugate bases) in the following chemical reactions. Use A, B, CA, CB for your labels.

Bronsted-Lowry: Acids donate H^+ ; Bases accept H^+

Ex:



Energy and Entropy

1. Calculate ΔH° for the following reactions:

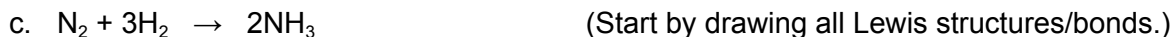
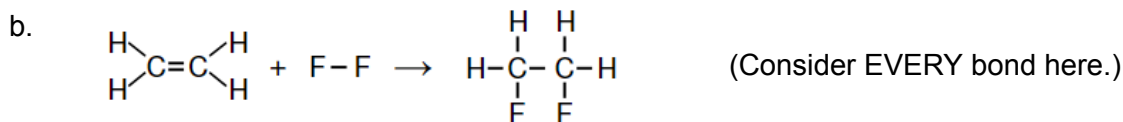
$$\Delta H_{\text{reaction}} = \sum \Delta H_{(\text{reactants})} - \sum \Delta H_{(\text{products})}$$

or use the following equation

$$H_{\text{rxn}} = [\text{energy used for breaking bonds}] - [\text{energy formed in making bonds}]$$

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



2. Use Gibbs Free Energy equation to determine if each of the following are spontaneous or nonspontaneous.

$$\Delta G = \Delta H - T\Delta S$$

ΔG = Gibbs free energy

ΔH = Change in Enthalpy

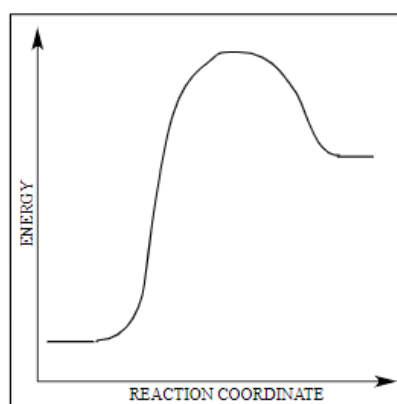
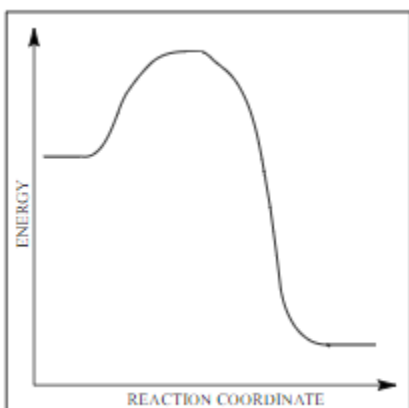
ΔS = Change in Entropy

T = Temperature (in Kelvin; add 273 to the Celsius temperature)

***Spontaneous = $-\Delta G$; Nonspontaneous = $+\Delta G$

- a. Calculate the ΔG for ice melting at 303K if the enthalpy and entropy changes of water are 6 kJ/mol and 0.022 kJ/mol-K. Is this a spontaneous process at this temperature?
- b. Calculate ΔG at 298K for a reaction in which $\Delta H = 119\text{kJ}$ and $\Delta S = 0.355\text{kJ/K}$. Is this process spontaneous at this temperature?

3. Label the following graphs as Exothermic processes or Endothermic processes.



On my honor, I have neither given nor received unauthorized aid on this work.

Signature

I do not know of any violations of the Honor Code.

Signature