

(5) Today

Section 1.2: Chemical Foundations

Sections 1.3: Physical-Chemical Foundations

Next Class (6)

Section 1.4: Genetic Foundations

Chap 2: Water and Its Role in Life

(7) Second Class from Today

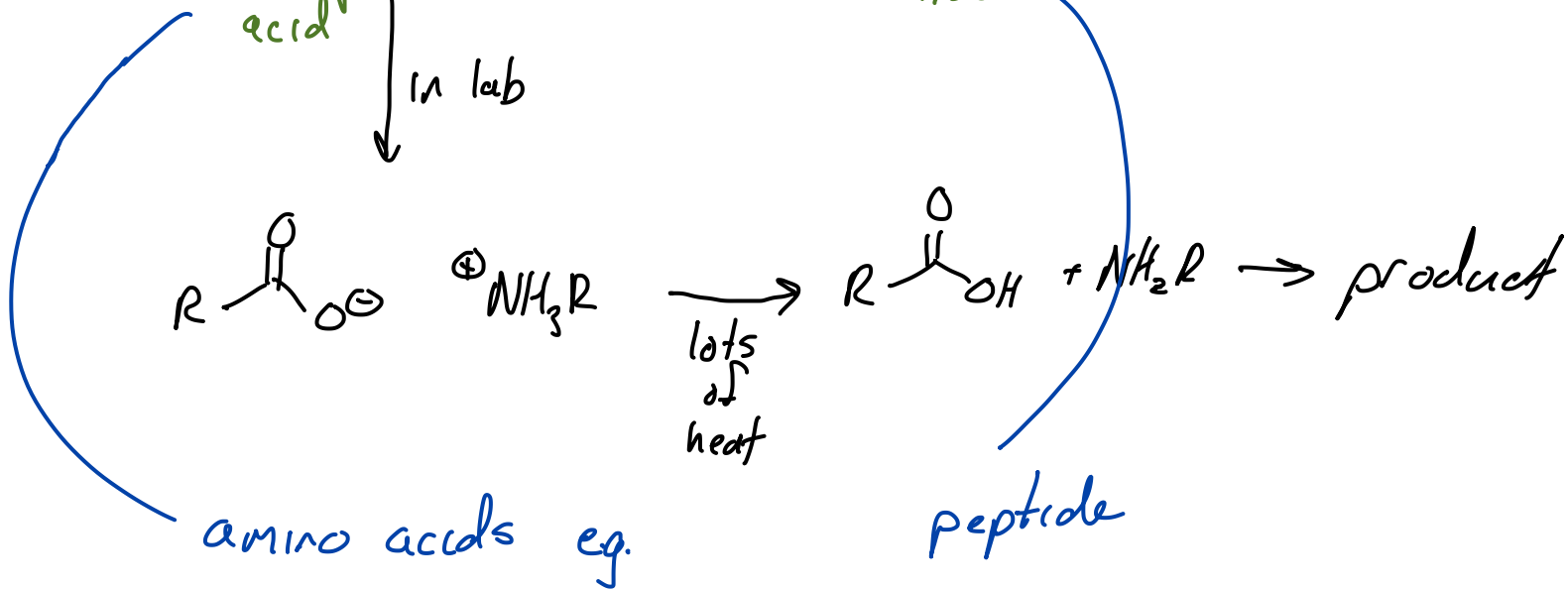
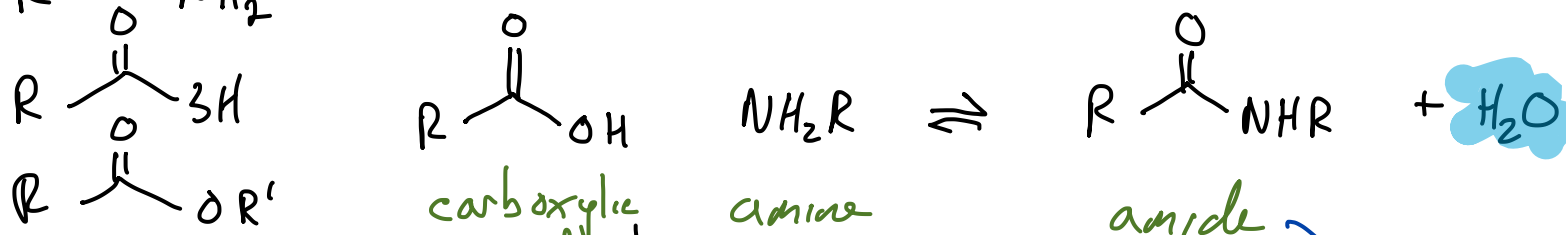
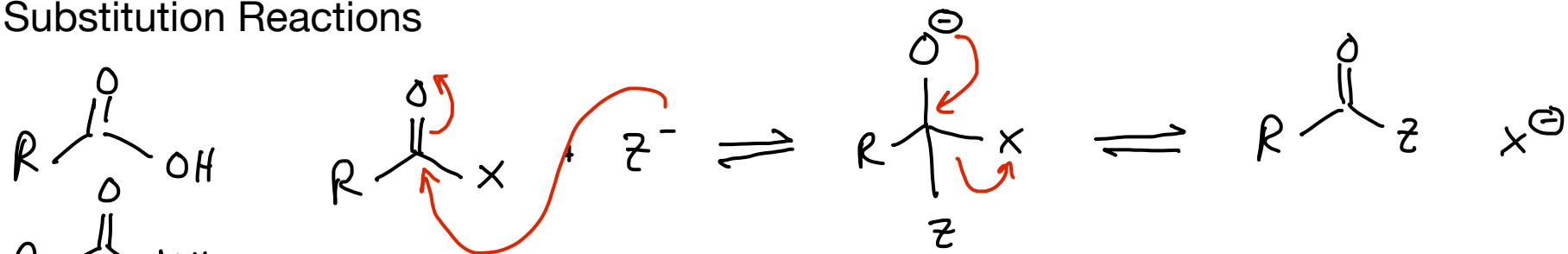
Chap 2: Water and Its Role in Life

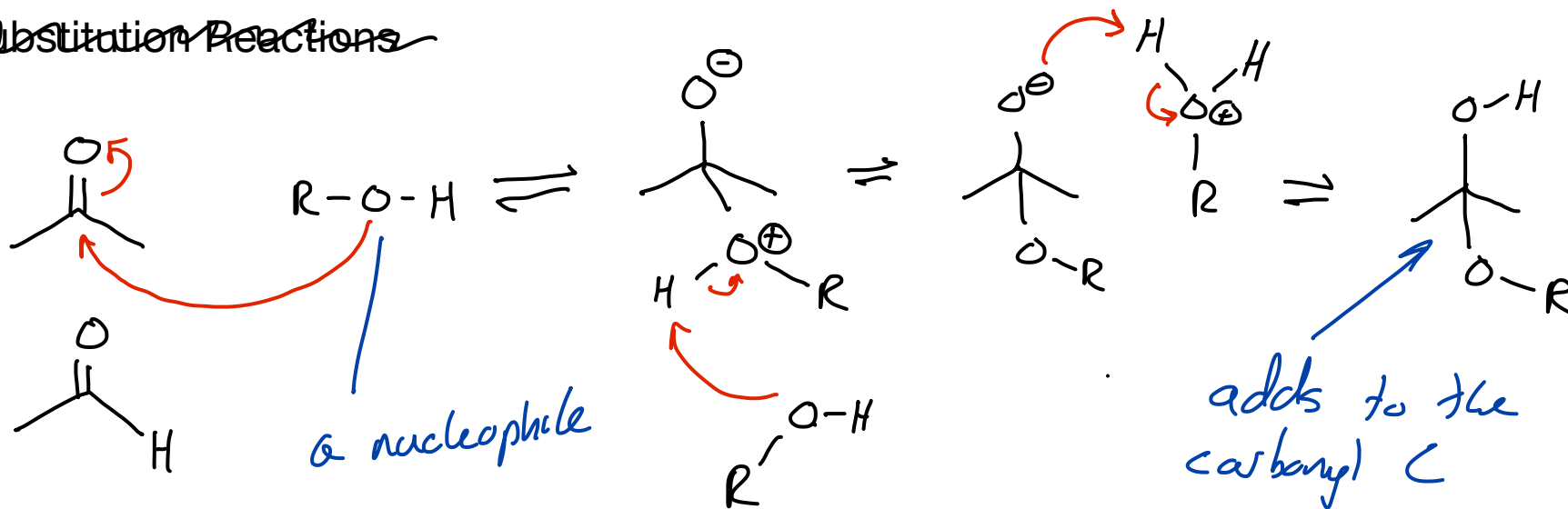
Chap 3: Amino Acids, Peptides, and Proteins

Third Class from Today (8)

Chap 3: Amino Acids, Peptides, and Proteins

Acyl Substitution Reactions

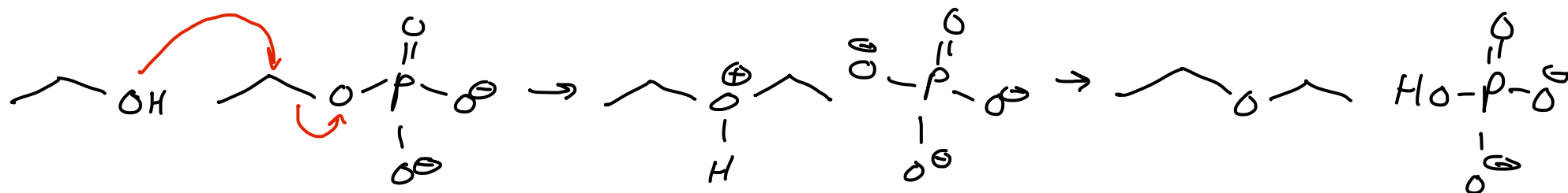
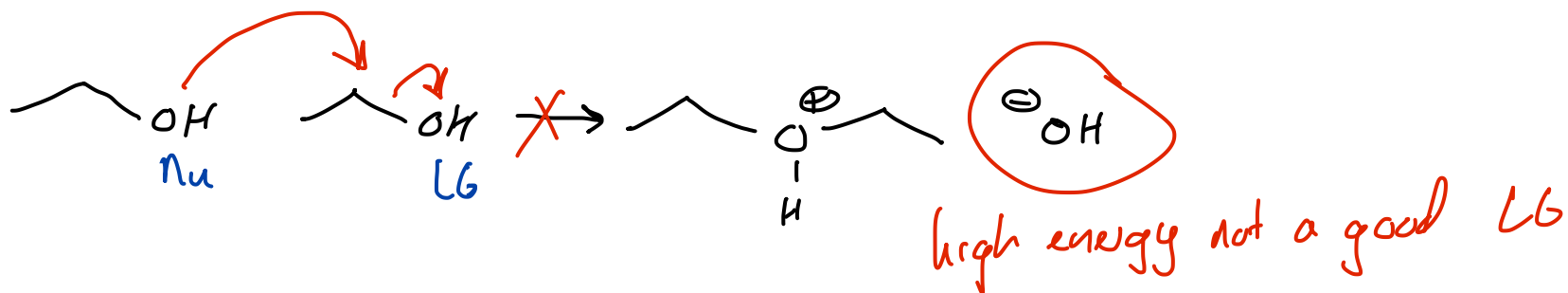
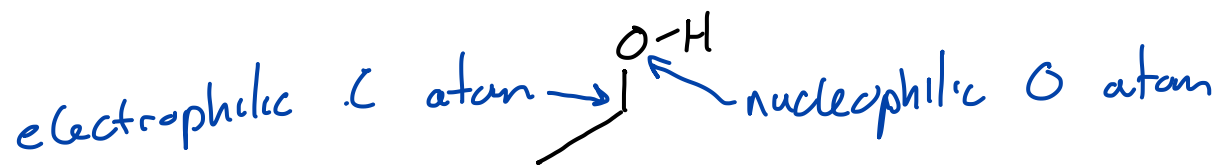
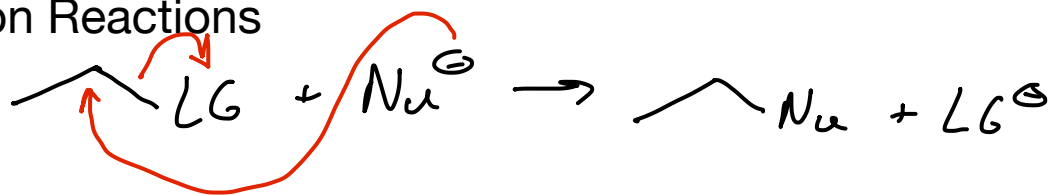


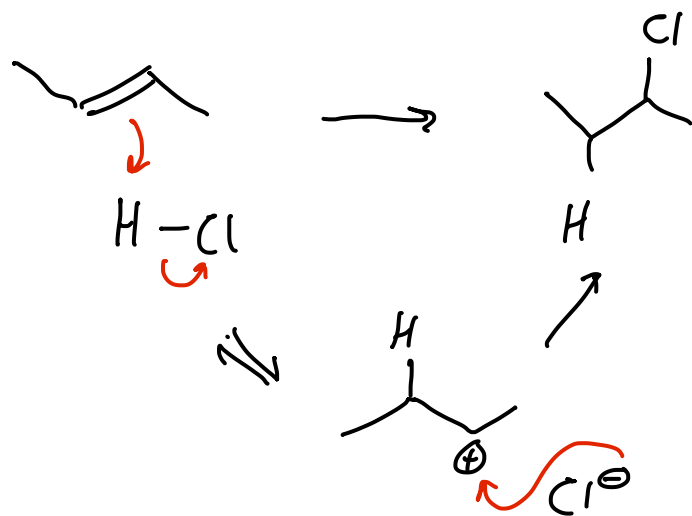
~~Acyl Substitution Reactions~~

Nucleophilic Addition Reactions

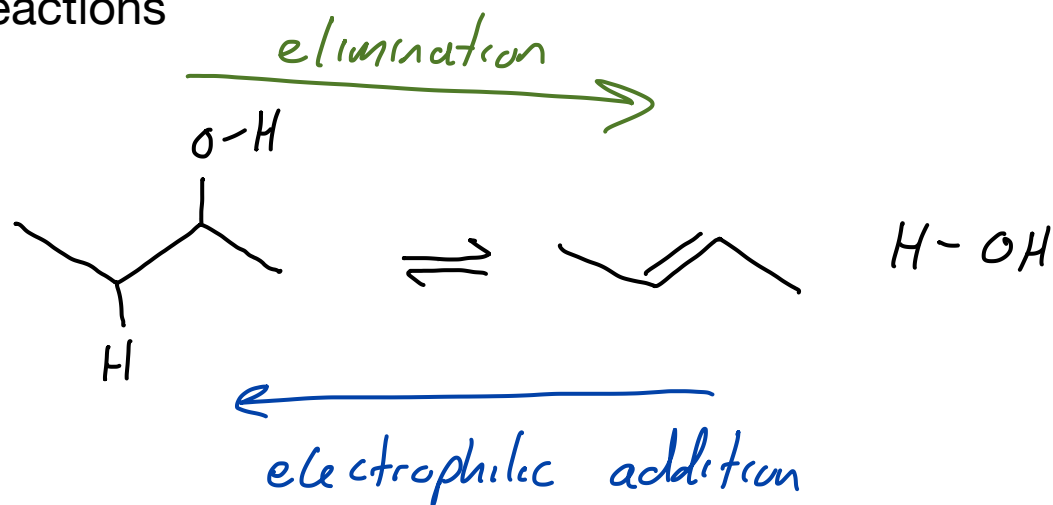
common in sugar chemistry

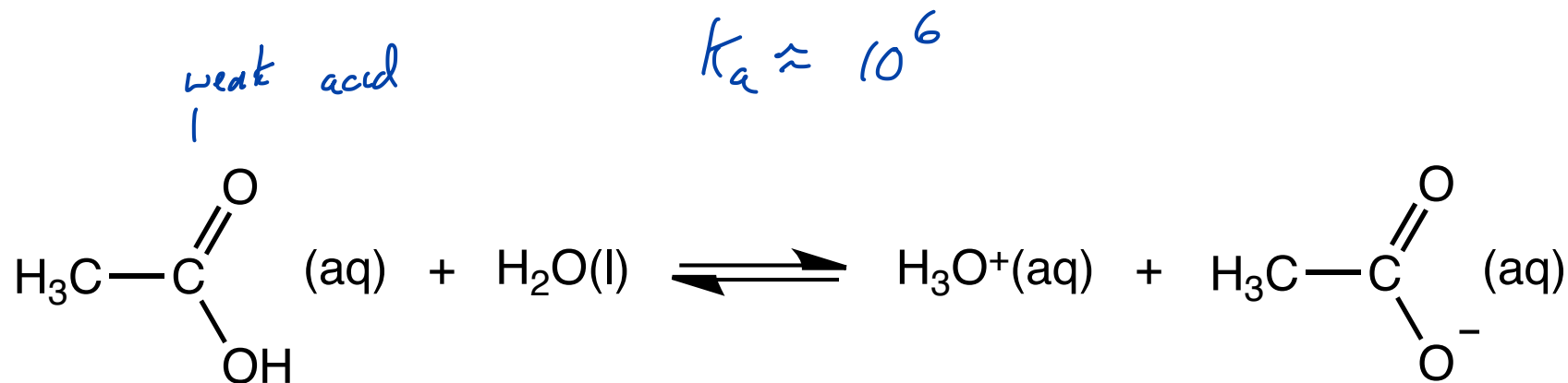
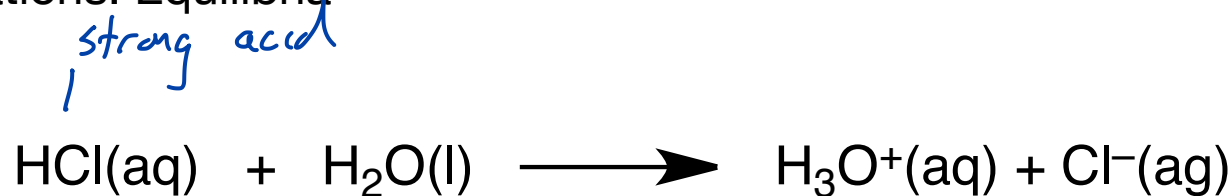
Nucleophilic Substitution Reactions



~~Nucleophilic Substitution Reactions~~

Elimination and Addition Reactions





$$K_a = 1.7 \times 10^{-4}$$

$$\Delta G^\circ = -RT \ln K$$

↑
tells us about the stability of the reactants or products

ΔG° tells us how far a reaction goes to reach equilibrium

ΔG tells us whether the rxn goes + or - in which direction

$$\Delta G = \Delta G^\circ + RT \ln Q$$

reaction quotient



even reactions with unfavourable ΔG° will produce products

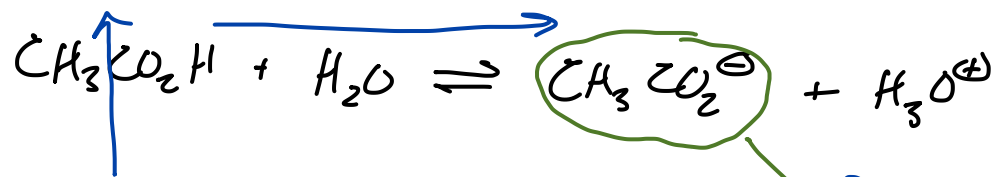
since none are present at the start of the reaction

$$K = \frac{[\text{prod}]}{[\text{reactants}]}$$

$$Q = \frac{[\text{prod}]_i}{[\text{reactants}]_i}$$

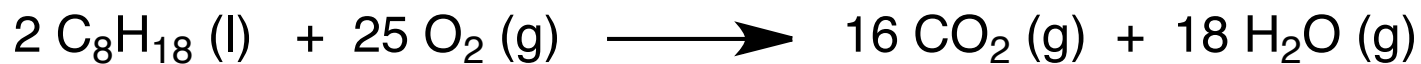
$$Q = \frac{[\text{H}_3\text{O}^+][\text{CH}_3\text{CO}_2^-]}{[\text{CH}_3\text{CO}_2\text{H}]}$$

Le Châtelier's principle... how do I increase $[\text{H}^+]$?

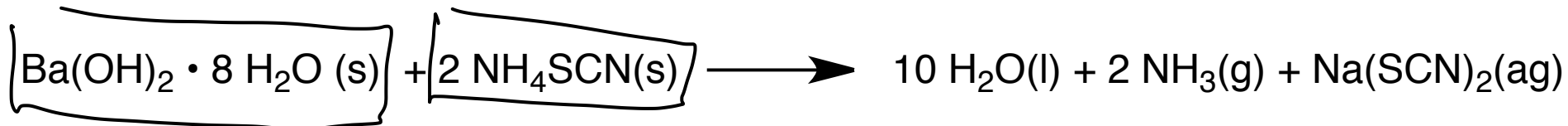


increasing conc of $\text{CH}_3\text{CO}_2\text{H}$ will make more H^+

remove acetate and equilibrium will shift and $[\text{H}^+]$ will increase



releases heat ... releasing energy ...
 reaction is favorable



feels cold ... reaction proceeds spontaneously

heat is q $\Delta H = q_p$ ← heat allowing only Pressure volume work at constant pressure

entropy is a measure of randomness

to be spontaneous a process or reaction has to increase the entropy of the universe

$$\Delta S_{\text{universe}} = \Delta S_{\text{rxn}} + \Delta S_{\text{surroundings}}$$

We can think of the universe as the reaction and its surroundings

means go

$$\ominus \Delta G = \Delta H - T \Delta S \leftarrow \begin{array}{l} \text{increase in entropy in the reaction} \\ \text{would increase the entropy of the} \\ \text{universe} \end{array}$$

release of enthalpy/energy ($-\Delta H$) to the surroundings would increase the entropy of the surroundings which increases the entropy of the universe.

Thus, $-\Delta H$, $+\Delta S$ creates a $-\Delta G$ for spontaneous (in the forward direction) reactions. Any $-\Delta G$ would be spontaneous in the forward direction.