

Stoichiometry of Biochemical Reactions II

Today's lecture

- Half reactions - exercises!
- Half reactions to overall reaction
- Exercises again!
- Fermentation

Half reactions

Step 1 Write oxidized form on the left and reduced form on the right

Step 2 Add other species involved in the reaction

Step 3 Balance the reaction for all elements except for oxygen and hydrogen

Step 4 Balance oxygen using water

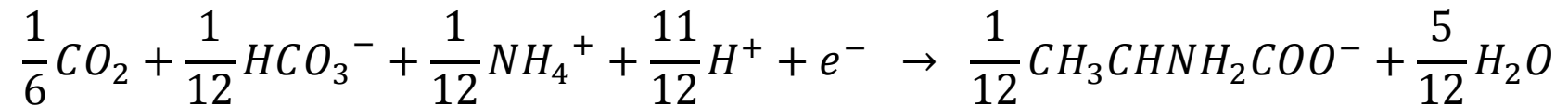
Step 5 Balance hydrogen using H^+

Step 6 Balance charge using e^-

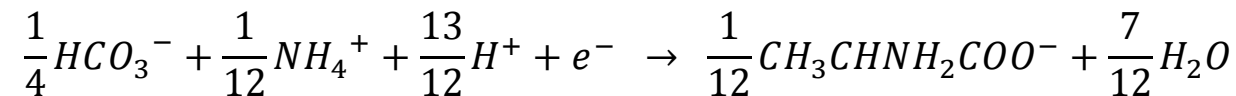
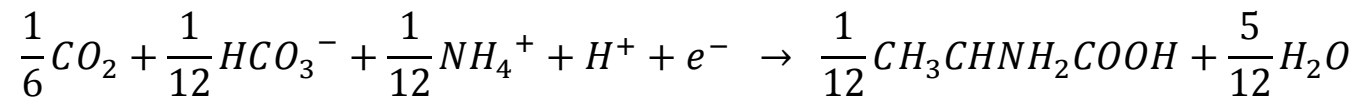
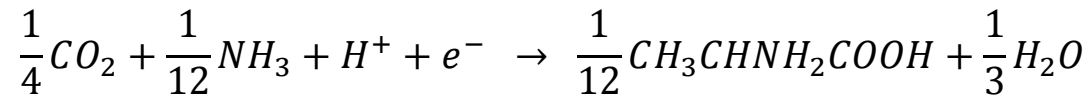
Step 7 Convert the equation to the e^- -equivalent form

Half reactions – various expressions

ex) Half reaction for alanine



can also be written as:

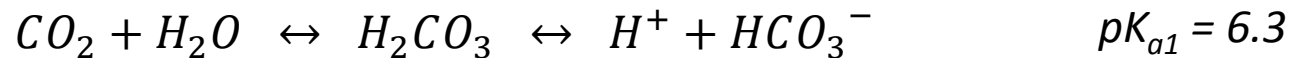


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Half reactions – various expressions

Factors of potential consideration:

- *Most relevant forms of reactants and products*



- *Simplest form of a half reaction*

- *Species of interest*

Overall reactions

1. Obtain half-reactions for an electron donor (R_d), electron acceptor (R_e), and cell formation (R_c)
2. Obtain f_s and f_e
3. Write energy and cell synthesis reactions:

$$R_e = R_a - R_d$$

$$R_s = R_c - R_d$$

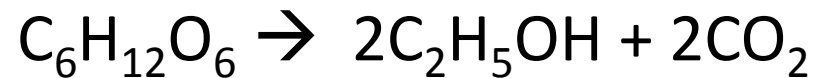
4. Calculate overall reaction: $R = f_e R_e + f_s R_s$

Or, instead of Step 3 & 4, $R = f_e R_a + f_s R_c - R_d$

Fermentation

- Organic compound serves as both e⁻ donor and e⁻ acceptor
- In the absence of oxygen
- Sugar is converted to acid, gases, and/or alcohol

ex1) ethanol fermentation



ex2) lactic acid fermentation

