

## Tutorial 2: Catabolic and Anabolic Reactions Stoichiometry

Provide an Excel file and its PDF version. Use one Excel sheet per exercise.

EPFL-MD-2018

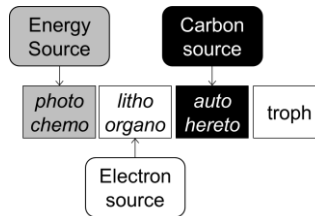
### 2.1. Definition of microbial growth systems, Catabolic reaction (26)

Establish the catabolic reaction with balanced stoichiometric coefficients for the following microbial growth systems use electron balance.

| No. | Growth    | Electron donor   | Electron acceptor                                 |
|-----|-----------|--|---|
| 0   | Aerobic   | Glucose  |   |
| 1   | Aerobic   | Ethanol  |   |
| 2   | Aerobic   | Methanol   |   |
| 3   | Aerobic   | H <sub>2</sub>   |   |
| 4   | Aerobic   | HS <sup>-</sup> to SO <sub>4</sub> <sup>2-</sup>             |   |
| 5   | Aerobic   | HS <sup>-</sup> to S <sup>0</sup>                            |   |
| 6   | Aerobic   | Fe <sup>2+</sup> to Fe <sup>3+</sup>                         |   |
| 7   | Anoxic    | Fe <sup>2+</sup> to Fe <sup>3+</sup>                         | NO <sub>3</sub> <sup>-</sup> to 1/2N <sub>2</sub> |
| 8   | Anoxic    | Ethanol  | NO <sub>3</sub> <sup>-</sup> to 1/2N <sub>2</sub> |
| 9   | Anaerobic | Ethanol  | SO <sub>4</sub> <sup>2-</sup> to S <sup>0</sup>   |
| 10  | Anaerobic | Ethanol  | SO <sub>4</sub> <sup>2-</sup> to H <sub>2</sub> S |
| 11  | Aerobic   | NH <sub>4</sub> <sup>+</sup> to NO <sub>2</sub> <sup>-</sup> |   |
| 12  | Anaerobic | NH <sub>4</sub> <sup>+</sup> to 1/2N <sub>2</sub>            | NO <sub>2</sub> <sup>-</sup> to 1/2N <sub>2</sub> |

## 2.2 Definition of microbial growth systems, Anabolic reaction (27)

Establish the anabolic reaction with balanced stoichiometric coefficients for the following microbial growth systems use atomic balance and check it with electron balance.



For each give the metabolic type according:

| No. | Growth    | Electron donor                      | Electron acceptor                     | C source      | N_source                      |
|-----|-----------|-------------------------------------|---------------------------------------|---------------|-------------------------------|
| 0   | Aerobic   | Glucose                             |                                       |               | $\text{NH}_4^+$               |
| 1   | Aerobic   | Ethanol                             |                                       |               | $\text{NH}_4^+$               |
| 2   | Aerobic   | Methanol                            |                                       |               | $\text{NH}_4^+$               |
| 3   | Aerobic   | Ethanol                             |                                       |               | $\text{NO}_3^-$               |
| 4   | Aerobic   | $\text{H}_2$                        |                                       | $\text{CO}_2$ | $\text{NH}_4^+$               |
| 5   | Anoxic    | $\text{HS}^-$ to $\text{SO}_4^{2-}$ |                                       | $\text{CO}_2$ | $\text{NH}_4^+$               |
| 6   | Anoxic    | $\text{Fe}^{2+}$ to $\text{Fe}^3$   |                                       | $\text{CO}_2$ | $\text{NH}_4^+$               |
| 7   | Anoxic    | Ethanol                             | $\text{NO}_3^-$ to<br>$1/2\text{N}_2$ |               | $\text{NO}_3^-$               |
| 8   | Anaerobic | $\text{NH}_4^+$ to $1/2\text{N}_2$  | $\text{NO}_2^-$ to<br>$1/2\text{N}_2$ | $\text{CO}_2$ | $\text{NO}_2^-/\text{NO}_3^-$ |