< Respiration >

Aerobic respiration : $O_2 + \{CH_2O\} \longrightarrow CO_2 + H_2O$

Denitrification : $4NO_3^- + 5\{CH_2O\} + 4H_3O^+ \rightarrow 2N_2(g) + 5CO_2 + 11H_2O$

Sulfate reduction : $SO_4^{2-}(aq) + 2\{CH_2O\} + H_3O^+ \rightarrow HS^-(aq) + 2CO_2 + 3H_2O$

Methane formation : $2\{CH_2O\} \rightarrow CH_4 + CO_2$.

↳ incomplete rxn (⇒ called fermentation).

(eg.) $3\{CH_2O\} + 4H_2O \rightarrow CH_3COO^-(aq) + HCO_3^- + 2H_3O^+ + 2H_2O$

products of fermentation (H_2 and org. acids).

$2NO_3^- + 2\{CH_2O\} + 2H_3O^+ \rightarrow \underbrace{N_2O}_{\text{(nitrous oxide)}} + 2CO_2 + 5H_2O$

$NO_3^- + 2\{CH_2O\} + 2H_3O^+ \rightarrow \underline{NH_4^+(aq)} + 2CO_2 + 3H_2O$

↳ cell biomass (or org. matter) synthesis.

⇒ called "assimilatory denitrification"

Under alkaline condition, $NH_4^+(aq) \rightarrow NH_3(g)$

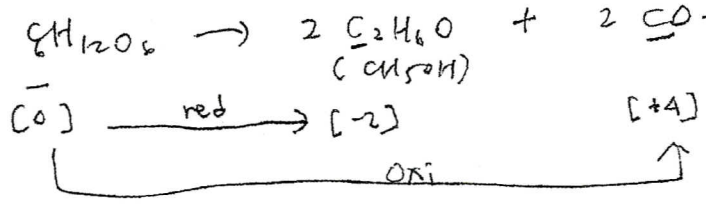
⇒ called dissimilatory denitrification

* photosynthesis

$2H_2O + CO_2 \xrightarrow{\text{light E}} \underbrace{CH_2O}_{\text{biomass}} + O_2 + H_2O$

$\Delta G = +115\ Kcal/mol$

fermentation: Catabolic rxns producing ATP in which org. compds serve as both (primary) electron donor and (ultimate) e. acceptor



: internally balanced oxidation-reduction rxn.

- occurs when no (little) external e acceptors are present...

respiration: catabolic rxns producing ATP in which either org. or inorg. compounds are e donors and org. or inorg. compds are e acceptors.