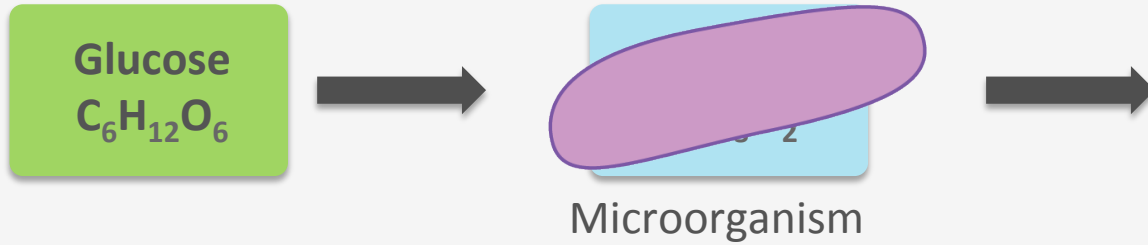


The process reaction

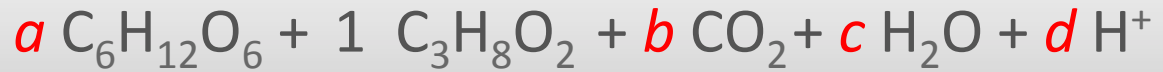
Technology for Biobased Products

Sef Heijnen, Department of Biotechnology, Faculty of Applied Sciences

1,3-Propanediol (PDO)



Theoretical product reaction: no O₂



PDO

Finding a,b, c and d: conservation principle



Glucose

PDO

CO₂

H₂O

H⁺

4 unknowns + 4 equations = Solvable !!

Theoretical PDO reaction



Minimum glucose
Requirement is

$$\frac{2}{3} \frac{\text{mol glucose}}{\text{mol PDO}}$$

Might be converted
in biological usefull
energy (ATP)

2 Product classes

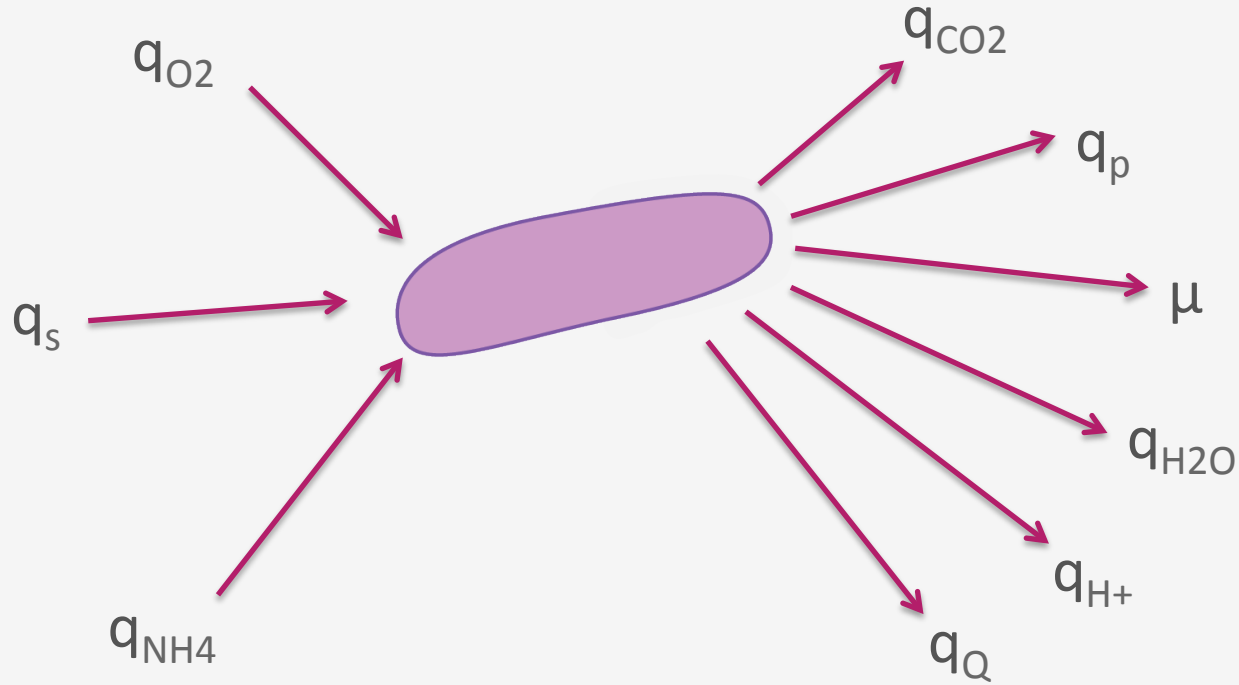
Energy producing product

- Anaerobic process (- O₂)
- PDO in principle, not succeeded yet

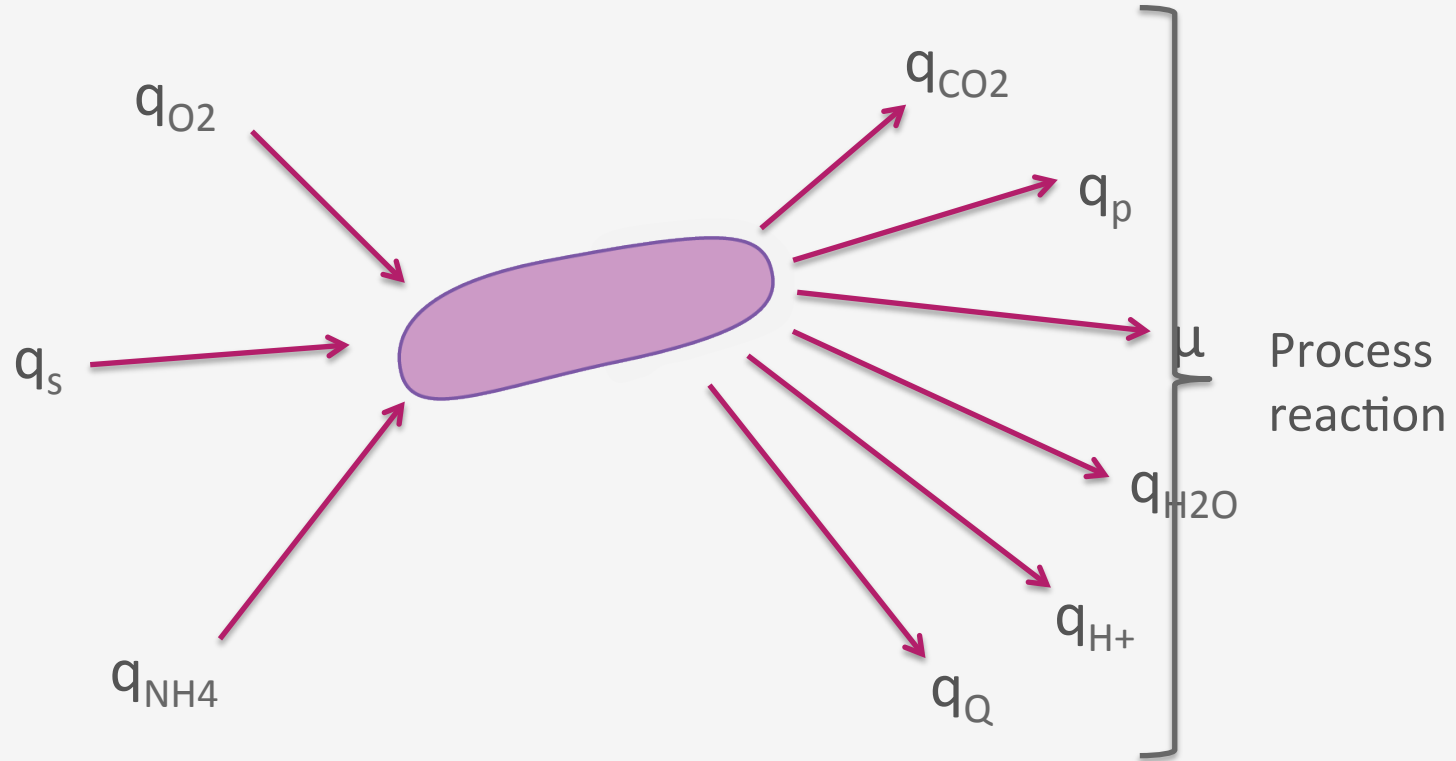
Energy consuming product

- Aerobic process (+ O₂)
- Most products

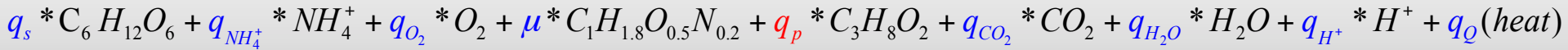
Uptake and secretion rates: process reaction



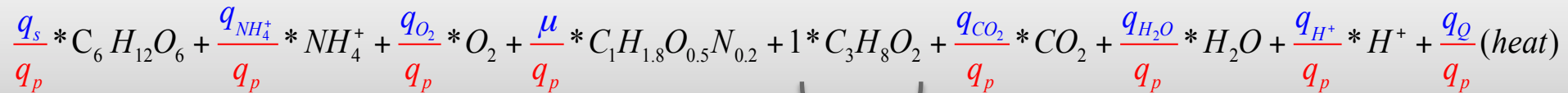
Uptake and secretion rates: process reaction



Process reaction concept: basis for process design



Normalize to
1 mol PDO



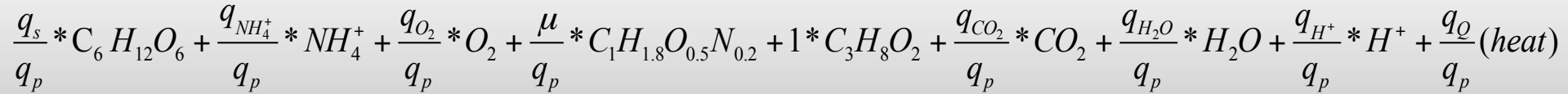
PDO

Process reaction properties

- Stoichiometric coefficients are q_i/q_p ratios \rightarrow not constant
- Absence of growth ($\mu=0$) and O_2 consumption ($q_{O_2}=0$)
 \rightarrow reduces to theoretical product reaction



How to obtain the process reaction



- Need the q-rates
- Set-up black box kinetic model

See you in the next unit!