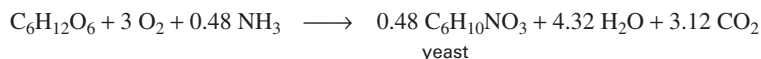


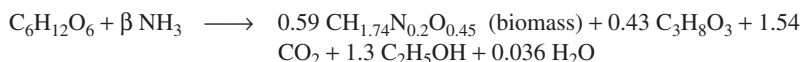
- 7.2. The growth of baker's yeast (*S. cerevisiae*) on glucose may be simply described by the following equation:



In a batch reactor of volume 10^5 l, the final desired yeast concentration is 50 gdw/l.

Using the above reaction stoichiometry:

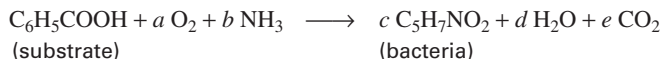
- Determine the concentration and total amount of glucose and $(\text{NH}_4)_2\text{SO}_4$ in the nutrient medium.
 - Determine the yield coefficients $Y_{X/S}$ (biomass/glucose) and Y_{X/O_2} (biomass/oxygen).
 - Determine the total amount of oxygen required.
 - If the rate of growth at exponential phase is $r_x = 0.7$ gdw/l-h, determine the rate of oxygen consumption (g O_2 /l-h).
 - Calculate the heat-removal requirements for the reactor (recall eq. 6.26).
- 7.3. The growth of *S. cerevisiae* on glucose under anaerobic conditions can be described by the following overall reaction:



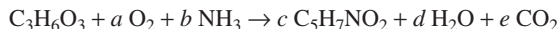
- Determine the biomass yield coefficient $Y_{X/S}$.
 - Determine the product yield coefficients $Y_{\text{EtOH}/S}$, Y_{CO_2}/S , $Y_{\text{C}_3\text{H}_8\text{O}_3}/S$.
 - Determine the coefficient β .
- 7.4. Aerobic growth of *S. cerevisiae* on ethanol is simply described by the following overall reaction:



- Determine the coefficients a , b , c , and d , where $\text{RQ} = 0.66$.
 - Determine the biomass yield coefficient, $Y_{X/S}$, and oxygen yield coefficient, Y_{X/O_2} (gdw/g O_2).
- 7.5. Aerobic degradation of benzoic acid by a mixed culture of microorganisms can be represented by the following reaction.



- Determine a , b , c , d , and e if $\text{RQ} = 0.9$.
 - Determine the yield coefficients, $Y_{X/S}$ and Y_{X/O_2} .
 - Determine degree of reduction for the substrate and bacteria.
- 7.6. Aerobic degradation of an organic compound by a mixed culture of organisms in waste water can be represented by the following reaction.



- Determine a , b , c , d , and e , if $Y_{X/S} = 0.4$ g X/g S.
- Determine the yield coefficients Y_{X/O_2} and Y_{X/NH_3} .
- Determine the degree of reductions for the substrate, bacteria, and RQ for the organisms.