

Test problems 1-5

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1. If $-1 S_s - (1-Y) O_2 + Y X_H = 0$

need Y to write
Stoichiometry for oxygen
true growth yield - can be measured exactly

Growth ONLY
Stoichiometry

$$R = R_d - f_c R_a - f_s R_c$$

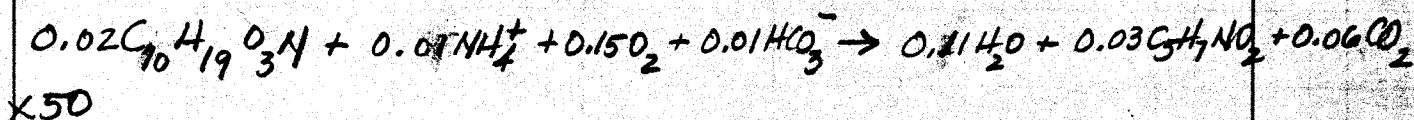
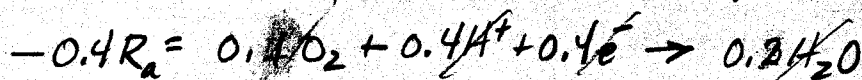
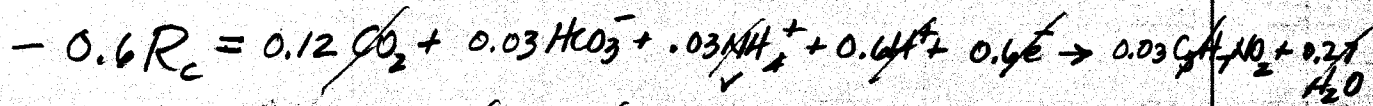
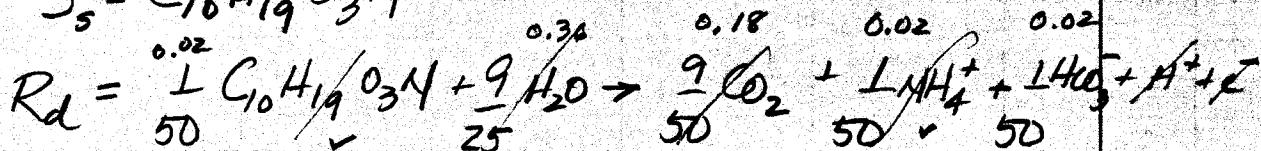
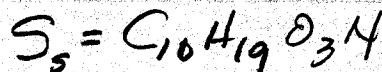
$$f_s = Y_H \text{ (COD basis)}$$

$$f_c = 1 - Y_H$$

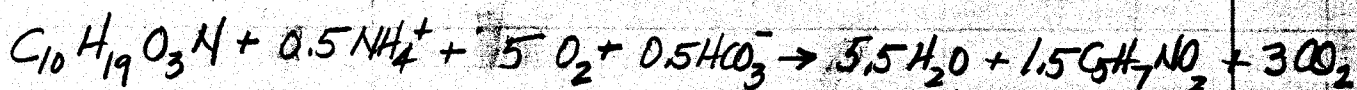
$$R = R_d - (1 - Y_H) R_a - Y_H R_c$$

2a. $Y_H = 0.6 \frac{\text{mg X-COD}}{\text{mg S-COD}} = f_s$

MOLAR



x50



	LHS	RHS
C	10.5	10.5
N	1.5	1.5
O	14.5	14.5
H	21.5	21.5

charge

0

0

$$\sum \psi_{\text{reactant}} = \sum \psi_{\text{product}}$$

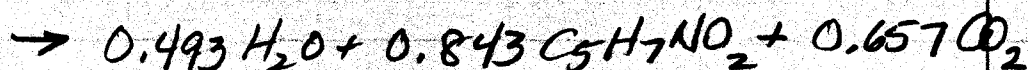
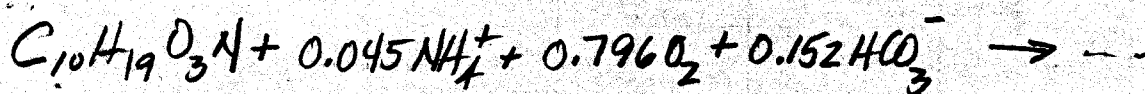
3. mw $C_{10}H_{19}O_3N = 201$

$$\psi_1 = 1, \psi_2 = \frac{0.5(18)}{201} = 0.045, \psi_3 = \frac{5(32)}{201} = 0.796$$

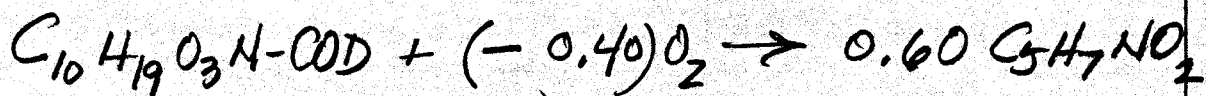
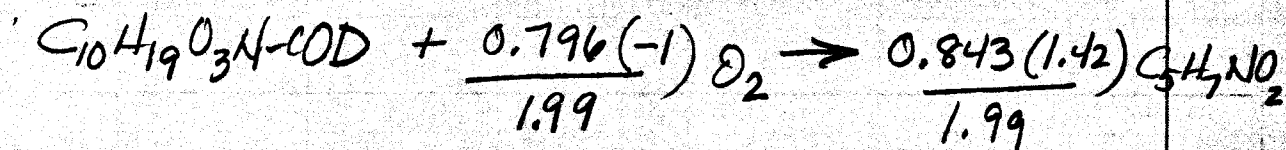
$$\psi_4 = \frac{0.5(61)}{201} = 0.152, \psi_5 = \frac{5.5(18)}{201} = 0.493, \psi_6 = \frac{1.5(113)}{201} = 0.843$$

$$\psi_7 = \frac{3(44)}{201} = 0.657$$

LHS: 1.993, RHS: 1.993 ✓



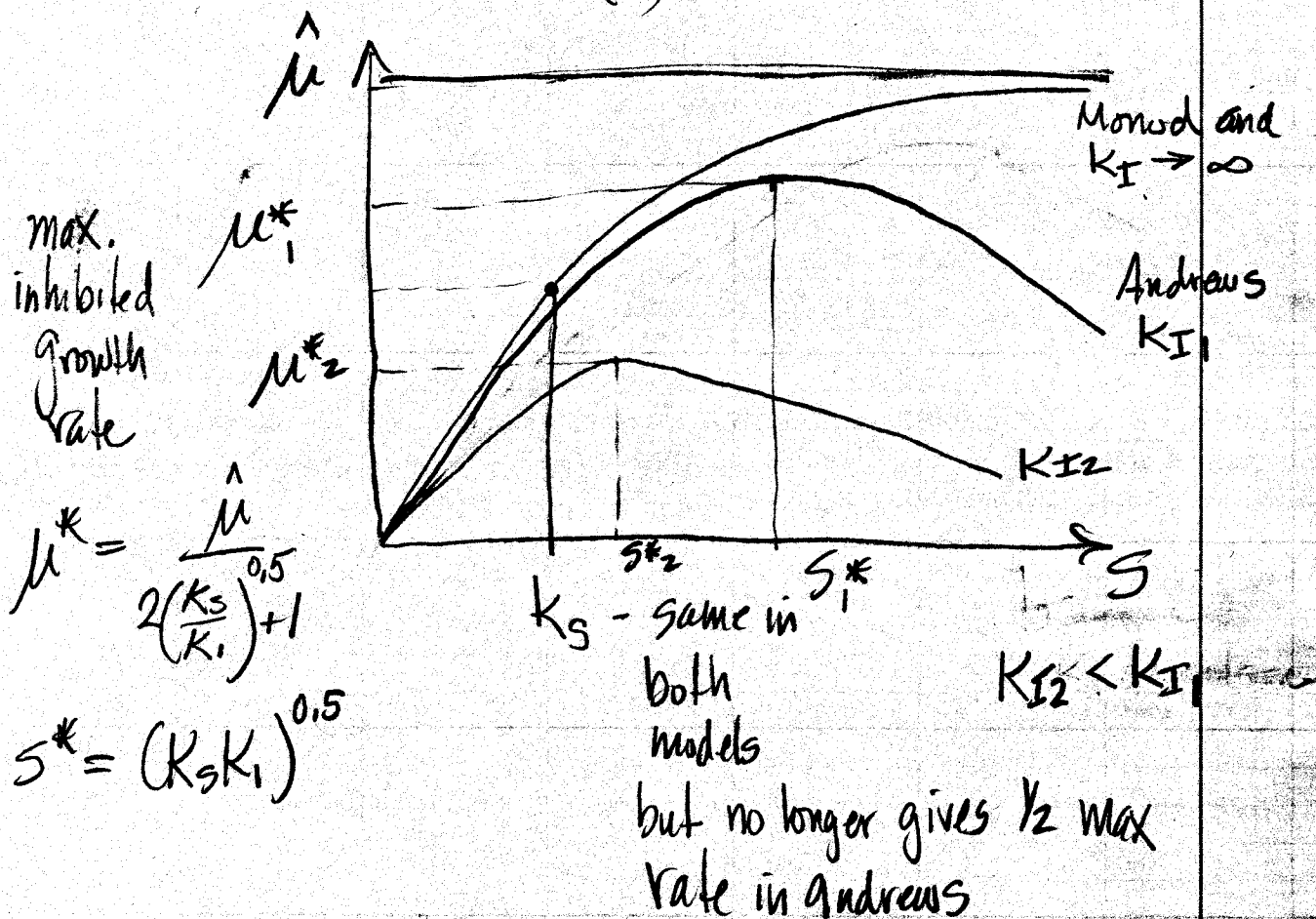
4. $C_{10}H_{19}O_3N$: $\frac{1.99 \text{ g COD}}{\text{g OM}}$



5. Monod: $\mu = \frac{\hat{\mu} S_s}{K_s + S_s}$

Andrews
(Inhibition) $\mu = \frac{\hat{\mu} S_s}{K_s + S_s + \frac{S_s^2}{K_I}}$

$$r_g = \mu X_B = \frac{r_s}{\left(\frac{1}{Y_H}\right)} = \frac{r_o}{\left(1 - \frac{1}{Y_H}\right)} = \frac{r_o}{\left(1 - \frac{Y_H}{Y_H}\right)}$$



if $K_I = S_s$

$$\mu = \frac{\hat{\mu} K_I}{\frac{K_s}{K_I} + K_I + K_I} = \frac{\hat{\mu}}{2 + \frac{K_s}{K_I}} < \frac{\hat{\mu}}{2} \text{ unless } K_I \gg K_s$$