

130404

g

$$N = N^0 e^{-k_d t}$$

$$k_{400} = \frac{-\ln \frac{N}{N^0}}{t} = 0,392 \text{ min}^{-1} = 0,00653 \text{ s}^{-1}$$

$$k_{380} = p_{50} = 0,226 \text{ min}^{-1} = 0,00377 \text{ s}^{-1}$$

$$E_d \quad k_d = k_a e^{-E_d/RT}$$

$$\frac{k_{d400}}{k_{d380}} = e^{-\frac{E_d}{R} \left[ \frac{1}{400} - \frac{1}{380} \right]}$$

$$E_d = 34798,5 \quad 34,8 \text{ kJ/mol.}$$

$$\frac{N_{\text{BATCH}}}{N^0} = \frac{1}{(1 + k_D t)} = \frac{1}{(1 + 0,226 \cdot 35)} = 0,1122$$

$$\frac{W^0}{N} = 8,91$$

NAGOT MINDRE

$$\frac{N}{N^0} (\text{BATCH}) = (9,7 \cdot 10^4)^{-1}$$

3)

$Y_{x/s}$

$Y_{p/s}$

	$t = 0$	$t = 20$
X	1	13
S	2	0
P	3	26
V	1	21

$$\frac{\Delta V}{\Delta t} = 1 \text{ l/h} = F$$

$$\text{BIODAD } X = 13 \cdot 21 - 1 \cdot 1 = 272$$

$$P = 26 \cdot 21 - 3 \cdot 1 = 543$$

$$\text{KONSUM } S = 2 \cdot 1 + 60 \cdot F \cdot 20 - 0 \cdot 21 = 1202$$

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$$Y_{x/s} = \frac{272}{1202} = 0,226$$

$$Y_{p/s} = \frac{543}{1202} = 0,4517$$

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	4 h	12 h
S =	39	0
V =	5	13

Kons substrat

$$39 \cdot 5 + 1 \cdot 60 \cdot 8 =$$

675

4)

SÖKIV  $F_0^u$  K  $x = 0,90$ 

$$C_A = \frac{P_A}{RT} = Y_A \cdot \frac{P}{RT} = \frac{F_A}{F_{T0}} \cdot \frac{P}{RT}$$

$$F_A = F_{T0}^0 (1 - X_A)$$

$$F_B = F_{T0}^0 X_A + F_B^0$$

$$F_C = F_{T0}^0 X_A + F_C^0$$

$$F_{T0}^0 = F_{T0}^0 (1 + X_A)$$

$$\frac{V}{F_{T0}^0} = \int_0^{x=0,9} \frac{dx}{r} = \frac{RT}{kP} \int_0^{0,9} \frac{(1+x)}{(1-x)} dx = \frac{RT}{kP} \int_0^{0,9} \left( -\frac{(1-x)}{(1-x)} + \frac{2}{(1-x)} \right) dx$$

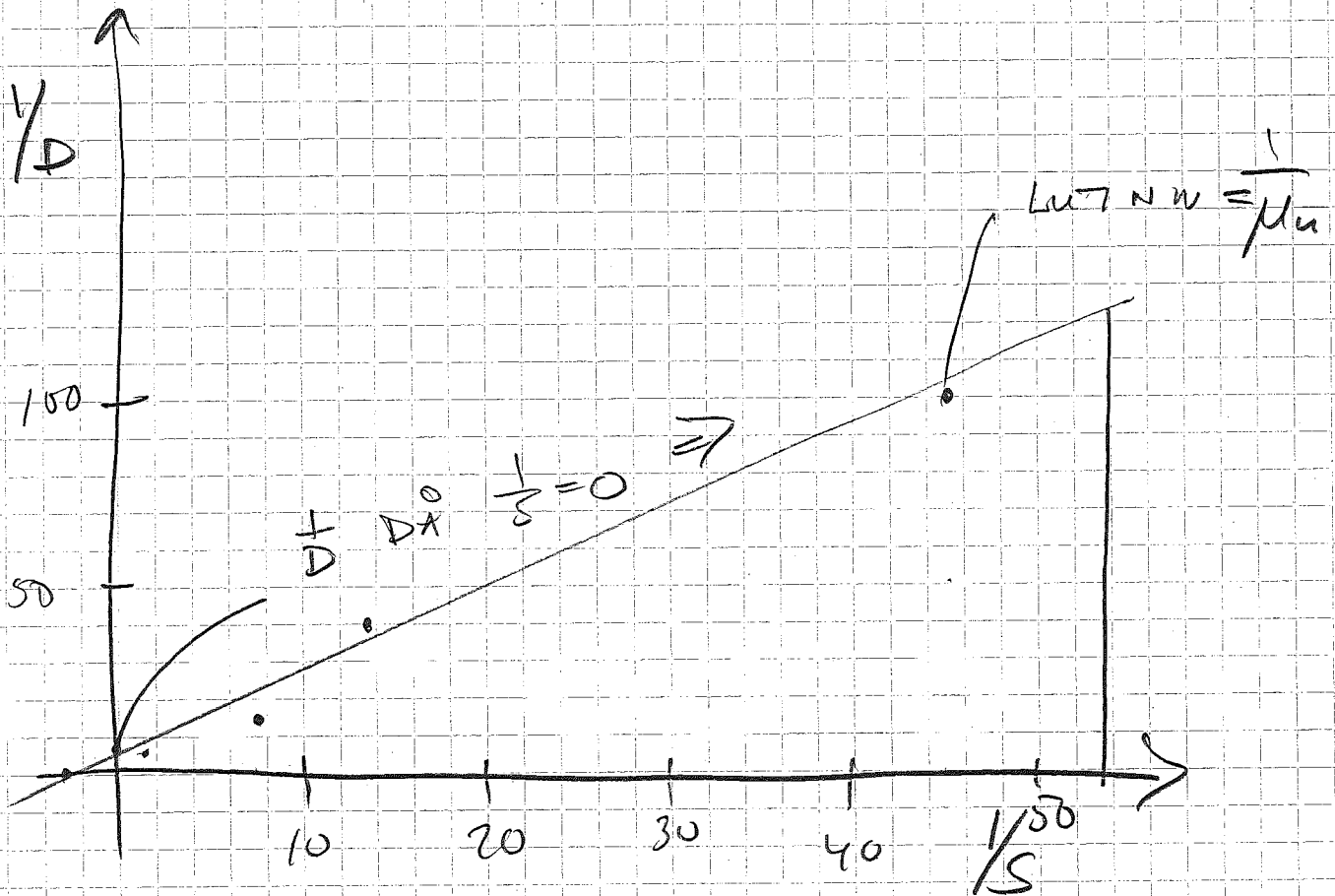
$$= \frac{RT}{kP} \left[ -x + 2 \ln(1-x) \right]_0^{0,9} = \frac{RT}{kP} \left[ -0,9 - 2 \ln 0,1 \right]$$

$2,9610^4$   
 $\frac{4 \cdot 10^{-5}}{135} \cdot 3$   
 $8314 \cdot 600$   
 $1,05110 \cdot 2 \cdot 10^5$   
 $3,705$   
 $21 \text{ m}^3 \text{ ou}$

5)

D	S	1/D	1/S
0,01	0,022	100	45,5
0,025	0,073	40	13,7
0,07	0,13	14,3	7,7
0,16	0,70	6,25	1,43
0,18	1,09	5,56	0,92
0,20	1,51	5	0,66

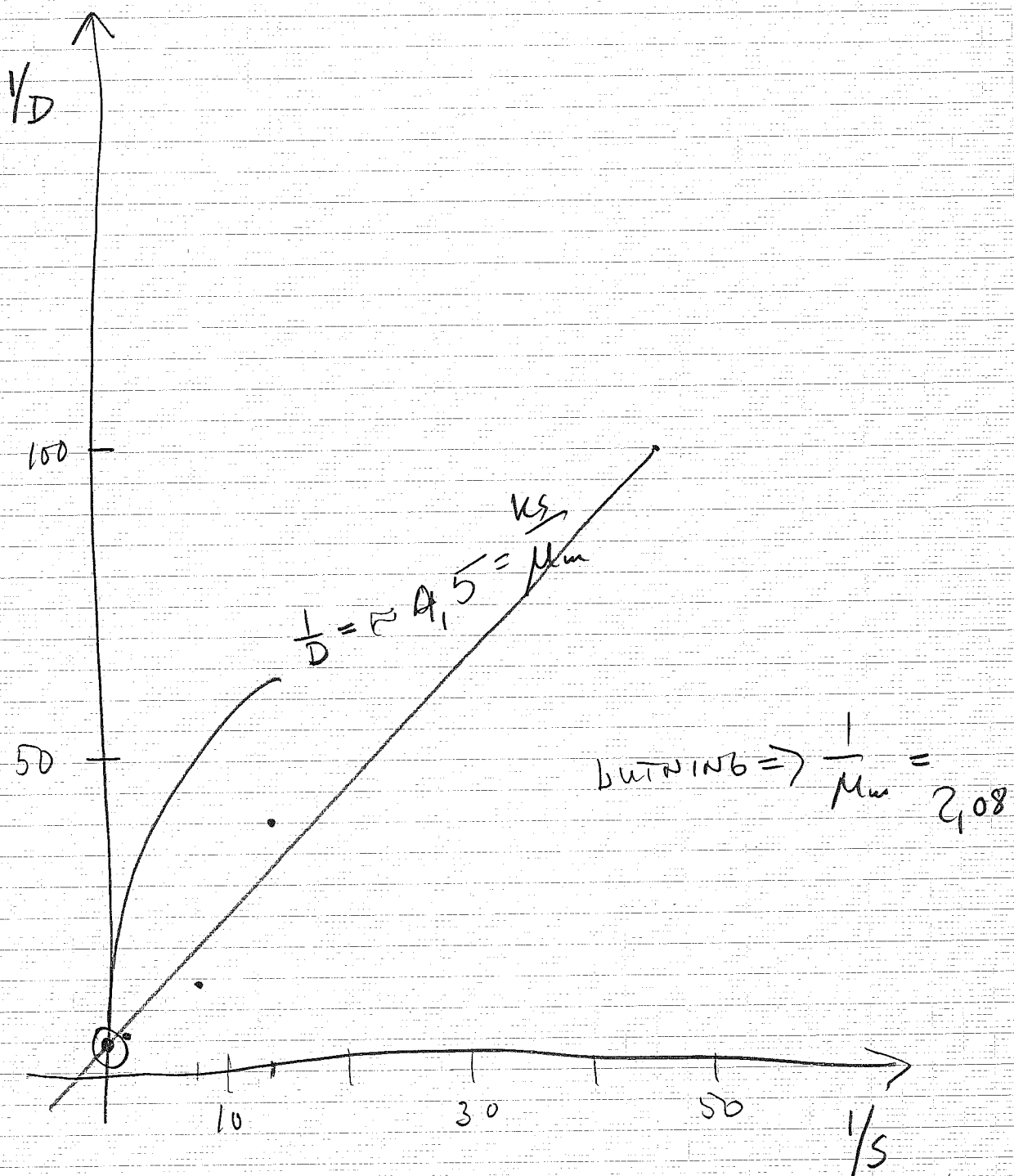
$$\frac{1}{\mu} = \frac{1}{\mu_{min}} \left( k_s + \frac{1}{S} \right)$$



$$\frac{1}{D} = 4,5 = \frac{k_s}{\mu_{min}}$$

$$k_{m, NW} = \frac{123}{54} = 2,08$$

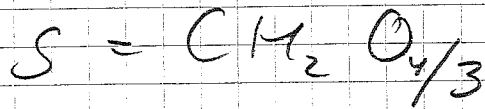
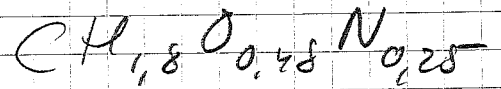
$$\Rightarrow \mu_{min} = 0,148 \pm 0,005 \quad k_s = \frac{2,163}{2,08} = 1,035$$



UBP6 6

130404

AEROBODUNG



32 mmol/l (IN)

HNO<sub>3</sub> - Nutella

$$D = 0,1 \text{ h}^{-1}$$

$$S_{\text{out}} = 0,73 \text{ mmol/l}$$

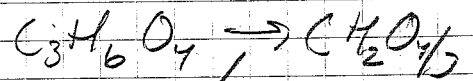
$$X = 1,22 \text{ g/l}$$

$$\gamma_s = 4 + 2 - \frac{4}{3} \cdot 2 = 3,33$$

$$\gamma_x = 4 + 1,8 - 2 \cdot 0,48 - 0,25 = 6,09$$

$$M_x = 24,98$$

$$M_s = 35,33$$



$$Y_{x/s} = \left( \frac{(32 - 0,73) \cdot 10^{-3} \cdot 3}{1,22} \right) \cdot \frac{1}{24,98} = \frac{0,5206}{20,52} \text{ mmol/mmol}$$

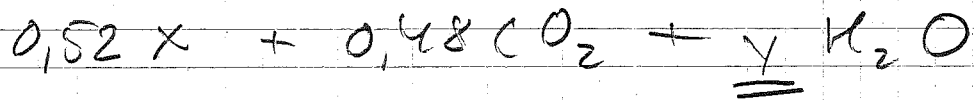
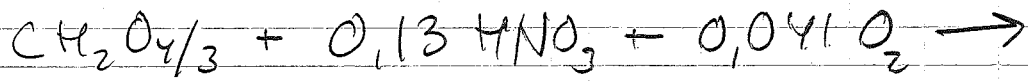
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INBA ANDRA PRODUKTOK

$$Y_{CO_2/s} = 0,4794 = 20,48$$

$$Y_{O_2/s} = \frac{1}{4} \left[ -\gamma_s Y_{x/s} + \gamma_x Y_{x/s} \right] = \frac{1}{4} \left[ -3,33 + 6,09 \cdot 0,52 \right] = 0,0408$$

$$Y_{N/S} = 0,52 \cdot 0,25 = 0,13$$



lue H alt O balans

$$RQ = \frac{0,48}{0,041} = 11,7 \quad \text{JÄTTE HÖGT}$$