Answers: tut 3.3 and 3.4

3.3

a) V 4119.6 dm^3
b) F_D = 42.8 $mol.min^{-1}$, F_U = 7.03 $mol.min^{-1}$, $S_{D/U}$ = 6.1
c) With T_{oB} = 100°C, T = 431.7 K, $F_A = F_B$ 7.23 $mol.min^{-1}$, F_D = 44.05 $mol.min^{-1}$, F_U = 8.689 $mol.min^{-1}$ $S_{D/U}$ = 5.07

3.4

Fogler 4th 8.26

a-c

Steam to EB = 14.5 - With ΔCp values for the reactions considered (Tref taken as 300 K)

T_o	$F_{Styrene}$	$S_{Styrene\_to\_TB}$	T_{Out}
K	mol/s	mol/mol	K
800	0.894	19.308	764.9
930	1.9317	4.628	850.1
1100	1.646	0.943	983.5

Steam to EB = 14.5 - With ΔCp values for the reactions assumed negligible

T_o	F_{EB}	$F_{Styrene}$	$F_{Benzene}$	$F_{Toluene}$	$S_{Styrene\_to\_TB}$	T_{Out}
K	mol/s	mol/s	mol/s	mol/s	mol/mol	K
800	2.496	0.897	0.0108	0.0359	19.23	765.2
930	1.084	1.936	0.217	0.204	4.61	850.5
1100	0.0511	1.653	1.608	0.127	0.953	981.79

Steam to EB = 14.5 - With ΔCp values for the reactions considered (Tref taken as 300 K) with heat exchange

T_o	$F_{Styrene}$	$S_{Styrene\_to\_TB}$	T_{Out}		With Ua	1.666667	kJ/m3/K
K	mol/s	mol/mol	K				
800	2.489	2.869	996.1				
930	2.379	2.41	998.5				
1100	1.682	0.978	1000.2				

d)	T_o optimum =	1002	K ΔCp's considered	$F_{Styrene}$	2.246	mol/s
	T_o optimum =	1002	K ΔCp's ignored	$F_{Styrene}$	2.246	mol/s
e)	Steam to EB =	24.7	ΔCp's considered	$F_{Styrene}$	1.888	mol/s
	Steam to EB =	24.7	ΔCp's ignored	$F_{Styrene}$	1.894	mol/s
f)						
	At St to EB = 20.0:					
	T_o optimum =	740.8	K ΔCp's considered	$F_{Styrene}$	2.617	mol/s