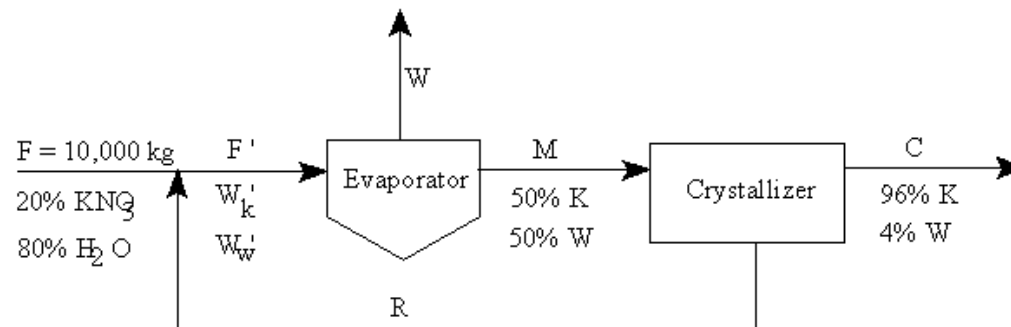
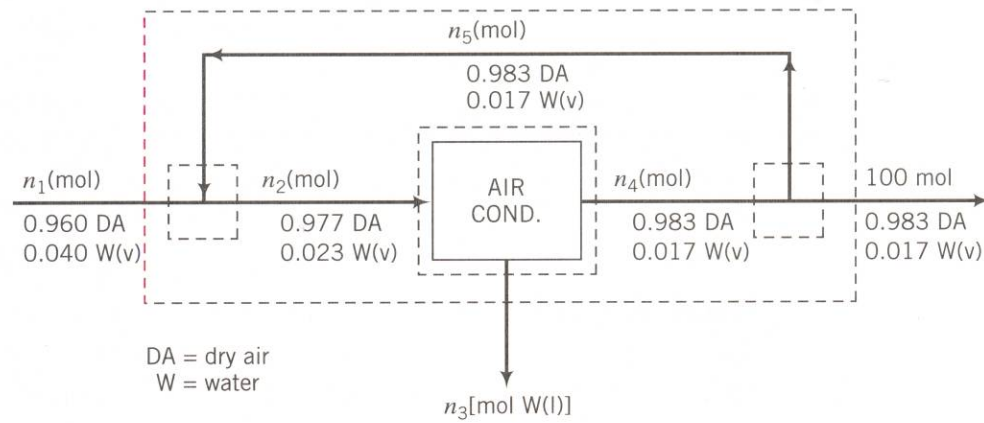


1. Fresh feed containing 20% by weight KNO_3 in H_2O is combined with a recycle stream and fed to an evaporator where the water content is reduced. The concentrated solution leaving the evaporator, containing 50% KNO_3 , is fed to a crystallizer. The crystals obtained from the crystallizer are 96% KNO_3 and 4% water. The supernatant liquid (liquid in equilibrium with crystals) from the crystallizer constitutes the recycle stream and contains 0.6 kg KNO_3 per 1.0 kg of H_2O . The objective is to complete the mass balance showing all stream values and compositions.



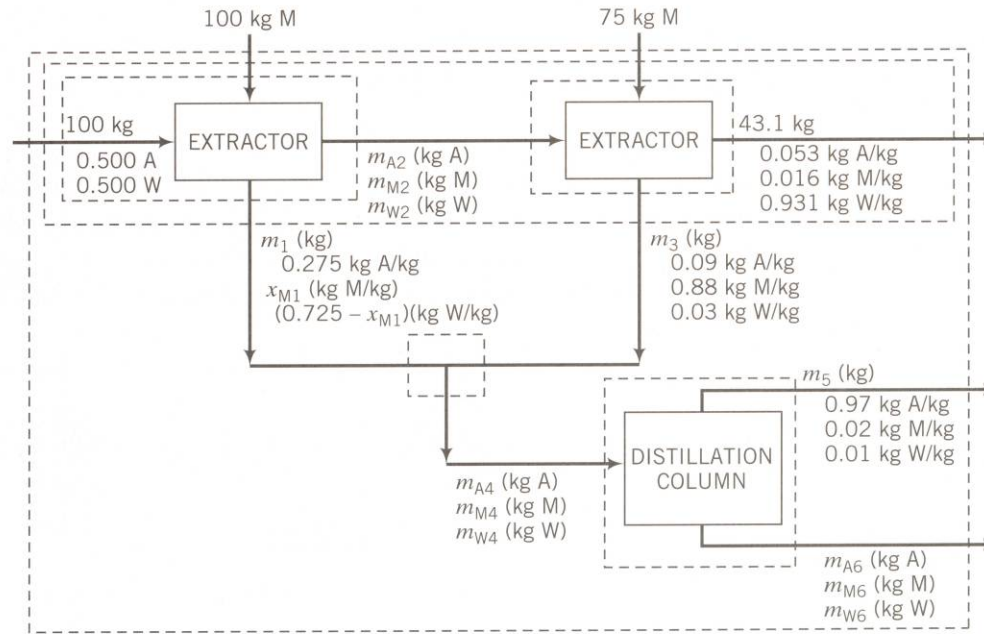
	Unknowns	# of U	BE	DE	DOF
Evap	F', W'_k, W, M	4	2	0	2
Cryst	M, R, C	3	2	0	1
Mixer	R, W'_k, F'	3	2	0	1
Overall	W, C	2	2	0	0
Process	F', W'_k, W, M, R, C	6	6	0	0

2.



	Unknowns	# of U	BE	DE	DOF
Air cond	n_2, n_3, n_4	3	2	0	1
Splitter	n_4, n_5	2	1	0	1
Mixer	n_1, n_2, n_5	3	2	0	1
Overall	n_1, n_3	2	2	0	0
Process	n_1, n_2, n_3, n_4, n_5	5	5	0	0

3.



	Unknowns	# of U	BE	DE	DOF
Ext 1	$m_{A2}, m_{M2}, m_{W2}, m_1, x_{M1}$	5	3	0	2
Ext 2	$m_{A2}, m_{M2}, m_{W2}, m_3$	4	3	0	1
Dist Col	$m_{A4}, m_{M4}, m_{W4}, m_5, m_{A6}, m_{M6}, m_{W6}$	7	3	0	4
Mixer	$m_1, x_{M1}, m_3, m_{A4}, m_{M4}, m_{W4}$	6	3	0	3
Combined Extractors	m_1, x_{M1}, m_3	3	3	0	0
Overall	$m_5, m_{A6}, m_{M6}, m_{W6}$	4	3	0	1
Process	$m_{A2}, m_{M2}, m_{W2}, m_1, x_{M1}, m_3, m_{A4}, m_{M4}, m_{W4}, m_5, m_{A6}, m_{M6}, m_{W6}$	13	12	0	1