

M		W		F
11		13		15
18 HW		20 HW		22 HW
25 HW		27 TEST #3		29

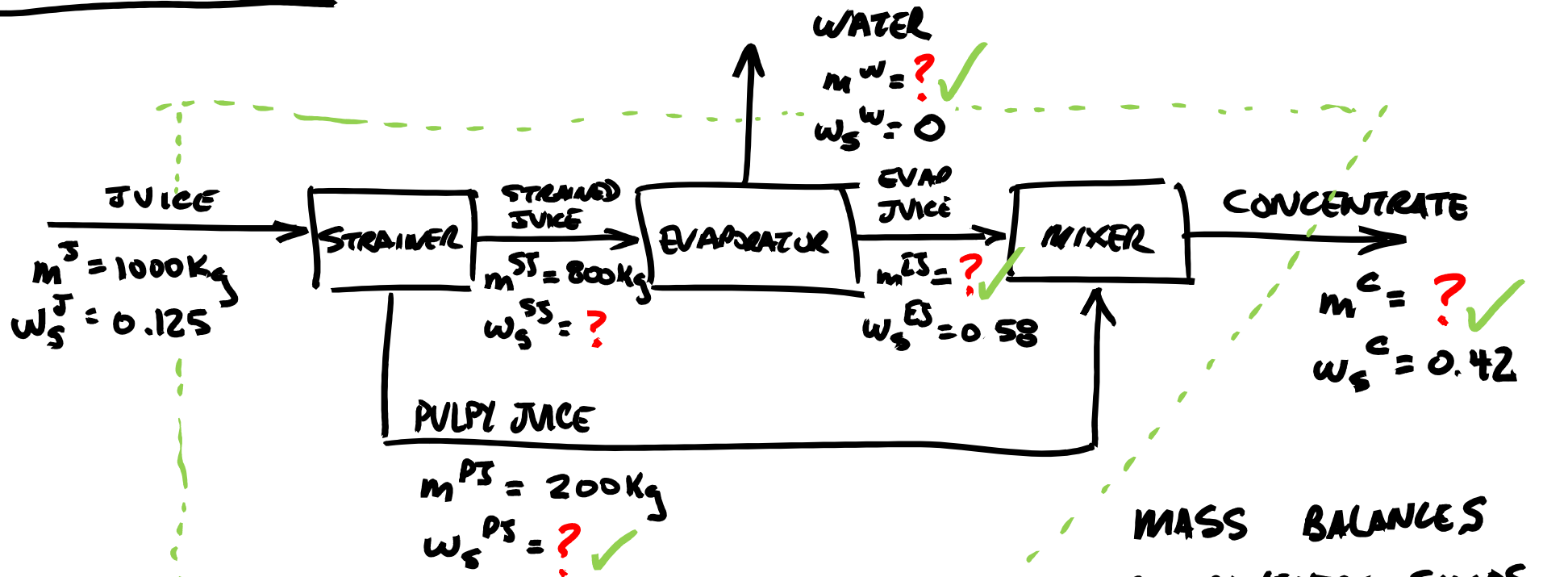
QUESTION 3

COMPONENTS: SOLIDS

STREAMS: JUICE, STRAINED JUICE, PULPY JUICE,
EVAPORATED JUICE, CONCENTRATE

UNITS (BLACK BOXES): STRAINER
OPERATIONS EVAPORATOR
MIXER

DRAW & LABEL



STRAINER: 2 UNKNOWN, 1 EQN
EVAPORATOR: 3 UNKNOWN, 2 EQN
MIXER: 3 UNKNOWN, 2 EQN
ENTIRE PROCESS: 2 UNKNOWN, 2 EQN

MASS BALANCES
 COMPONENTS: SOLIDS
 NON-SOLIDS
 (WATER)

WE CAN DO SOLIDS
 BALANCES AND OVERALL
 BALANCES

① BALANCES AROUND ENTIRE PROCESS

OVERALL

$$ACC = IN - OUT$$

$$0 = m^T - m^W - m^C$$

$$0 = 1000 - m^W - m^C$$

STEADY-STATE!

SPECIES: SOLIDS

$$ACC = IN - OUT + GEN$$

$$0 = m_s^T - m_s^W - m_s^C$$

$$0 = w_s^T m^T - w_s^W m^W - w_s^C m^C$$

$$0 = (0.125)(1000) - 0 - (0.42)(m^C)$$

$$m^C = 297.6 \text{ Kg}$$

$$m^W = 1000 - 297.6 = 702.4 \text{ Kg}$$

← MASS FRACTION
SOLIDS = $\frac{\text{TOTAL MASS}}{\text{TOTAL MASS}}$

ANSWER
TO PART ii

② BALANCES AROUND MIXER:

OVERALL:

$$ACC = IN - OUT$$

$$0 = m^{ES} + m^{PS} - m^C$$

$$0 = m^{ES} + 200 - 297.6$$

$$\underline{m^{ES} = 97.6 \text{ Kg}}$$

SOLIDS:

$$ACC = IN - OUT + GEN$$

$$0 = w_s^{ES} m^{ES} + w_s^{PS} m^{PS} - w_s^C m^C$$

$$0 = (0.58)(97.6) + 200 w_s^{PS} - (0.42)(297.6)$$

$$\underline{w_s^{PS} = 0.342}$$

ANSWER TO
PART iii

③ BALANCE AROUND STRAINER

SOLIDS:

$$ACC = IN - OUT + GEN$$

$$0 = w_s^I m^I - w_s^{PJ} m^{PJ} - w_s^{SJ} m^{SJ}$$

$$0 = (0.125)(1000) - (0.342)(200) - w_s^{SJ}(800)$$

$$\underline{w_s^{SJ} = 0.0708}$$

ANSWER
TO PART i