Q.1 Soybean seeds are extracted with hexane in a batch contractor. The seeds contain 18.6% oil, 69% solids and 12.4% moisture. At the end of extraction process, deoiled cake is separated from the hexane oil mixture. Deoiled cake analysis yields 0.8% oil, 87.7% solids and 11.5% moisture, find the % recovery of the oil.

Q.2 The average MW of a flue gas sample is calculated by two different engineers. One engineer uses the correct MW for N_2 and determines the average MW to be 30.08. The other engineer, using an incorrect value for the MW of N_2 (i.e 14), calculate the average MW to be 18.74.

(a) Calculate the volume% of N_2 in the flue gas

(b) If the remaining components of the flue gases are CO_2 and O_2, calculate the volume% of each.

Q.3 A 100 kg mixture of 27.8% of acetone (A) and 72.2% of chloroform (B) by weight id to be extracted with a mixed solvent. The solvent contains unknown composition of water (S1) and acetic acid (S2). The mixture, of the original mixture and solvent, is shaken well, allowed to attain equilibrium and the separated into 2 layers. The composition of the 2 layers is:-

	A	B	s1	s2
Upper layer (mass%)	7.5	3.5	57.4	31.6
Lower layer (mass%)	20.3	67.3	2.8	9.6

Calculate (a) the quantities of the 2 layers (b) the weight ratio of the mixed solvent to the original mixture (c) the composition of the mixed solvent.

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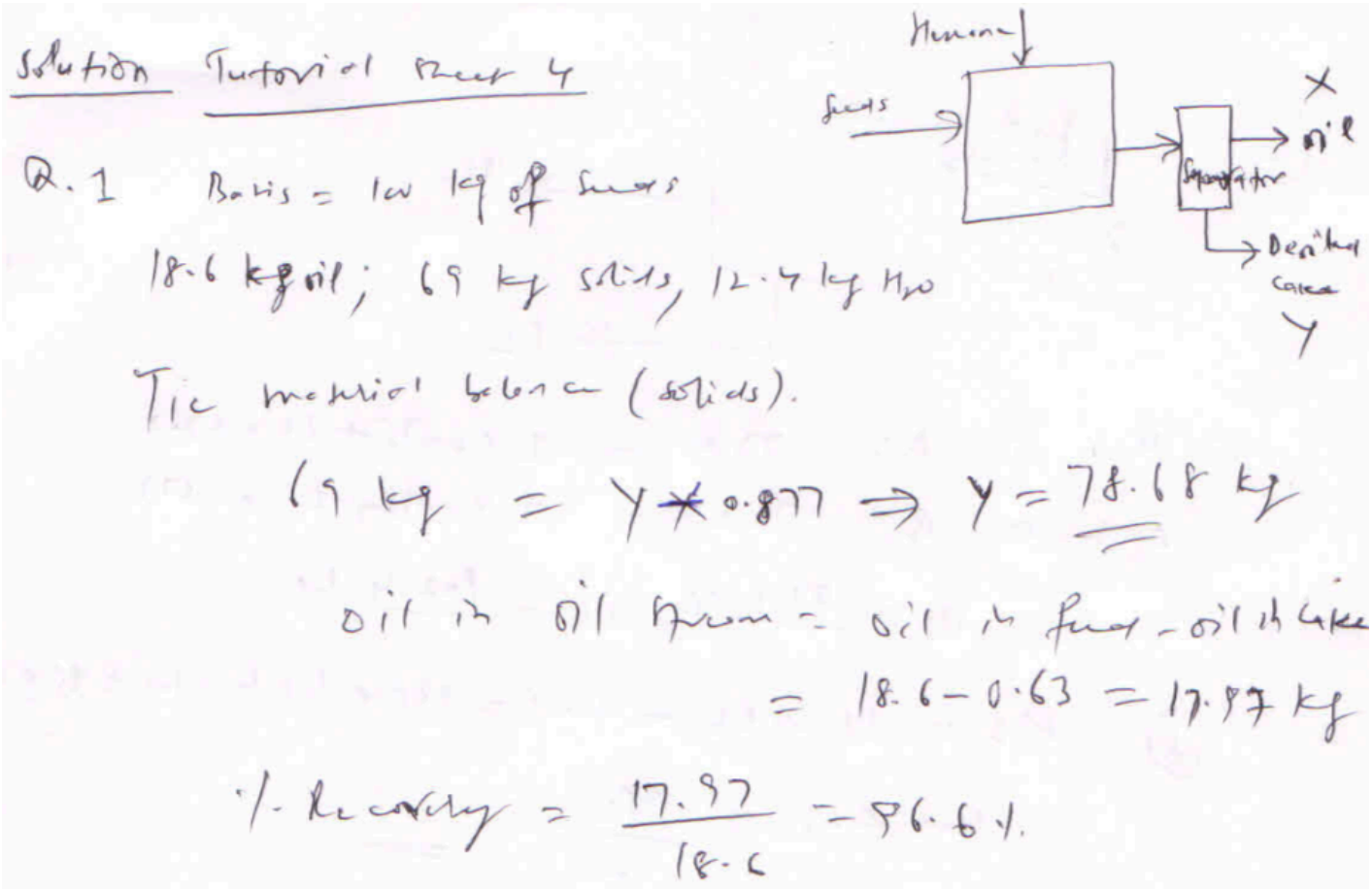

Solution Tutorial Sheet 4

Q. 1 Basis = 100 kg of seeds

18.6 kg oil; 69 kg solids, 12.4 kg H_2O

The material balance (solids).

$69\ kg = Y * 0.877 \Rightarrow Y = 78.68\ kg$

oil in oil from = oil in feed - oil in cake

$= 18.6 - 0.63 = 17.97\ kg$

% Recovery $= \frac{17.97}{18.6} = 96.6\ \%$

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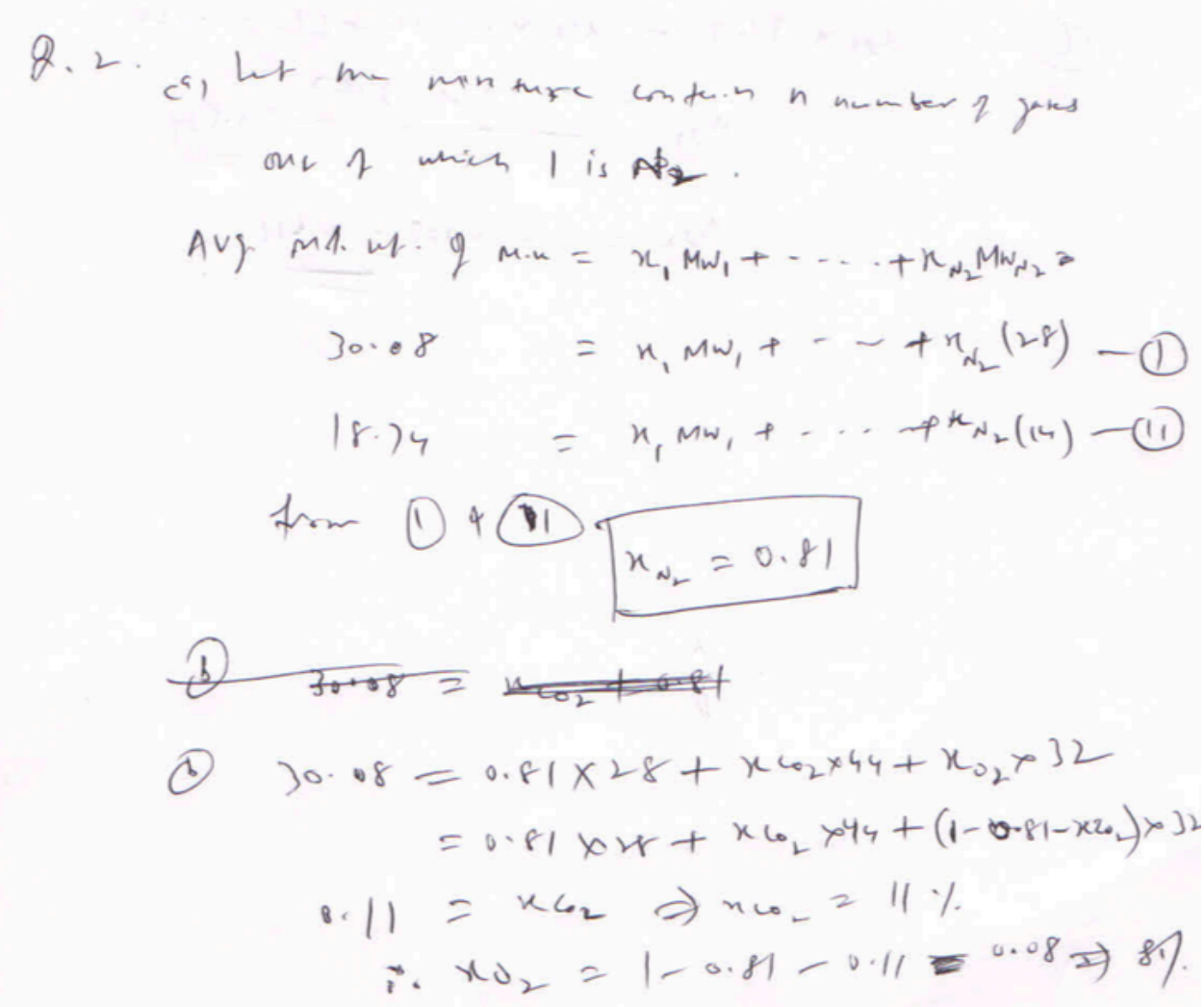

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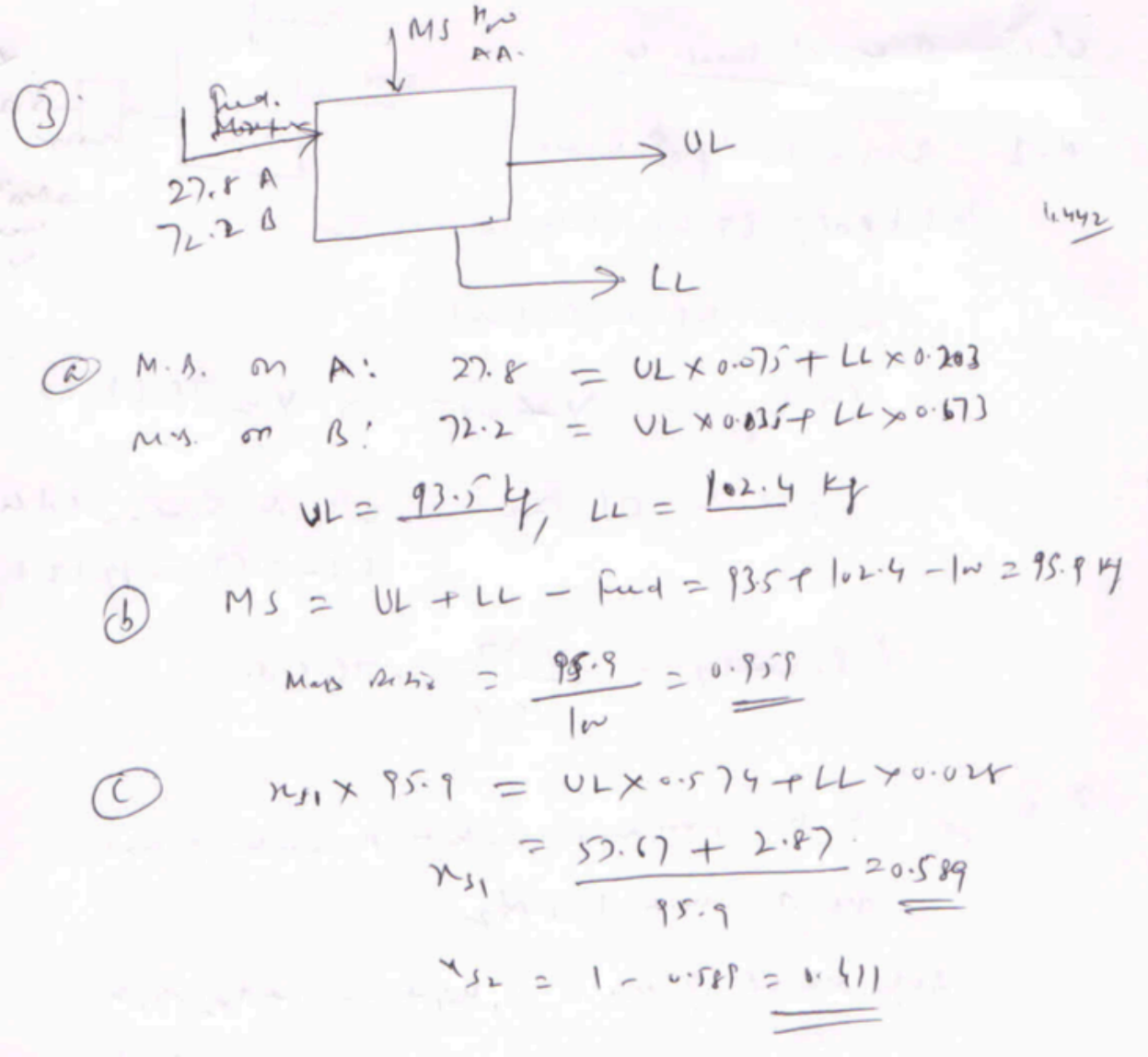

(a) M.B. on A: $27.8 = UL \times 0.075 + LL \times 0.203$

M.B. on B: $72.2 = UL \times 0.835 + LL \times 0.673$

$UL = 93.5$ kg, $LL = 102.4$ kg

(b) $MS = UL + LL - Feed = 93.5 + 102.4 - 100 = 95.9$ kg

$\text{Mass ratio} = \frac{95.9}{100} = 0.959$

(c) $x_{s1} \times 95.9 = UL \times 0.574 + LL \times 0.024$

$x_{s1} = \frac{53.67 + 2.87}{95.9} = 0.589$

$x_{s2} = 1 - 0.589 = 0.411$