This is ACA # 10. It is OK to use your textbook, but if you can answers the questions without it that is OK too.

I recommend you print out this page and bring it to class. Click here to show a set of five ACA10 student responses, randomly selected from all of the student responses thus far, in a new window.

john , here are your responses to the ACA and the Expert's response.

You are welcome to use the simulation for Q1 - Q2 on this ACA. The simulation will open in a new window. Resize the window so you can interact with the simulation and see the ACA window.

1. The balanced reaction for the combustion of methane;

$$CH_{4(g)} + 2O_{2(g)} \text{ --> } CO_{2(g)} + 2H_2O_{(l)}$$

Consider mixing 1.50 mol of methane with 1.80 mol of oxygen. Assume there is no carbon dioxide or water present in the initial mixture.

2. Which of the following ICE Tables (I or II) make sense assuming the initial amounts above and that the reaction goes to completion.

Table I: Based on assuming all the CH_4 reacts (CH_4 is the limiting reagent)

	REACTANTS	REACTANTS		PRODUCTS	PRODUCTS
Equation	CH_4	$2O_2$	--->	CO_2	$2H_2O$
Initial Amount	1.50 mol	1.80 mol		0 mol	0 mol
Change Amount	-1.50 mol	-3.00 mol		+1.50 mol	+3.00 mol
Final Amount	0 mol	-1.20 mol		+1.50 mol	+3.00 mol

Table II: Based on assuming all the O_2 reacts (O_2 is the limiting reagent)

	REACTANTS	REACTANTS		PRODUCTS	PRODUCTS
Equation	CH_4	$2O_2$	--->	CO_2	$2H_2O$
Initial Amount	1.50 mol	1.80 mol		0 mol	0 mol
Change Amount	-0.90 mol	-1.80 mol		+0.90 mol	+1.80 mol
Final Amount	+0.60 mol	0 mol		+0.90 mol	+1.80 mol

mole of CH_4 initially

Table II makes the most sense;

Table II 82% 17% Table I

briefly explain your reasoning.

In Table I when methane is picked as the limiting reagent, there is not enough oxygen to react with all of the methane. In Table II there is enough methane to react with all of the oxygen.

In Table I if we assume all of the 1.50 mol of CH_4 reacts 3.00 mol of O_2 would be required. This is because, according to the coefficients in the balanced chemical equation, for every 1 mol of CH_4 that reacts 2 moles of O_2must react. However, there are only 1.80 mol O_2 available, therefore that much CH_4 can not react. So in Table II when 1.80 mol of O_2 reacts, 0.40 mol of CH_4 must react. There is an excess of CH_4 in this reaction.

3. The balanced reaction for the synthesis of ammonia;

$$N_{2(g)} + 3H_{2(g)} \text{ --> } 2NH_{3(g)}$$

Consider mixing 0.50 mol of nitrogen with 2.10 mol of hydrogen. Assume there is no ammonia present in the initial mixture.

4. Which of the following ICE Tables (III or IV) make sense assuming the initial amounts above and that the reaction goes to completion.

Table III: Based on assuming all the N_2 reacts (N_2 is the limiting reagent)

	REACTANTS	REACTANTS		PRODUCTS
Equation	N_2	$3H_2$	--->	$2NH_3$
Initial Amount	0.50 mol	2.10 mol		0 mol
Change Amount	-0.50 mol	-1.50 mol		+1.00 mol
Final Amount	0 mol	+0.60 mol		+1.00 mo

Table IV: Based on assuming all the H_2 reacts (H_2 is the limiting reagent)

	REACTANTS	REACTANTS		PRODUCTS
Equation	N_2	$3H_2$	--->	$2NH_3$
Initial Amount	0.50 mol	2.10 mol		0 mol
Change Amount	-0.70 mol	-2.10 mol		+1.40 mol
Final Amount	-0.20 mol	0 mol		+1.40 mol

Table III makes the most sense;

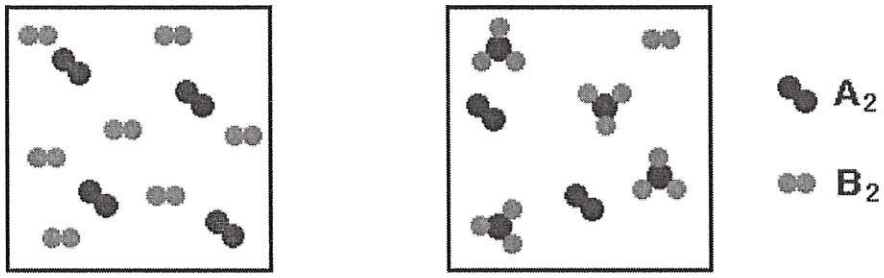
Table III 89%

briefly explain your reasoning.

In Table III there is enough hydrogen to react with all of the nitrogen. In Table IV when hydrogen is picked as the limiting reagent, there is not enough nitrogen to react with all of the hydrogen.

In Table III if we assume all of the 0.50 mol of N_2 reacts 1.50 mol of H_2 would be required. This is because, according to the coefficients in the balanced chemical equation, for every 1 mol of N_2 that reacts 3 moles of H_2must react. Since there are 2.10 mol H_2 available, there is an excess of H_2 and all of the N_2 reacts. In Table IV when 2.10 mol of H_2 reacts, 0.70 mol of N_2 is required. However, there is only 0.50 mol of N_2 available, so not all of the N_2 reacts.

5. Write the reaction that best describes the change that occurs in the containers below.



initial condition final condition

The equation is

43%

A2 + 3B2 ---> 2AB3

$A_2 + 3B_2 \rightarrow 2AB_3$

3% not balanced with multiple
28% counted particles
8% right equation not balanced
8% connect R & P crazy balance

ICE Table

	REACTANTS	REACTANTS		PRODUCTS
Exp.	A_2	$3B_2$	--->	$2AB_3$
Initial Amount	4 molecule (from initial container)	7 molecules (from initial container)		0 mol (from initial container)
Change Amount				

Final Amount	2 molecules (from final container)	1 molecules (from final container)		4 molecules (from final container)

Now complete the Change Row

ICE Table

	REACTANTS	REACTANTS		PRODUCTS
Exp.	**A_2**	**$3B_2$**	**--->**	**$2AB_3$**
Initial Amount	4 molecule (from initial container)	7 molecules (from initial container)		0 mol (from initial container)
Change Amount	-2 molecules	-6 molecules		+4 molecules
Final Amount	2 molecules (from final container)	1 molecules (from final container)		4 molecules (from final container)

We see from the change row the coefficients must be 1 : 3 : 2.

6. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

7. If there is one question you would like to have answered in lecture, what would that question be?

nothing