This is ACA # 15. 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 ACA15 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.

1. A 1.00 liter container holds 1.00 mol of CO(g) and 1 .00 mol H_2O(g) only at 800 °C. The reaction that occurs is described by the chemical equation

$$CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$$

a) Write the equilibrium expression for the reaction.

K_C = [CO2][H2]/[CO][H2O] 77%

$K_C = [CO_2]\,[H_2]/[CO][H_2O]$

b) Which direction will the reaction proceed to reach equilibrium?

left to right

The reaction will proceed from left to right to establish equilibrium.

c) Assuming 'x' molar CO reacts to reach equilibrium, determine the entry for each substance in the change row in the ICE table below in terms of 'x', then determine the equilibrium entry for each substance.

	CO(g)	+ H_2O(g)	⇌ CO_2(g)	+ H_2(g)
Initial Pressure	**1.00 M**	**1.00 M**	**0 M**	**0 M**
Change	x – No x -x M - x 86%	-x M - x 86%	+x M + x 100%	+x M 100%

				+ x
Equilibrium Pressure	86% 1.00-x M 1.00 - x x~1 No	86% 1.00-x M 1.00 - x	90% 0+x M 0 + x x~0 No	90% 0+x M 0 + x

d) Substitute the equilibrium amounts into the equilibrium expression you enter in Q2.

$K_C = (x)(x)/(1.00-x)(1.00-x)$

$K_C = (x)(x)/(1.00 - x)(1.00 - x) = x^2/(1.00 - x)^2$

e) The equilibrium constant for this reaction at this temperature is 0.72. Calculate the value of x, the amount of CO that reacts to reach equilibrium,

$x = 0.459M$ 48%

$0.72 = x^2/(1.00 - x)^2$

Take the square root of both sides of the equation,

$0.849 = x/(1.00 - x)$

$0.849*(1.00 - x) = x$

$0.849 - 0.849x = x$

$1.849x = 0.849$

$x = 0.459$ M

f) Determine the equilibrium concentration for each reactant and product in the reaction.

[CO] = 0.541M 43%

[CO] = 1.00 - x = 1.00 - 0.459 = 0.541 M

$[H_2O] = 0.541M$

$[H_2O] = 1.00 - x = 1.00 - 0.459 = 0.541\ M$

$[CO_2] = 0.459M$

$[CO_2] = + x = 0.459\ M$

$[H_2] = 0.459M$

$[H_2] = + x = 0.459\ M$

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

nothing

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

nothing

e-mail me your work, I'll check & comment

what is valuable to know for the exam?

ACA 8 – ACA 16
BCE 8 – BCE 15
PS 5 – PS 8

Shifting Rxn A, B
Extent of Rxn

Lecture Resources Page