

(#11-2)  
ISE Table Calculations

There are only so many ways these calculations can work. So, we will preview a few different versions

1.  $A(aq) + B(aq) \rightarrow 2C(aq)$  In an equilibrium mixture,  $[A] = 0.25M$   $[B] = 1.1M$  and  $[C] = 0.1M$ .

a. Write out the equilibrium expression.

$$K_c = \frac{[C]^2}{[A][B]}$$

b. Write out an ISE table and solve the equilibrium constant.

I	A	+	B	$\rightleftharpoons$	2C	$K = \frac{[0.1]^2}{[.25][1.1]}$
S						$= 0.0364M$
E	0.25		1.1		0.1	

Version 1: Notice they give you all the concentrations at equilibrium. Simply plug into the expression and solve for K.

2. Given the reaction above at an alternate temperature has a K value = 250. When at equilibrium, A and B were both shown to have a concentration of 0.5M.

a. Write out an equilibrium expression, and calculate the concentration of C at equilibrium?

I	A	+	B	$\rightleftharpoons$	2C	$K_c = \frac{[C]^2}{[A][B]}$
S						$250 = \frac{[?]^2}{(0.5)(0.5)}$
E	0.5		0.5		?	$C = 7.9M$

Version 2: How is this different then version 1? Why is temperature mentioned here?

b. Is this reaction product or reactant favored, how do you know?

$$K > 1$$

3.  $A(aq) + B(aq) \rightarrow 2C(aq)$  at an alternate temperature. A solution is containing 0.5M concentrations of each substance. At equilibrium the concentration of C = 0.1M.

a. Determine the equilibrium concentration of A and B.

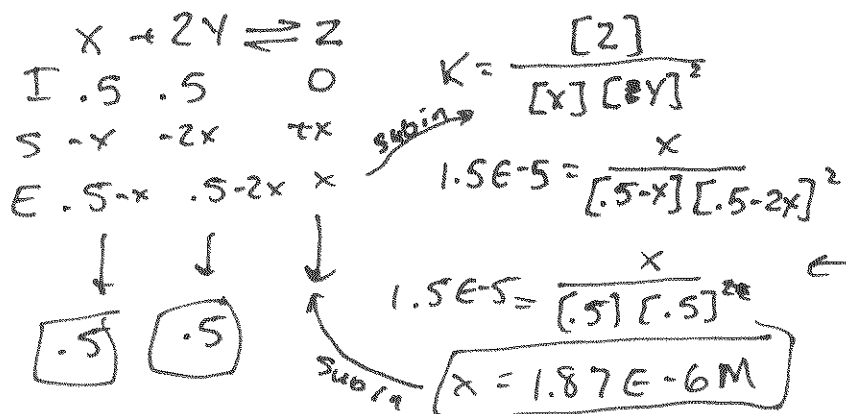
b. Determine K at this temperature.

	A	+	B	$\rightarrow$	2C	
I	0.5		0.5		0.5	
S	+x		+x		-2x	$2x = .4$
E	$0.5 - .2$		$0.5 - .2$		0.1	$x = .2$
	$0.7$		$0.7$			Sub in to "x"

$$\frac{(.1)^2}{(.7)(.7)} = 0.0204 = K$$

Version 3: Very common problem. Notice how the ISE table is unlocked

4.  $X(aq) + 2Y(aq) \rightleftharpoons Z(aq)$   $K = 1.5E-5$  In a reaction beaker 0.5M X and 0.5M Y are placed in a beaker and allowed to come to equilibrium.
- Write out the equilibrium expression.
  - Fill out an ISE table, what is the concentration of each substance at equilibrium?

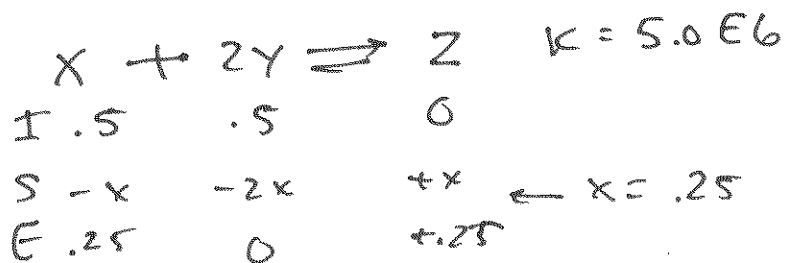


Version 4: This is an example where the K is given, we then solve for "x" in the ISE table.

Short Cut rule: Since reaction has a very small K value there will be very little loss and therefore gain of product in order to achieve equilibrium. Therefore "x" is very tiny.

How does the short-cut rule work, and when can I use this process?

5.  $X(aq) + 2Y(aq) \rightleftharpoons Z(aq)$   $K = 5,000,000$ .  
 [0.5] [0.5] [0 M]  
 Set up the ISE table and substitute into the equilibrium expression. Determine the concentration of each substance at equilibrium.



went to completion

Version 5 alternate: The K in this reaction is very large, how can you solve this question?