wkst 7b

Part 3

① $2NOCl \rightleftharpoons 2NO + Cl_2$ Reverse, $K_{cr} = \frac{1}{K_c}$

$(Cl_2 + 2NO \rightleftharpoons 2NOCl) \cdot \frac{1}{3}$ $K_{c_{1/3}} = K_{cr}^{1/3} = \left(\frac{1}{K_c}\right)^{1/3}$

$K_{c_{1/3}} = \left(\frac{1}{2.4 \cdot 10^{-7}}\right)^{1/3} = \boxed{160}$

② $A_2 + 2B \rightleftharpoons 2AB$ Reverse

$(2AB \rightleftharpoons A_2 + 2B) \frac{1}{2}$

$K_c = \left(\frac{1}{.145}\right)^{1/2} = \boxed{2.63}$

③ ~~$2CO_2$~~ + ~~H_2O~~ $\rightleftharpoons$ ~~$2O_2$~~ + CH_2O

CH_4 + ~~$2O_2$~~ $\rightleftharpoons$ ~~CO_2~~ + ~~$2H_2O$~~

$CH_4 + CO_2 \rightleftharpoons CH_2O + H_2O$

$K_c = (K_{c_1} \cdot K_{c_2}) = (6.1 \cdot 10^{8})(1.2 \cdot 10^{14})$

$= \boxed{7.3 \cdot 10^{22}}$

Part 4

④ $H_2 + I_2 \rightleftharpoons 2HI$ * assume 1L

	H_2	I_2	$2HI$	$K_c = 70$
I	.100 M	.200 M	0	
c	$-x$	$-x$	$+2x$	
e	$.1-x$	$.2-x$	$2x$	

$K_c = \frac{[HI]^2}{[H_2][I_2]} = \frac{(2x)^2}{(.1-x)(.2-x)} = 70$

$(2x)^2 = 70(.1-x)(.2-x)$

$0 = 70(.1-x)(.2-x) - (2x)^2$

* graphed + found 0 $x = .095$ M

$= .223$ M

too big! $.1-x = \ominus$

$[H_2] = .1 - .095 = .005$ mol

$[I_2] = .2 - .095 = .105$ mol

$[HI] = 2 \cdot .095 = .19$ mol

⑤ $COCl_2 \rightleftharpoons CO + Cl_2$ $\frac{.400 mol}{1.00 L} = .400 M$

	$COCl_2$	CO	Cl_2
i	0	.400 M	2.20 M
c	+x	−x	−x
e	x	.4 − x	2.2 − x

$K_c = \frac{[CO][Cl_2]}{[COCl_2]}$ $.800 = \frac{(.4-x)(2.2-x)}{x}$

$.800x = (.4-x)(2.2-x)$

$0 = (.4-x)(2.2-x) - .800x$

$x = .282 M$, $3.11 \leftarrow$ too big

$[COCl_2] = x = .282 M$

$[CO] = .400 - .282 = .118 M$

$[Cl_2] = 2.20 - .282 = 1.92 M$

⑥ $A + 2B \rightleftharpoons 3C$

	A	2B	3C
i	9.22M	10.11	27.83
c	+x	+2x	−3x
e	9.22+x	10.11+2x	27.83−3x

18.32

$18.32 = 10.11 + 2x$

$x = 4.11$

$[A] = 9.22 + 4.11 = 13.33 M$

$[B] = 18.32 M$

$[C] = 27.83 - 3(4.11) = 15.50 M$

⑦ $2IBr \rightleftharpoons I_2 + Br_2$ $K_c = \frac{[I_2][Br_2]}{[IBr]^2}$

	2IBr	I_2	Br_2
i	?	0	0
c	−2x	+x	+x
e	.0124M	x	x

$4.13 \cdot 10^{-2} = \frac{x^2}{(.0124 M)^2}$

a) $[I_2] = [Br_2] = .00252 M$

b) if $x = .00252 M$, then initial $[IBr] - 2x = .0124 M$

$[IBr]_i = .0174 M$

AP Problem

a) $K_c = \frac{[H_2][I_2]}{[HI]^2}$

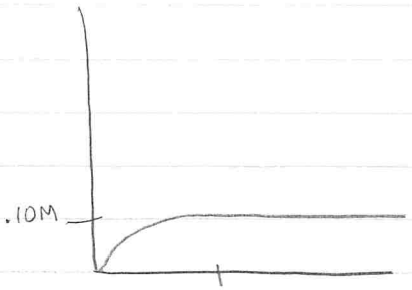
b) $[HI]_{eq} = .800M$ (read graph)

c)

	$2HI$	$\rightleftharpoons$	H_2	+	I_2
I	1.00M		0		0
C	$-2x$		$+x$		$+x$
E	$1.00-2x$		x		x
	.80M		.10M H_2		.10M I_2

$x = .10$

d)



H_2 starts at 0M

H_2 levels out at .10M

H_2 time levels out should be same t as [HI] levels out

e) i) $K_c = \frac{[H_2][I_2]}{[HI]^2} = \frac{(.10M)(.10M)}{(.80M)^2} = .016$

ii) $[H_2] = [I_2] = .10\frac{mol}{L} \cdot 1.0L = .10\ mol$

$[HI] = .80\frac{mol}{L} \cdot 1.0L = .80\ mol$

H_2 & I_2:

$n = .10\ mol$

$V = 1.0\ L$

$R = .08206\ \frac{Latm}{molK}$

$T = 700.\ K$

$PV = nRT$

$P = \frac{nRT}{V} = \frac{(.10)(.08206)(700)}{1.0L}$

$P_{H_2} = P_{I_2} = 5.7\ atm$

$P_{HI} = \frac{(.80)(.08206)(700)}{1.0L}$

$= 46\ atm$

$$K_p = \frac{(P_{H_2})(P_{I_2})}{(P_{HI})^2} = \frac{(5.7\ atm)(5.7\ atm)}{(46\ atm)^2} = .015$$

f) $K_c = 2.6 \cdot 10^{-2}$

	$2HI$	$\rightleftharpoons$	H_2	+	I_2
I	.75		.1		.5
C					
E					

$\frac{.10\ mol}{1.0L} = .10M$

$$Q = \frac{[H_2][I_2]}{[HI]^2} = \frac{(.10M)(.50M)}{(.75M)^2} = .089 = 8.9 \cdot 10^{-2}$$

$Q > K_c$ so Rxn is not at equilibrium

Rxn will produce more reactants to decrease value of Q