Objective 1

1. Dynamic equilibrium exists once a reversible reaction ceases to change its ratio of reactants/products, but substances move between chemicals at equal rate, no net change.

2. a. $K = \frac{[NO_2][N_2O]}{[NO]^3}$ b. $K = \frac{[CS_2][H_2]^4}{[CH_4][H_2S]^2}$

c. $K = \frac{[CO]^4}{[Ni(CO_4)]}$ d. $K = \frac{[F^-][H^+]}{[HF]}$

e. $K = \frac{[Ag^+]^2}{[Zn^{+2}]}$

3. $K = \frac{[H_2][I_2]}{[HI]^2} = \frac{4.79 \times 10^{-4} \cdot 4.79 \times 10^{-4}}{(3.53 \times 10^{-3})^2} = \boxed{.0184}$

4. $K = \frac{[NO_2]^2}{[NO]^2[O_2]}$ $K = \frac{(15.5)^2}{(.0542)^2(.127)} = \boxed{6.4 \times 10^5}$

5. $K = \frac{[NH_3]^2}{[N_2][H_2]^3}$ $1.45 \times 10^{-5} = \frac{x^2}{.432 \cdot (.928)^3}$

$x = [NH_3] = \boxed{.00224\ M}$

6.

	$COCl_2$	$\leftrightarrow$	CO	+	Cl_2
I	.5 M		0		0
C	$-x$		$+x$		$+x$
E	$.5 - x \approx .5$		x		x

$$K = \frac{[CO][Cl_2]}{[COCl_2]} = \frac{x \cdot x}{.5} = 8.3 \times 10^{-4}$$

$x = .0204$

At equilibrium:

$[COCl_2] \approx .5\,M \quad [CO] = .0204\,M \quad [Cl_2] = .0204\,M$

7.

	$2NO$	+	$2H_2$	$\leftrightarrow$	N_2	+	$2H_2O$
I	.1 M		.05 M		0		.1 M
C	$-.038$		$-.038\,M$		$+.019$		$+.038$
E	$.062\,M$		$.012\,M$		$.019\,M$		$.138\,M$

$$K = \frac{[N_2][H_2O]^2}{[NO]^2[H_2]^2} = \frac{(.019)\cdot(.138)^2}{(.062)^2\,(.012)^2} = \boxed{6.5 \times 10^2}$$

Objective 2

3. $4NH_3(g) + 5O_2(g) \leftrightarrow 4NO(g) + 6H_2O(g)$
$\Delta H = -904.4 kJ$

NO will

a. increase
b. decrease
c. decrease
d. decrease
e. no change
f. decrease

4. a. shift right
b. no effect
c. no effect

5.

	$HC_2H_3O_2$	$\leftrightarrow$	H^+	+	$C_2H_3O_2^-$
I	x		0		0
C	$-.00126$		$+.00126$		$+.00126$
E	$x - .00126 \approx x$		$[H^+] = 10^{-pH} = .00126$		$.00126$

$$K_a = \frac{[H^+][C_2H_3O_2^-]}{[HC_2H_3O_2]} = \frac{.00126 \cdot .00126}{x - .00126 \approx x} = 1.8 \times 10^{-5}$$

$$\frac{1.588 \times 10^{-6}}{x} = 1.8 \times 10^{-5} \qquad x = \frac{1.588 \times 10^{-6}}{1.8 \times 10^{-5}} = \boxed{.0882 M = [HC_2H_3O_2]}$$

6. $.0560g\ HC_2H_3O_2 \times \frac{1mol\ HC_2H_3O_2}{60g} = \frac{9.33 \times 10^{-4} mol}{.05L}$

$M = .01866M$

	$HC_2H_3O_2$	$\leftrightarrow$	H^+	$+$	$C_2H_3O_2^-$
I	$.01866M$		0		0
C	$-x$		$+x$		$+x$
E	$.01866 - x$		x		x

$1.8 \times 10^{-5} = \frac{x^2}{.01866}$ $\quad x = 5.79 \times 10^{-4}$

$[H^+] = 5.8 \times 10^{-4} M = [C_2H_3O_2^-]$

$[HC_2H_3O_2] = .0181 \approx .01866 M$