

Chapter 15

① a) $K_f > K_r$

b) $[prod] > [reactants]$ Greater than 1

② yes, the last 2 time periods have the same conc. of products and reactants

③
$$K_c = \frac{[AX]}{[A][X]} = \frac{\frac{8}{1}}{3/1 \times 2/1} = \frac{8}{6} = 1\frac{1}{3}$$

$K > 1$ product favored

④
$$K_c = \frac{[AB]^2}{[A_2][B_2]}$$

i) $Q = \frac{6^2}{1 \times 1} = 36$
 $36 > 1.5$ proceed to left

ii) $Q = \frac{3^2}{3 \times 2} = \frac{9}{6} = 1.5$ @ equilibrium $Q = K$

iii) $Q = \frac{2^2}{3^2 \times 3} = \frac{4}{27} < 1.5$ proceed to right

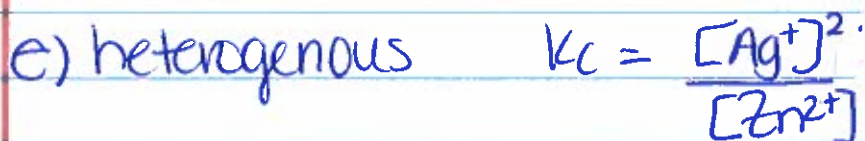
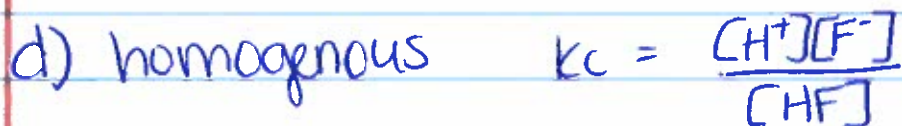
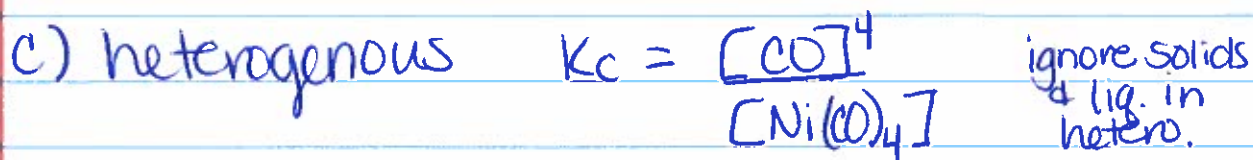
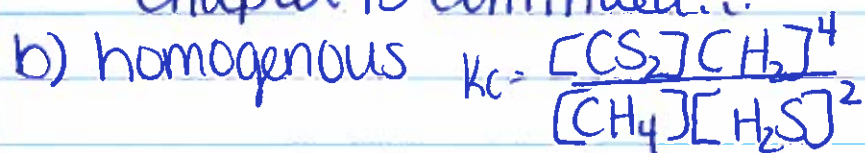
a) ii @ equilibrium b) i to left; iii to right

⑫ a) $K > 1$ product favored

b) forward

⑬ a) homogenous
$$K_c = \frac{[N_2O][NO_2]}{[NO]^3}$$

Chapter 15 continued...



- 15) a) $K_c < 1$ reactant favored
b) $K_p > 1$ product favored

- 16) a) $K_p > 1$ lies to right
b) $K_c < 1$ lies to left

- 19) a) flip reaction inverse K_c
 $1/1.3 \times 10^{-2} = 77$
b) $K_c = 1.3 \times 10^{-2} < 1$ reactant favored $NO + Br_2$

- 21) a) flip reaction inverse K_p $1/1.85 = 0.541$
b) double reaction square K_p $1.85^2 = 3.42$

Chapter 15 continued...

(23) flip reaction 2 inverse K_c
 $67 \times 1/490 = 0.137$

(27) $K_c = \frac{[H_2][I_2]}{[HI]^2} = \frac{(4.79 \times 10^{-4})(4.79 \times 10^{-4})}{(3.53 \times 10^{-3})^2}$
 $= 0.0184 = 1.84 \times 10^{-2}$

(29) $K_p = \frac{[NOCl]^2}{[NO]^2[Cl_2]} = \frac{(0.28)^2}{(0.095)(0.171)}$
 $= 4.83$

(30) a) $K_p = \frac{[PCl_5]}{[PCl_3][Cl_2]} = \frac{1.30}{(0.124)(0.157)}$

$K_p = 66.8 \text{ atm}^{-1}$

b) $66.8 > 1$ product favored

- (35) a) reaction quotient is not at ^{necessarily} equilibrium
it is a real life snap shot of where
the reaction is at that moment
b) $Q < K$ proceed to right
c) at equilibrium

Chapter 15 Continued...

(37) a)
$$Q = \frac{[CO][Cl_2]}{[COCl_2]} = \frac{(3.3 \times 10^6)(6.62 \times 10^6)}{2 \times 10^{-3}}$$
$$Q = 1.09 \times 10^{-8} > 2.19 \times 10^{-10}$$
proceed to left

b)
$$\frac{(1.1 \times 10^7)(2.25 \times 10^6)}{4.50 \times 10^2} = 5.5 \times 10^{-12} < 2.19 \times 10^{-10}$$
proceed to right

c)
$$\frac{(1.48 \times 10^6)(1.48 \times 10^6)}{.01} = 2.19 \times 10^{-10} = 2.19 \times 10^{-10}$$
at equilibrium

- (51) a) shift to right
b) $\Delta H < 0$ exothermic = heat product
shift to left
c) # moles react > products shift to left
d) no effect
e) no effect - nota reactant or product
f) shift to right

- (52) a) increase
b) decrease
c) decrease
d) decrease
e) no effect
f) exothermic heat product - decrease

	NO	N ₂	O ₂
43) initial	0.20	0	0
change	-2x	x	x
equilibrium			

$$K_c = 2.4 \times 10^3 = \frac{[0.20 - 2x]^2}{x^2}$$

quadratic formula $4 \times 10^3 x^2 = .04 - 4x^2 - .8x$