Name

Kc/Kp Multiple choice

d 1. (ebbing14.3)
The equilibrium expression for K_c for the system
$CO_{2(g)} + CaO_{(s)} \rightarrow CaCO_{3(s)}$ is

a. $[CaCO_3]/[CO_2][CaO]$
b. $[CaCO_3]/[CO_2]$
c. $[CO_2]$
d. $1/[CO_2]$
e. $[CO_2][CaO]$

e 2. (Ebbing 14.4)
In which of the following does the reaction go the least to completion (see the following K values)

a. 10E5
b. 10E3
c. 10E0
d. 10E-3
e. 10E-5

smallest K

a 3. (Ebbing 14.7)
Carbon disulfide and chlorine react according to the following equation:
$CS_{2(g)} + 3Cl_2 \leftrightarrow S_2Cl_{2(g)} + CCl_{4(g)}$
When 1.00 mol of CS_2 and 3.00 mol of Cl_2 are placed in a 2.00L container and allowed to come to equilibrium, the mixture is found to contain 0.250mol of CCl_4. What is the amount of Cl_2 at equilibrium?

a. 2.25 mol
b. 2.75 mol
c. 0.75 mol
d. .25 mol
e. .50 mol

$CS_{2(g)} + 3Cl_{2(g)} \rightleftharpoons S_2Cl_{2(g)} + CCl_{4(g)}$
I 1.00 3.00 0 0
S −0.25 −0.750 +0.250 +0.250
E 0.75 2.250 mol 0.250 0.250

d. 5. (Ebbing14.11)
Which expression correctly describes the equilibrium constant for the following reaction?
$4NH_{3(g)} + 5O_2 \leftrightarrow 4NO_{(g)} + 6H_2O(g)$

a. $Kc = 4[NH_3] + 5[O_2]/6[H_2O] + 4[NO]$
b. $Kc = 6[H_2O] + 4[NO]/4[NH_3]+5[O_2]$
c. $Kc = [H_2O][NO]/NH_3][O_2]$
d. $K_c = [H_2O]^6[NO]^4/[NH_3]^4[O_2]^5$
e. $Kc = [NH_3]^4[O_2]^5/[H_2O]^6[NO]^4$

$$K_c = \frac{[NO]^4[H_2O]^6}{[NH_3]^4[O_2]^5}$$

b 7. (ebbing14.19)
Consider the reaction system
$Br_2(g) + Cl_2(g) \leftrightarrow 2BrCl(g)$

$$K_c = \frac{[BrCl]^2}{[Br_2][Cl_2]} = \frac{(0.015)^2}{(0.006)(0.0095)} = 3.947$$

At a given temperature. When the system is at equilibrium, the molar concentrations of Br_2, Cl_2 and BrCl are 0. 0060M, 0.0095M, and 0.015M, respectively. The value of Kc for this system is

a. .025
b. 3.9
c. 27
d. 53
e. 260

more reactants

$K = 0.02 < Q = 1$

reactant favored

d 8. (ebbing14.21)

For the reaction system

$2HI(g) \Leftrightarrow H_2(g) + I_2(g)$ $K_c = \frac{[H_2][I_2]}{[HI]^2} = 0.020$ $Q = \frac{(1.5E-3)(1.5E-3)}{(1.5E-3)^2} = 1$

I 1.5E-3 1.5E-3 1.5E-3

Kc = 0.020 at 720K. If the initial concentrations of HI, H_2, and I_2 are all 1.50E-3M at 720K, which one of the following statements is correct?

a. The system is at equilibrium. no $K \neq Q$

b. The concentrations of HI and I_2 will ~~increase~~ decr. as the system is approaching equilibrium.

c. The concentrations of H_2 and HI will decrease as the system approaches equilibrium.

d. The concentration of HI will increase as the system is approaching equilibrium. more reactants

e. The concentrations of H_2 and I_2 will increase as the system is approaching equilibrium. (decrease)

b 9. (ebbing14.22) For the reaction $2H_2S(g) \Leftrightarrow 2H_2(g) + S_2(g)$ $Q = \frac{[S_2][H_2]^2}{[H_2S]^2} = \frac{(1.5)(1)^2}{(0.01)^2} = 15000$

I 0.01 1.0 1.5

at a certain temperature Kc equals 4500. What will happen when 0.010 mol of $H_2S(g)$, 1.0 mol of H_2 and 1.5 mol of S_2 are added to a 2.0L container and the system is brought to the temperature at which Kc = 4500.

more product $Q > K_c$ 15,000 4500 ← less products + more reactant H_2S shift ←

a. Nothing, the system is at equilibrium.

b. More H_2S will be formed.

c. More H_2 will be formed than S_2

d. More S_2 will be formed than H_2.

e. The amount of H_2 formed will be half the amount of S_2.

d 10. (ebbing14.23) A 1.00 mol sample of HI is placed in a 1-L vessel at 460C, and the reaction system is allowed to come to equilibrium. The HI partially decomposes, forming 0.11 mol H_2 and 0.11 mol I_2. What is the equilibrium constant for the reaction?

$H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$

a. 0.020
b. 7.1
c. 8.1
d. 50
e. 65

	H_2 +	I_2 ⇌	2HI
I			1.00
S	+0.11	+0.11	-0.22
E	0.11	0.11	0.78

$K = \frac{(0.78)^2}{(0.11)(0.11)} = 50$

___ 11. (ebbing14.25)

Consider the equilibrium $N_2(g) + 3H_2(g) \leftrightarrow 2NH_3(g)$ at a certain temperature. An equilibrium mixture in an 8.00L vessel contains .800 mol N_2, and 1.20 mol H_2. What is the value of K_c?

a. 1.85
b. 29.6
c. 37.4
d. 75.8
e. 119

need more information

$\frac{0.8}{8} = 0.1M$

$\frac{1.2}{8} = 0.15$

moles in M

	$N_{2(g)}$ +	$3H_{2(g)}$ ⇌	$2NH_{3(g)}$
I			
S			
E	0.1	0.15	$\boxed{}$?

c 12.

$$4H_{2(g)} + CS_{2(g)} \Leftrightarrow CH_{4(g)} + 2H_2S_{(g)}$$

The system reaches equilibrium according to the equation above. A mixture of 2.5 mol H_2, 1.50 mol CS_2, 1.50 mol CH_4 and 2.00mol H_2S is placed in a 5L reaction vessel. When equilibrium is achieved, the concentration of CH_4 has become 0.25M.

Changes in concentration occur as this system approaches equilibrium. Which expression gives the best comparison of the changes in those concentration shown in the ratio below?

$\Delta[H_2S]/\Delta[CS_2]$

$4H_2(g) + CS_2(g) \rightleftharpoons CH_4(g) + 2H_2S(g)$

moles in 1L

	$4H_2$	CS_2	CH_4	$2H_2S$
I	$\boxed{0.5}$	$\boxed{0.3}$	$\boxed{0.3}$	$\boxed{0.4}$
S	+4x	+x	−x	−2x
E	0.7	0.35	$\boxed{0.25}$	

a. +2 /+1
b. ~~+2 /-1~~
c. -2 /+1
d. -1 /+1
e. -1 /+2

$\Delta[H_2S] = -2x$
$\Delta[CS_2] = +x$

$\frac{2.5 mol}{5L} = .05 M$

x = 0.05 mol in 1L

b 13.

What is the change in the number of moles of H_2S(g) present as the system moves from its original state to the equilibrium described?

a. -1.25
b. -.50
c. -.25
d. +.25
e. +.50

Change in M is −2x

2(0.05) = 0.1M

$\boxed{0.1M = \frac{x\ mol}{5L}}$

x = 0.5 mol

e 14.

When equilibrium is achieved, the concentration of CH_4 has become 0.25M.

What is the number of moles of CS_2(g) at equilibrium

a. .25
b. .35
c. .75
d. ~~1.25~~
e. 1.75

$0.35M = \frac{x}{5L}$

x = 1.75 mol

b 15.

When equilibrium is achieved, the concentration of CH_4 has become 0.25M.

What is the concentration in moles per liter of H_2 at equilibrium?

a. ~~.5~~
b. .70
c. 1.00
d. 2.5
e. 3.5

M

$4H_2(g) + CS_2(g) \rightleftharpoons CH_4(g) + 2H_2S$

total moles

	$4H_2$	CS_2	CH_4	$2H_2S$
I	2.5	1.50	1.50	2.00
S	+1.0	+0.25	0.25	0.50
E	3.5	$\boxed{1.75}$	$\boxed{1.25}$	

(M)

$\frac{3.5 mol}{5L} = \boxed{0.7M}$

$0.25M = \frac{x}{5L}$

x = 1.25 mols