Grossmont College Name: \_\_\_\_\_\_\_\_KEY\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Chemistry 142, Spring 2015

Quiz 3

1. For the reaction H2 (g) + I2 (g) 🡨 🡪 2 HI (g) Kc = 50.5

The initial pressures are HI = 0.975 atm, H2 = 0.105atm and I2 = 0.105 atm,

1. Find Q, compare to Kc explain what it means.

$$Q= \frac{\left(HI \right)^{2}}{\left(H\_{2}\right)\left(I\_{2}\right)}= \frac{\left(0.975 atm \right)^{2}}{\left(0.105 atm \right)\left(0.105 atm \right)}=86.2$$

Q > Kp so too many products are present & reaction shifts left to attain eq.

Rxn shifts ←, thus products decrease (-signs) and reactants increase(+ signs)

1. What are the equilibrium pressures for all the substances?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | H2 (g) + | I2 (g) | 🡨 🡪 | 2 HI (g)  |
| I | 0.105 atm | 0.105 atm |  | 0.975 atm |
| C | +x | +x |  | -2x |
| E | 0.105 atm + x | 0.105 atm + x |  | 0.975 atm -2x |
|  | 0.130 atm | 0.130 atm |  | 0.925 atm |

$$K= \frac{\left(HI \right)^{2}}{\left(H\_{2}\right)\left(I\_{2}\right)} 50.5= \frac{\left(0.975 atm -2x\right)^{2}}{\left(0.105 atm + x\right)\left(0.105 atm + x\right)} = \frac{\left(0.975 atm -2x\right)^{2}}{\left(0.105 atm + x\right)^{2}} $$

$$ $$

$$7.106=\frac{0.975 atm -2x}{0.105 atm + x}$$

$$7.106 ×\left(0.105 atm + x\right)=0.975 atm -2x$$

$$0.764613 atm +7.106 \left(X\right)=0.975 atm -2x$$

$$9.106\left(X\right)=0.22887 atm\rightarrow X=0.0251 atm$$

1. Using the data,

(1) SnO2 (s) + 2 H2 (g) ⇌ Sn(s) + 2 H2O (g) Kp1= 8.12

(2) H2 (g) + CO2 (g) ⇌ H2O (g) + CO (g) Kp2 = 0.771

Calculate the value of Kp for the following reaction.

SnO2 (s) + 2 CO (g) ⇌ Sn (s) + 2 CO2 (g)

Reverse equation (2), multiply equation (2) by 2, then add eq. (1)

Kp= (Kp1) (1 / Kp22) = Kp1/ (Kp2)2 =8.12/(0.771)2 = 13.7

1. The mechanism of a reaction is shown below.

HOOH + I¯ 🠆 HOI + OH¯ (slow)

 HOI + I¯ 🠆 I2 + OH¯ (fast)

 2OH¯ + 2H3O+ 🠆 4 H2O (fast)

 a) What is the overall reaction?

HOOH + 2 I- + 2 H3O+ 🡨🡪 I2+ 4 H2O

b) Which compounds are intermediates?

 OH¯ and HOI

c) Predict the rate law based on this mechanism.

Rate = k [HOOH] [I¯]

d) What is the overall order of the reaction?

 2nd order