Chem 102 Week 9 Group quiz (Do these for practice by yourself then compare your answers with those given on the next page)

(1) If the equilibrium constants for the two reactions

$2\ HCl(g) \rightleftharpoons H_2(g) + Cl_2(g)$ and $I_2(g) + Cl_2(g) \rightleftharpoons 2\ ICl(g)$

are denoted K_1 and K_2 respectively, then the equilibrium constant for the reaction

$2\ HCl(g) + I_2(g) \rightleftharpoons 2\ ICl(g) + H_2(g)$ equals ___

(2) The equilibrium constant expression for the reaction shown below is ___

$Ag_3PO_4(s) \rightleftharpoons 3\ Ag^+(aq) + PO_4^{3-}(aq)$

(3) The equilibrium constant for the reaction $NO(g) + 1/2\ O_2(g) \rightleftharpoons NO_2(g)$ has a value of $K_c = 1.23$ at a certain temperature. What is the value of K_c for the reaction

$2\ NO_2(g) \rightleftharpoons 2\ NO(g) + O_2(g)$?

(4) Consider the equilibrium reaction $2\ NO_2(g) \rightleftharpoons N_2O_4(g)$.
A sample of pure $NO_2(g)$ of concentration 0.140 M is allowed to come to equilibrium. It is then found that 57.0 % of the $NO_2(g)$ has reacted to form $N_2O_4(g)$. What is the value of K_c?

(5) For the reaction $2A \rightleftharpoons B$ $K_c = 1.4 \times 10^{15}$.
In an equilibrium mixture, [A] = 0.45 M. What is the concentration of B?

answers:

(1) $K = K_1K_2$

(2) $K = [Ag^+]^3[PO_4^{3-}]$

(3) The desired equation is the reverse of the given and double its coefficient, therefore the new K' $= 1/(K)^2 = 1/(1.23)^2 = 0.66$

(4) Use ICE method: $2\ NO_2(g) \rightleftharpoons N_2O_4(g)$. NO_2 reacted = (.140M)(.570)=0.0798M
So: NO_2 remaining = .140-.0798=0.0602M
and N_2O_4 formed = (.0798M NO_2)(1mol N_2O_4 / 2 mol NO_2) = 0.0399 M
$K = [N_2O_4] / [NO_2]^2 = .0399/(.0602)^2 = 11.0$

(5) $K_c = [B]/[A]^2 \Rightarrow [B] = K_c[A]^2 = (1.4 \times 10^{15})(.45)^2 = 2.8 \times 10^{14}$