Answer on Question #50218 – Chemistry – Physical Chemistry

Question:

log K_p/K_c+log RT=0 is a relationship for the reaction

(1) $PCl_5=PCl_3+Cl_2$

(2) $2SO_2+O_2=2SO_3$

(3) $H_2+I_2=2HI$

(4) $N_2+3H_2=2NH_3$

Answer:

For the general reaction

$$aA+bB \rightleftharpoons cC+dD$$

the relationship between two equilibrium constants is:

$$K_p=K_c*(RT)^{\Delta n}$$

where, Δn = (Total moles of products on the products side) - (Total moles of reactants on the reactants side). Hence Δn = (d + c) - (a + b). *R* is the gas constant found in the ideal gas law (0.0821 liter*Atm/Mole/Kelvin), *T* is the temperature of reaction, Kelvin.

This we can use in a relationship for the reaction:

log K_p/K_c+log RT=0

log $(K_c*(RT)^{\Delta n}/K_c)$+log RT=0

log $(RT)^{\Delta n}$)+log RT=0

log $((RT)^{\Delta n}*(RT)=0$

log $(RT)^{\Delta n+1}=0$

$(RT)^{\Delta n+1}=0$

R is a constant and *T* is the temperature of reaction, so their product can't be zero. That's why

$\Delta n+1=0$ and $\boldsymbol{\Delta n = -1}$

So our relationship is true for the reaction **(2) $2SO_2+O_2=2SO_3$**

Because Δn for this reaction is:

$\Delta n = 2 - 2 - 1 = -1$

Answer: (2) $2SO_2+O_2=2SO_3$