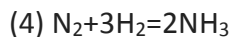
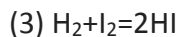
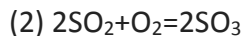
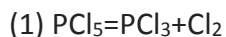


Answer on Question #50218 – Chemistry – Physical Chemistry

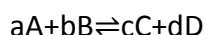
Question:

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



Answer:

For the general reaction



the relationship between two equilibrium constants is:

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

where, $\Delta n = (\text{Total moles of products on the products side}) - (\text{Total moles of reactants on the reactants side})$. Hence $\Delta n = (d + c) - (a + b)$. 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

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

So our relationship is true for the reaction **(2) $2\text{SO}_2 + \text{O}_2 = 2\text{SO}_3$**

Because Δn for this reaction is:

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

Answer: **(2) $2\text{SO}_2 + \text{O}_2 = 2\text{SO}_3$**