Below are some chemistry problems and solution steps to help you succeed in science.

Question #1:

The equilibrium constant for the chemical equation is K_p = 0.00307 at 262 °C. Calculate the value of the K_c for the reaction at 262 °C.

$$2N_{2\,(g)} + 6H_{2\,(g)} \leftrightarrow 4NH_{3\,(g)}$$

Solution steps:

- To begin this problem, you should keep in mind that the question just included words like equilibrium constant, K_p, and K_c so this means we may need to use the formula $K_p = K_c\,(RT)^{\Delta n}$.
- Using the formula:

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

K_c = is known as molar concentrations, this is subject to change.
K_p = is known as partial pressure, this is subject to change.
R, is a constant, in this case, = 0.0821 L*atm/(mol*K)
T, is temperature. In cases like these, it's best to convert Celsius (°C) to Kelvin's (K).
Δn = the difference of the gas moles, in other words, moles of gas products minus the moles of gas reactants.

Now we plug in what we already know in the formula. Please take your time in doing so because this is a very important step:

Notice that K_p is already given as 0.00307 so is temperature at 262 °C, and we know what is R. Before you plug in the temperature you should convert it to Kelvin's.

- 262 °C + 273 = 535 K
- Thus far, we have for $K_p = K_c\,(RT)^{\Delta n}$
  - $0.00307 = K_c\,[(0.0821)*(535)]^{\Delta n}$
- Now we need to find out what is delta n (also known as Δn). As mention before Δn is the moles of product gas minus the moles of reactant gas.

  Referring back to the equation, which is crucial to our answer, we see that there are 2 N's (also known as nitrogen), in the reactants side. See below.

$$2N_{2\,(g)} + 6H_{2\,(g)} \leftrightarrow 4NH_{3\,(g)}$$

We have 6 H's (also known as hydrogen), in the reactants side. See below.

$$2N_{2\,(g)} + 6H_{2\,(g)} \leftrightarrow 4NH_{3\,(g)}$$

For the product side, we see that there are 4 moles. See below.

$$2N_{2\,(g)} + 6H_{2\,(g)} \leftrightarrow 4NH_{3\,(g)}$$

- ⇨ As we were trying to, which is find delta n (Δn), we take the moles of product gas minus the moles of reactant gas and it would give us:

  [moles of the product gas – moles of the reactant gas]

  4 - (8) = -4
- ⇨ Now we know Δn, which is -4.
- ⇨ We now plug in all the numbers to solve for K_c.

  $K_p = K_c\ [(0.0821)*(535)]^{\Delta n}$
  - $0.00307 = K_c\ [(0.0821)*(535)]^{-4}$
  - $0.00307 = K_c\ [43.9235]^{-4}$
  - $0.00307 = K_c\ [2.69*10^{-7}]$
  - $0.00307/ (2.69*10^{-7}) = K_c$
  - $11412.6 = K_c$
- ⇨ There we have it my beloved brothers and sisters, our answer, finally:

  Kc = 11412.6

We hope you found this to be helpful. We wish you the best and more success. God bless you all. Enjoy chemistry. Learn more chemistry to increase our chances to find cures for numerous diseases and save lives!

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