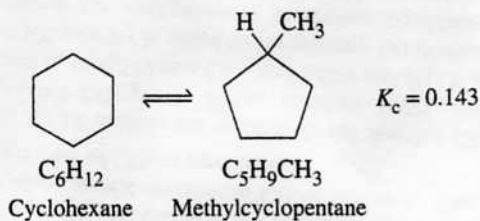


53. In a sealed 10.5-L vessel at 184 °C, equilibrium is established between $\text{NO}_2(\text{g})$ and its dissociation products, $\text{NO}(\text{g})$ and $\text{O}_2(\text{g})$. The quantities found at equilibrium are 1.353 g NO_2 , 0.0960 g NO , and 0.0512 g O_2 . What is the value of K_c for the reaction $2 \text{NO}_2(\text{g}) \rightleftharpoons 2 \text{NO}(\text{g}) + \text{O}_2(\text{g})$? What is the value of K_p ?

55. Ammonium carbamate dissociates into ammonia gas and carbon dioxide gas. If we start with a sample of pure $\text{NH}_2\text{COONH}_4(\text{s})$ at 30 °C, the total pressure of the gases is 0.164 atm when equilibrium is established. Write an equation for the dissociation reaction, and determine the value of K_p .

57. A 0.682-g sample of $\text{ICl}(\text{g})$ is placed in a 625-mL reaction vessel at 682 K. When equilibrium is reached in the reaction $2 \text{ICl}(\text{g}) \rightleftharpoons \text{I}_2(\text{g}) + \text{Cl}_2(\text{g})$, 0.0383 g I_2 is found in the mixture. What is K_c for this reaction?

59. Assume that at 25 °C, with AlCl_3 as a catalyst, the following equilibrium can be established between the liquids cyclohexane and methylcyclopentane.



If initially 1.00×10^2 g cyclohexane is present, what mass of methylcyclopentane will be present in the equilibrium mixture? (Hint: Does the volume of solution matter?)

61. For the water-gas reaction (Problem 43), $K_c = 0.111$ at about 1100 K. If 0.100 mol $\text{H}_2\text{O}(\text{g})$ and 0.100 mol $\text{H}_2(\text{g})$ are mixed with excess $\text{C}(\text{s})$ at this temperature and equilibrium is established, how many moles of $\text{CO}(\text{g})$ will be present? No $\text{CO}(\text{g})$ is present initially.

63. For the synthesis of phosgene at 395 °C, $\text{CO}(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons \text{COCl}_2(\text{g})$, $K_c = 1.2 \times 10^3$. If 20.0 g CO and 35.5 g Cl_2 are placed in an 8.05-L reaction vessel at 395 °C and equilibrium is established, how many grams of COCl_2 will be present?

69. In the reaction $\text{C}(\text{s}) + \text{S}_2(\text{g}) \rightleftharpoons \text{CS}_2(\text{g})$, $K_p = 5.60$ at 1009 °C. If, at equilibrium, $P_{\text{CS}_2} = 0.152$ atm, find (a) P_{S_2} and (b) the total gas pressure, P_{total} .

For the reaction $\text{C}(\text{s}) + 2 \text{H}_2(\text{g}) \rightleftharpoons \text{CH}_4(\text{g})$, $K_p = 0.263$ at 1000 °C. Calculate the total pressure when 0.100 mol CH_4 and an excess of $\text{C}(\text{s})$ are brought to equilibrium at 1000 °C in a 4.16-L reaction vessel.