

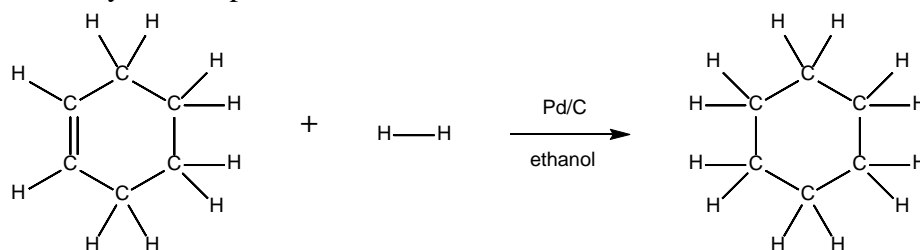
Exercise 7.1

Activities and Reaction Quotients

1.

- (a) 75 mg NaCl is dissolved in 1.000 L water. What is the activity of each species in the solution? Assume that the addition of the salt does not change the volume of solution in any significant way.
- (b) 75 mg $Cu(NO_3)_2$ is dissolved in 1.000 L water. What is the activity of each species in the solution? Assume that the addition of the salt does not change the volume of solution in any significant way.
- (c) 65 mL of ethanol (CH_3CH_2OH) and 35 mL of water are mixed. What is the activity of each species in the solution? At room temperature, the density of ethanol is $0.789 \frac{g}{mL}$, and the density of water is $0.998 \frac{g}{mL}$.

2. Hydrogenation of an alkene using a transition metal catalyst is a common reaction in organic chemistry. A sample reaction is shown below:



Pd/C stands for “carbon powder in which the particles are coated with a thin layer of palladium”.

- (a) Write the reaction quotient expression for this reaction.
- (b) What is the activity of the palladium catalyst? Would doubling the amount of palladium catalyst in the flask change the reaction quotient? Why or why not?
- (c) 0.125 mol cyclohexene (C_6H_{10}) is dissolved in 250 mL ethanol. Hydrogen gas is bubbled through the solution until the pressure of hydrogen gas above the solution can be maintained at a constant 1 bar.
- i. What is the reaction quotient before any cyclohexene is converted into cyclohexane (C_6H_{12})?
 - ii. What is the reaction quotient after 0.050 mol cyclohexene has been converted into cyclohexane (C_6H_{12})?