Typical errors on Chem 116
Exam 2 from previous years

- This document is a compilation of the most common errors students made when they took the practice exam that is posted.
- The intent of this document is to help you identify the kinds of errors that you might make when you solve these problems, so that you can learn to fix these errors before you take the exam.

What influences the rate of a reaction?

Q5 on practice exam
Which of the following changes in experimental conditions would not increase the rate of the following reaction:

\[ \text{H}_2\text{O}_2 (aq) + 2 \text{H}^+ (aq) + 2 \text{I}^- (aq) \rightarrow \text{I}_2 (s) + 2 \text{H}_2\text{O} (l) \]

A. Increasing the temperature
B. Increasing the amount of H$_2$O$_2$ initially present
C. Using a catalyst for the reaction
D. Using less water in the initial reactant mixture
E. Increasing the pressure

Answers selected with greatest frequency:
(B) In the laboratory, you found that rate of this reaction is proportional to [H$_2$O$_2$]. It turns out rate = [H$_2$O$_2$][H$^+$][I$^-$]. So, increasing [H$_2$O$_2$] will cause rate to increase.
(D) The initial reactant mixture had to consist of the three reactants dissolved in water. If you decrease the amount of water used, then the initial concentrations of all of these will increase. Therefore, the rate will increase.
(E) Correct answer. Pressure only affects the reaction rate when there is a gas phase reaction.
Calculating the equilibrium constant

Q7 on practice exam
At 43 °C, the reaction below takes place in a closed 2.00 L container.

\[ (\text{NH}_4\text{H}_2\text{NCO}_2) (s) \rightleftharpoons 2 \text{NH}_3 (g) + \text{CO}_2 (g) \]

When the system is at equilibrium, there are 0.20 moles of \( \text{NH}_3 \) and 0.10 moles of \( \text{CO}_2 \) present. What is the value of the equilibrium constant (\( K_c \)) at this temperature?

A. \( K_c = 3.4 \times 10^{-3} \)
B. \( K_c = 4.0 \times 10^{-3} \)
C. \( K_c = 5.0 \times 10^{-4} \)
D. \( K_c = 6.0 \times 10^{-2} \)
E. there is not enough information to tell

Answers selected with greatest frequency:
(B) Used moles in equilibrium constant instead of concentrations.
(E) I don't know why people selected this answer.
(C) Correct answer: calculated by using \( K_c = [\text{NH}_3]^2 [\text{CO}_2] \) using concentrations not moles. To get concentration (molarity) you have to divide moles by volume.

Problem 2 on the exam

Most common difficulties on each part were:
(a) Confused \([\text{NO}_2]^{-1}\) and \([\text{NO}_2]\). Remember, the -1 exponent means “reciprocal.”
(b) Missing sign (reactant is disappearing, so rate should be negative)
(c) Few difficulties
(d) Stoichiometry incorrect, sketch approaching incorrect asymptote: \( \text{O}_2 \) gets made at half the rate that \( \text{NO}_2 \) disappears
(e) Confused “rate law” with “equilibrium constant”
(f) Confused \([\text{NO}_2]^{-1}\) and \([\text{NO}_2]\)
   Solution to problem set up correctly, but algebra difficulties