SOLVING EQUILIBRIUM PROBLEMS WITH THE TI-NSPIRE

TEACHER NOTES

Teaching time: One class period

Topic: Equilibrium-Law of Mass Action

Level: Honors Chemistry I and/or Advanced Placement Chemistry

Prerequisite Knowledge: The student will be expected to have a working knowledge of Equilibrium.

Materials: TI-Nspire Calculator

Objectives: In this activity the student will use the Calculator application to determine the unknown species (x) using known initial concentrations, the change in concentration, and a given value for the equilibrium constant (K). The student will use the following functions:

1. the Calculator Application
2. the Numerical Solve Function

Discussion: The equilibrium constant (K) for any given reaction does not vary so long as the temperature of the reaction remains constant. The usual temperature for equilibrium calculations is room temperature (25°). The Law of Mass Action will be used to solve for the unknown species (x):

$$K=\frac{[C]^l[D]^m}{[A]^j[B]^k}$$

When the concentration of a species (x) in an equilibrium expression is to be determined, it is often necessary to use the quadratic formula or to approximate using the 5% rule. When the value of

K is relatively large, the 5 % rule fails and other, more complicated means of solution are necessary. With the TI-Nspire Numerical Solve function, solving for the value of x is extremely quick and easy.

Teaching Tips:

Students will need a presentation of the Law of Mass Action, as well as appropriate units for concentration. The concept of ICE (Initial, Change, and Equilibrium) will need to be taught prior to this exercise.

Answers:

Part I

$[NOCl] = 0.50 - 2x = 0.48$ M
$[NO] = 2x = 2(9.8 \times 10^{-3}) = 1.9 \times 10^{-2}$ M
$[Cl_2] = x = 9.8 \times 10^{-3}$M

Part II

$[N_2] = 5.30 \times 10^{-4}$ atm
$[H_2] = 1.59 \times 10^{-3}$ atm
$[NH_3] = 1.06 \times 10^{-3}$ atm