Concentration Dilution Tutorial #1

This quiz tests you on the most fundamental understanding of dilution problems

1. The first question on this test will test your conceptual understanding of the process:

   Sample question
   “What is being calculated when the molarity of a solute in a solution is multiplied by the volume of the solution in liters?”  Answer = moles of solute

2. For the second question, you will be given the concentration and volume of a concentrated solution and you will be asked to find the concentration of a dilute solution. You should know how to use the formula \( M_1 V_1 = M_2 V_2 \)

   Sample Question
   When 50.0 mL of a solution containing 1.35 M BaF\(_2\) is diluted to 120 mL, what is the concentration of BaF\(_2\) in the new solution? (Answer: 0.563 M)

3. The third question will ask you to find the moles of solute in the dilute solution. Here you need to know two things:
   1. \( M \times V = \) moles.
   2. Moles of solute do NOT change upon dilution.
   Put those together and it means that if you know the concentration and volume of EITHER the concentrated OR the dilute solution you can get the moles of solute.

   Sample Question
   When 25.2 mL of a solution containing 1.25 M CaCl\(_2\) is diluted to 75.0 mL, how many moles of CaCl\(_2\) are in the new solution? (Answer 0.0315 moles)

4. The fourth question will ask you to find the initial volume of a concentrated solution needed to prepared a dilute solution of a given concentration. Like the second problems you should be able to easily do this using \( M_1 V_1 = M_2 V_2 \)

   Sample Question
   How many milliliters of solution of 1.90 M K\(_2\)SO\(_4\) must be used to make 60 mL of a solution that has a concentration of 0.225 M K\(_2\)SO\(_4\)? (Answer: 7.10ml)

5. The last question will be more challenging. First of all there will be more than one type of problem, so you cannot memorize how to solve a problem and get it right. You will have to read the problem carefully to decide what you need to do to get the answer. I’d suggest you draw a diagram of the process that is being described. In many of the questions in this category (but not all) you will need to do two calculations to get the correct answer. The sample problem below is of this type.

   Sample Question
   A 125 mL sample of a solution of Pb(ClO\(_3\))\(_2\) was diluted with water to 245 mL. A 75.0 mL sample of the dilute solution was found to contain 0.0335 moles of Pb(ClO\(_3\))\(_2\). What was the concentration of Pb(ClO\(_3\))\(_2\) in the original undiluted solution?

   Step 1: use \( M \times V = \) moles to find the concentration dilute solution:
   \[ \text{0.0335 moles} = 75 \text{mL} \times M_2 \text{ so } M_2 = 0.447 \text{M} \]
   Step 2: Now use \( M_1 V_1 = M_2 V_2 \) to find \( M_1 \) Answer: \( M_1 = 0.875 \text{M} \)

Make sure YOU understand how this problem was done. You won’t be able to just “plug and chug” on the Basic Skill test...
**Concentration Dilution Tutorial #2**

Like tutorial # 1, this will have 5 questions

Question one will ask you to read a question and determine what information in the question is “extra”. You do not have to “solve” for the answer.

The remaining 4 questions will be just like the ones in tutorial #1 except that most of them will all have “extra” information that you do not need to solve the problem.

**Concentration Dilution Tutorial #3**

Like tutorial # 1, this will have 5 questions

Question one will ask you to determine the concentration of ions given the analytical concentration of a substance. In order to answer these questions correctly, you must know what happens to substances when they dissolve in water. Review your nomenclature if necessary. (Chapter 2 section 2.7) and be sure you understand what strong electrolytes are and how they dissociate (Section 4.1).

The remaining 4 questions will be just like the ones in tutorial #1 except that most of them will all have “extra” information that you do not need to solve the problem.