$M_1V_1 = M_2V_2$

FITCH

Chemistry Unit 7
HW #2 – Dilution problems

1. If you took 3L of a 12 M hydrochloric acid solution and diluted it to 10 L, what would the new molarity be?

$(3L)(12M) = (10L)(XM)$ $\frac{3L \cdot 12M}{10L} = 3.6\,M$

2. How many moles of HCl are present in the 10 L of solution in #1?

$\left(3.6\frac{mol}{L}\right)(10\,L) = 36\ mol\ HCl$

3. I have 300 ml of a 3 M acid. If I began with 100 ml of the concentrated stock solution, and then diluted it to the 300 ml, what was the original molarity of the stock solution.

$(.3L)(3M) = (.1L)(XM) = \frac{(.3L)(3M)}{(.1L)} = 9\,M$

4. You have 16 M sulfuric acid. How much of the acid must you dilute in order to get 500 ml of a 2 M sulfuric acid solution?

$(16M)(XL) = (.5L)(2M)$ $L = \frac{(.5L)(2M)}{16} = \frac{1}{16}L = .0625\,L$

$= 62.5\ ml\ H_2SO_4$

5. 2 kg of a 3m salt solution are diluted so that the total mass of solvent is 5 kg. What is the new molality?

$\left(3\frac{mol}{kg}\right)(2kg) = (5kg)(X\,m)$ $\frac{6}{5} = X\,m = 1.2\,m$

6. Action Addison is making a secret potion for cranial massage. He has a 4 M bottle of the potion but finds this to be too strong. He decides to dilute it to a 1 M potion. What volume of the 4 M solution will he need to make 1 L of the 1M potion?

$(4M)(XL) = (1M)(1L) = \frac{1M \cdot 1L}{4M} = .25\,L$ OF THE 4M SOL'N

7. Fearsome Fitch wants to use this potion too but the 1M solution is too strong for his delicate scalp. He decides to make 1 L of .35 M potion. How much of Addison secret recipe (the 1M variety) will Fitch need?

$(1L)(.35M) = (1M)(XL) = \frac{.35}{1} = .35\,L$ OF THE 1M SOL'N

8. Haulin' Holland wants to make 3 L of 5 M sulfuric acid from an 18 M stock solution. How much H_2SO_4, and how much water should he use to make the solution?

$(3L)(5M) = (18M)(XL) = \frac{15\,mol}{18M} = X = \frac{5}{6}L$

$= .833L$ 18 M H_2SO_4

TO EQUAL H_2O TO MAKE 3L

9. The Great and powerful Oz decides to take 100 ml of Holland's 5M H_2SO_4 and combine it with 500 ml of water. What is the molarity of the new solution?

$(.1L)(5M) = (X\,M)(.6L) = \frac{.5}{.6} = .833\,M$

10. The B man takes 600 ml Oz's acid and decides to return it to its original 18 M state. He does this by evaporation the water, leaving a stronger solution behind. When should he stop boiling away the water... in other words, what will the final volume be?

$(.6L)(.833M) = (18M)(XL)$

$\frac{(.6L)(.833M)}{18M} = .02776\,L = 27.8\ ml$ 18M H_2SO_4