Name: KEY

Molality Problems

1. What is the molality of a solution made by mixing 3.5 moles of solute with 2 kilograms of solvent?

$$\text{molality} = \frac{\text{moles solute}}{\text{Kg solvent}} = \frac{3.5\,\text{mol}}{2\,\text{Kg}} = 1.75\ \frac{\text{mol}}{\text{Kg}} \text{ or } \boxed{1.75\,m}$$

2. A solution of potassium hydroxide, KOH, is made by mixing 40 grams of KOH, the solute, in 1000 grams of water, the solvent. What is the molality of the solution?

$$\frac{40\,g\,KOH}{1} \times \frac{1\,\text{mol KOH}}{56.1\,g\,KOH} = \frac{0.713\,\text{mol}}{1\,Kg} = \boxed{0.713\,m}$$

3. A saltwater solution is made by mixing 27 moles of NaCl in 1500 grams of water. What is the molality of the solution?

$$\frac{27\,\text{mol}}{1.5\,Kg} = \boxed{18\,m}$$

4. What is the molality of methanol in solution made by dissolving 32 grams of methanol, CH_3OH, in 200 grams of water?

$$\frac{32\,g\,CH_3OH}{1} \times \frac{1\,\text{mol}}{32\,g\,CH_3OH} = \frac{1\,\text{mol}}{.2\,Kg} = \boxed{5\,m\ CH_3OH}$$

5. What is the amount of solvent needed to make a 0.2m solution of salt in water if 15g of NaCl are to be used?

$$\frac{15\,g\,NaCl}{1} \times \frac{1\,\text{mol NaCl}}{58.45\,g\,NaCl} \times \frac{1\,Kg\,H_2O}{.2\,\text{mol}} \quad \left(\frac{.2\,\text{mol}}{1\,Kg}\right) = \boxed{1.3\,Kg\,H_2O}$$

6. How many moles of solute are in a solution made from 0.35kg of acetone if the concentration is 1.5m?

$$\frac{.35\,Kg}{1} \times \frac{1.5\,\text{mol}}{1\,Kg} = 0.525\,\text{mol}$$

7. A one liter flask of 1.37M citric Acid, $H_3C_6H_5O_7$, holds 1100 grams of solution. What is the molality of this solution? Assume you have 1 liter of solution.

$$\frac{1.37\,\text{mol}\ H_3C_6H_5O_7}{1\,L}$$

$$\frac{1\,L}{1} \times \frac{1.37\,\text{mol}\ H_3C_6H_5O_7}{1\,L} \times \frac{192.13\,g\ H_3C_6H_5O_7}{1\,\text{mol}\ H_3C_6H_5O_7} = 263.2\,g \text{ (solute)} \quad 1100\,g - 263.2\,g = 836.8\,g \text{ (solvent)}$$

$$\frac{1.37\,\text{mol}}{.8368\,Kg} = \boxed{1.64\,m}$$