

SAMPLE PROBLEM A

For more help, go to the *Math Tutor* at the end of this chapter.

You have 3.50 L of solution that contains 90.0 g of sodium chloride, NaCl.
What is the molarity of that solution?

SOLUTION**1 ANALYZE**

Given: solute mass = 90.0 g NaCl
solution volume = 3.50 L
Unknown: molarity of NaCl solution

2 PLAN

Molarity is the number of moles of solute per liter of solution. The solute is described in the problem by mass, not the amount in moles. You need one conversion (grams to moles of solute) using the inverted molar mass of NaCl to arrive at your answer.

grams of solute \longrightarrow number of moles of solute \longrightarrow molarity

$$\text{g NaCl} \times \frac{1 \text{ mol NaCl}}{58.44 \text{ g NaCl}} = \text{mol NaCl}$$

$$\frac{\text{amount of solute (mol)}}{V \text{ solution (L)}} = \text{molarity of solution (M)}$$

3 COMPUTE

You will need the molar mass of NaCl.
NaCl = 58.44 g/mol

$$90.0 \text{ g NaCl} \times \frac{1 \text{ mol NaCl}}{58.44 \text{ g NaCl}} = 1.54 \text{ mol NaCl}$$

$$\frac{1.54 \text{ mol NaCl}}{3.50 \text{ L of solution}} = 0.440 \text{ M NaCl}$$

4 EVALUATE

Because each factor involved is limited to three significant digits, the answer should have three significant digits, which it does. The units cancel correctly to give the desired moles of solute per liter of solution, which is molarity.

SAMPLE PROBLEM B

For more help, go to the *Math Tutor* at the end of this chapter.

You have 0.8 L of a 0.5 M HCl solution. How many moles of HCl does this solution contain?

SOLUTION**1 ANALYZE**

Given: volume of solution = 0.8 L
concentration of solution = 0.5 M HCl
Unknown: moles of HCl in a given volume

2 PLAN

The molarity indicates the moles of solute that are in one liter of solution. Given the volume of the solution, the number of moles of solute can then be found.

$$\text{concentration (mol of HCl/L of solution)} \times \text{volume (L of solution)} = \text{mol of HCl}$$