3 COMPUTE

$$\frac{0.5 \text{ mol HCl}}{1.0 \text{ L of solution}} \times 0.8 \text{ L of solution} = 0.4 \text{ mol HCl}$$

4 EVALUATE

The answer is correctly given to one significant digit. The units cancel correctly to give the desired unit, mol. There should be less than 0.5 mol HCl, because less than 1 L of solution was used.

SAMPLE PROBLEM C

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

To produce 40.0 g of silver chromate, you will need at least 23.4 g of potassium chromate in solution as a reactant. All you have on hand is 5 L of a 6.0 M K_2CrO_4 solution. What volume of the solution is needed to give you the 23.4 g K_2CrO_4 needed for the reaction?

SOLUTION

1 ANALYZE

Given: volume of solution = 5 L
concentration of solution = 6.0 M K_2CrO_4
mass of solute = 23.4 g K_2CrO_4
mass of product = 40.0 g Ag_2CrO_4

Unknown: volume of K_2CrO_4 solution in L

2 PLAN

The molarity indicates the moles of solute that are in 1 L of solution. Given the mass of solute needed, the amount in moles of solute can then be found. Use the molarity and the amount in moles of K_2CrO_4 to determine the volume of K_2CrO_4 that will provide 23.4 g.

grams of solute ⟶ moles solute
moles solute and molarity ⟶ liters of solution needed

3 COMPUTE

To get the moles of solute, you'll need to calculate the molar mass of K_2CrO_4.

$$1 \text{ mol } K_2CrO_4 = 194.2 \text{ g } K_2CrO_4$$

$$23.4 \text{ g } K_2CrO_4 \times \frac{1 \text{ mol } K_2CrO_4}{194.2 \text{ g } K_2CrO_4} = 0.120 \text{ mol } K_2CrO_4$$

$$6.0 \text{ M } K_2CrO_4 = \frac{0.120 \text{ mol } K_2CrO_4}{x \text{ L } K_2CrO_4 \text{ soln}}$$

$$x = 0.020 \text{ L } K_2CrO_4 \text{ soln}$$

4 EVALUATE

The answer is correctly given to two significant digits. The units cancel correctly to give the desired unit, liters of solution.

PRACTICE

Answers in Appendix E

1. What is the molarity of a solution composed of 5.85 g of potassium iodide, KI, dissolved in enough water to make 0.125 L of solution?
2. How many moles of H_2SO_4 are present in 0.500 L of a 0.150 M H_2SO_4 solution?
3. What volume of 3.00 M NaCl is needed for a reaction that requires 146.3 g of NaCl?

extension

Go to **go.hrw.com** for more practice problems that ask you to calculate molarity.

Keyword: HC6SLNX