

Here is one way to solve #5 in Molarity II assignment.

5. In the reaction, $2 \text{ Al (s)} + 6 \text{ HCl (aq)} \rightarrow 2 \text{ AlCl}_3 \text{ (aq)} + 3 \text{ H}_2 \text{ (g)}$, 2.00 g of Al will react with how many milliliters of 0.500 M HCl?

What we need: ? ml 0.5 M HCl

What we know:

- 2.00g Al
- the ratio given by the reaction is (2moles Al / 6moles HCl)
- Molar Mass of Aluminum is (26.9815 grams Al / 1 mole Al)
- The ratio of moles HCl to liters HCl solution (0.500moles HCl/ 1 liter HCl solution)
- 1000ml/1liter

1. Determine the number of moles of HCl that will be used if all of the Al reacts

Find the # of moles Al in 2 grams Al

$$2\text{gAl} \left(\frac{1\text{moleAl}}{26.9815\text{gAl}} \right) = 0.07412\text{molesAl}$$

Find the # of moles of HCl that will react.

$$0.07412\text{Al} \left(\frac{6\text{molesHCl}}{2\text{molesAl}} \right) = 0.2224\text{molesHCl}$$

2. Determine the number of ml of the HCl solution that are needed.

Find the # of liters

$$0.2224\text{molesHCl} \left(\frac{1\text{literHCl solution}}{0.500\text{molesHCl}} \right) = 0.4447\text{litersHCl solution}$$

Convert the liters to milliliters

$$0.4447\text{liters} \left(\frac{1000\text{ml}}{1\text{liters}} \right) = 445\text{ml}$$

For some of you it may be easier to combine some or all of these steps

For Example:

1. Determining the # of moles HCl needed

$$2gAl \left(\frac{1moleAl}{26.9815gAl} \right) \left(\frac{6molesHCl}{2molesAl} \right) = 0.2224molesHCl$$

2. Determine the # of ml HCl solution needed

$$0.2224molesHCl \left(\frac{1literHCl\text{solution}}{0.500molesHCl} \right) \left(\frac{1000ml}{1liter} \right) = 445mlHCl\text{solution}$$

Any of these are right. It is just a matter of what makes the most sense to you. For most people, when they are starting out, it is best to not go beyond 1 or 2 conversion factors in each step.