

Exercise 12.3e(H)

Solution Stoichiometry

Name: _____

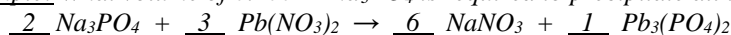
Date: _____ Per: _____

Stoichiometry calculations rely on the conversion of chemical measurements into moles. The volume and molarity (mol/L) of a solution may be used to determine the number of moles of a reactant or product in a stoichiometric calculation. Multiplying the volume of the solution in liters by the molarity results in the number of moles of solute.

<small>(given volume of solution expressed in liters)</small>	<small>(given molarity written as a ratio over 1 mole)</small>	<small>(mole ratio step)</small>	<small>(final conversion to desired units)</small>
volume of solution (L)	moles of solute 1 Liter	moles unknown moles known	desired unit of known (or 1 liter) 1 mole known (or moles solute)

If finding a volume of a particular concentration of solution, the final conversion factor may be written as concentration ratio (L/mol). This provides a final answer in liters of solution.

Example: What volume of 0.100 M Na_3PO_4 is required to precipitate all the lead(II) ions from 150.0 mL of 0.250 M $\text{Pb}(\text{NO}_3)_2$?



$$\frac{0.150 \text{ L Pb}(\text{NO}_3)_2}{1 \text{ liter solution}} \times \frac{0.250 \text{ mol Pb}(\text{NO}_3)_2}{1 \text{ liter solution}} \times \frac{2 \text{ mol Na}_3\text{PO}_4}{3 \text{ mol Pb}(\text{NO}_3)_2} \times \frac{1 \text{ liter Na}_3\text{PO}_4 \text{ sol'n}}{0.100 \text{ mol Na}_3\text{PO}_4} = \boxed{0.250 \text{ L}}$$

DIRECTIONS: Answer the following in the space provided.

1. How many grams of aluminum are required to react with 35 mL of 2.0 M hydrochloric acid, HCl?
 ___ HCl + ___ Al \rightarrow ___ AlCl₃ + ___ H₂

2. How many liters of a 3.0 M H_3PO_4 solution are required to react with 4.5 g of zinc?
 ___ H_3PO_4 + ___ Zn \rightarrow ___ $\text{Zn}_3(\text{PO}_4)_2$ + ___ H₂

3. How many grams of sodium can be reacted with 750 mL of a 6.0 M solution of sulfuric acid, H_2SO_4 ?
 ___ Na + ___ H_2SO_4 \rightarrow ___ Na_2SO_4 + ___ H₂

4. How many milliliters of 0.10 M $\text{Pb}(\text{NO}_3)_2$ are required to react with 75 mL of 0.20 M NaI?
 ___ $\text{Pb}(\text{NO}_3)_2$ + ___ NaI \rightarrow ___ PbI_2 + ___ NaNO_3

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5. If 45 mL of a 1.5 M AgNO₃ is added to KCl how many grams of AgCl can be formed?
___ AgNO₃ + ___ KCl → ___ AgCl + ___ KNO₃
6. How many grams of solid BaSO₄ will form when Na₂SO₄ reacts with 25 mL of 0.50 M Ba(NO₃)₂?
___ Ba(NO₃)₂ + ___ Na₂SO₄ → ___ BaSO₄ + ___ NaNO₃
7. How many liters of a 0.75 M solution of Ca(NO₃)₂ will be required to react with 148 g of Na₂CO₃?
___ Ca(NO₃)₂ + ___ Na₂CO₃ → ___ CaCO₃ + ___ NaNO₃
8. If 525 mL of 0.80 M HCl solution is neutralized with 315 mL of Sr(OH)₂ solution what is the molarity of the Sr(OH)₂?
___ HCl + ___ Sr(OH)₂ → ___ SrCl₂ + ___ H₂O
9. What mass of solid AgBr is produced when 100.0 mL of a 0.150 M AgNO₃ is added to 20.0 mL of 1.00 M NaBr?
___ AgNO₃ + ___ NaBr → ___ AgBr + ___ NaNO₃
10. What volume of 0.150 M HNO₃ will react completely with 50.00 mL of 0.200 M NaOH?
___ HNO₃ + ___ NaOH → ___ H₂O + ___ NaNO₃