SOLUTION STOICHIOMETRY

1. 60.0 mL of 0.322 M potassium iodide are combined with 20.0 mL of 0.530 M lead (II) nitrate. How many grams of lead (II) iodide will precipitate?

2. How many grams of calcium phosphate can be produced from the reaction of 2.50 L of 0.250 M calcium chloride with excess phosphoric acid?

3. How many mL of 1.50 M nitric acid is required to react with 100 g of cuprous oxide?

4. 60.5 mL of HNO_3 react with 25.0 mL of a 1.00 M barium hydroxide solution. Write the balanced reaction. Find the molarity of the nitric acid solution.

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Answers

1. 60.0 mL of 0.322 M potassium iodide are combined with 20.0 mL of 0.530 M lead (II) nitrate. How many grams of lead (II) iodide will precipitate?

$2\ KI\ (aq) + Pb(NO_3)_2\ (aq) \rightarrow 2\ KNO_3\ (aq) + PbI_2\ (s)$

$0.060\ L\ KI \times (0.322\ mol\ KI/1\ L\ KI) \times (1\ mol\ PbI_2/2\ mol\ KI) \times (461\ g\ PbI_2/1\ mol\ PbI_2) = 4.45\ g\ PbI_2$

$0.020\ L\ Pb(NO_3)_2 \times (0.530\ mol\ Pb(NO_3)_2/1\ L\ Pb(NO_3)_2) \times (1\ mol\ PbI_2/1\ mol\ Pb(NO_3)_2) \times (461\ g\ PbI_2/1\ mol\ PbI_2) = 4.89\ g\ PbI_2$

The lower mass of PbI_2 will precipitate.

2. How many grams of calcium phosphate can be produced from the reaction of 2.50 L of 0.250 M calcium chloride with excess phosphoric acid?

$3\ CaCl_2 + 2\ H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6\ HCl$

$2.5\ L\ CaCl_2 \times (0.250\ mol\ CaCl_2/1\ L\ CaCl_2) \times (1\ mol\ Ca_3(PO_4)_2\ /3\ mol\ CaCl_2) \times (310\ g\ Ca_3(PO_4)_2/\ 1\ mol\ Ca_3(PO_4)_2) = 64.6\ g\ Ca_3(PO_4)_2$

3. How many mL of 1.50 M nitric acid is required to react with 100 g of cuprous oxide?

$14\ HNO_3 + 3\ Cu_2O \rightarrow 6\ Cu(NO_3)_2 + 2\ NO + 7\ H_2O$

$100\ g\ Cu_2O \times (1\ mol\ Cu_2O\ /143.1\ mol\ Cu_2O) \times (14\ mol\ HNO_3/3\ mol\ Cu_2O) \times (1000\ mL\ HNO_3/\ 1.5\ mol\ HNO_3) = 2180\ mL\ HNO_3$

4. 60.5 mL of HNO_3 react with 25.0 mL of a 1.00 M barium hydroxide solution. Write the balanced reaction. Find the molarity of the nitric acid solution.

$2\ HNO_3\ (aq) + Ba(OH)_2\ (aq) \rightarrow 2\ H_2O\ (s) + Ba(NO_3)_2\ (aq)$

$0.025\ L\ Ba(OH)_2 \times (1\ mol\ Ba(OH)_2/\ 1\ L\ Ba(OH)_2) \times (2\ mol\ HNO_3/1\ mol\ Ba(OH)_2) = 0.05\ mol\ HNO_3$

$Molarity = 0.05\ mol\ HNO_3/0.0605\ L\ HNO_3 = 0.826\ M$

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