LESSON 92

CLASSWORK

Mole Tunnel Stoichiometry

Name _____

Date _____ Period _____

Purpose

To practice performing stoichiometric calculations.

Part 1: Root Canal

1. Calcium hydroxide is sometimes used in dentistry to temporarily fill the space left by a root canal. The equation for the formation of calcium hydroxide is this:

$$\underset{\text{Calcium chloride}}{CaCl_2(aq)} + \underset{\text{Sodium hydroxide}}{2NaOH(aq)} \longrightarrow \underset{\text{Calcium hydroxide}}{Ca(OH)_2(s)} + \underset{\text{Sodium chloride}}{2NaCl(aq)}$$

Calculate the molar mass of each substance and fill in the table.

	Reactant		Product	
	$CaCl_2$	NaOH	$Ca(OH)_2$	NaCl
Molar mass				

Imagine that a dentist performs this reaction four times using different amounts of the reactants. Figure out the amounts of each compound.

Reaction	Quantity	$CaCl_2(aq)$	$NaOH(aq)$	$Ca(OH)_2(s)$	$NaCl(aq)$
1	moles	1.00 mol	2.00 mol	1.00 mol	2.00 mol
	grams	111.0 g	80.0 g	74.1 g	117.0 g
2	moles			0.500 mol	
	grams	55.5 g		37.0 g	58.5 g
3	moles		0.200 mol	0.100 mol	
	grams				
4	moles				
	grams			10.0 g	

2. How many moles of $Ca(OH)_2$ are formed for every mole of NaOH used?

3. For every 0.50 mol of $Ca(OH)_2$ formed, how many moles of NaCl are formed?

4. Why isn't the number of grams of $CaCl_2$ identical to that of $Ca(OH)_2$?

5. How many grams of calcium chloride do you need to make 20.0 g of calcium hydroxide?

Part 2: Human Bones

1. The chemical equation for the reaction that forms calcium phosphate, the main ingredient in bones, is this:

$$\underset{\text{Calcium chloride}}{3CaCl_2(aq)} + \underset{\text{Sodium phosphate}}{2Na_3PO_4(aq)} \longrightarrow \underset{\text{Calcium phosphate}}{Ca_3(PO_4)_2(s)} + \underset{\text{Sodium chloride}}{6NaCl(aq)}$$

Calculate the molar mass of each substance and fill in the table.

	Reactant		Product	
	$CaCl_2$	Na_3PO_4	$Ca_3(PO_4)_2$	NaCl
Molar mass				

Imagine that this reaction is repeated three times in the laboratory using different amounts of reactants. Complete the table.

Reaction	Quantity	$CaCl_2(aq)$	$Na_3PO_4(aq)$	$Ca_3(PO_4)_2(s)$	$NaCl(aq)$
1	moles	3.00 mol	2.00 mol	1.00 mol	6.00 mol
	grams	333 g	328 g	310 g	351 g
2	moles			2.00 mol	
	grams	666 g		620 g	702 g
3	moles				
	grams			9.92 g	

2. For every mole of Na_3PO_4 used, how many moles of $Ca_3(PO_4)_2$ are formed?

3. For every 0.500 mol of $Ca_3(PO_4)_2$ formed, how many moles of $CaCl_2$ are used?

4. How many grams of calcium chloride do you need to make 20.0 g of human bone (calcium phosphate)?

5. Making Sense Outline the steps you took to calculate the number of grams of calcium chloride needed to make 20.0 g of calcium phosphate.

6. If You Finish Early How many moles of product would you make if you added 10.0 g of $CaCl_2$ to 10.0 g of NaOH?