Question No. 1 of 10

Instructions: (1) Read the problem statement and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

1. How many grams of AgCl will precipitate out if 0.27 moles of $CaCl_2$ is reacted?

$CaCl_2 + 2\ AgNO_3 \rightarrow 2\ AgCl + Ca(NO_3)_2$

(A) 77 g AgCl
(B) 39 g AgCl
(C) 0.54 g AgCl
(D) 0.054 g AgCl
(E) 0.027 g AgCl

Feedback

A. Correct!
You successfully completed the stoichiometry problem.

B. Incorrect!
There are 2 moles of AgCl produced for each molecule of $CaCl_2$ reacted.

C. Incorrect!
First move from moles $CaCl_2$ to moles AgCl using the balanced equation coefficient, and then move from mole AgCl to grams AgCl using the molar mass.

D. Incorrect!
First move from moles $CaCl_2$ to moles AgCl using the balanced equation coefficient, and then move from mole AgCl to grams AgCl using the molar mass.

E. Incorrect!
First move from moles $CaCl_2$ to moles AgCl using the balanced equation coefficient, and then move from mole AgCl to grams AgCl using the molar mass.

Solution

Mole ratio: 1 mole $CaCl_2$ = 2 mole AgCl

Molar mass: 1 mole AgCl = 143.35 g AgCl

$$\frac{0.27\ \cancel{\text{mole}}\ \cancel{CaCl_2}}{} \left| \frac{2\ \cancel{\text{mole}}\ \cancel{AgCl}}{1\ \cancel{\text{mole}}\ \cancel{CaCl_2}} \right| \frac{143.35\ \text{g AgCl}}{1\ \cancel{\text{mole}}\ \cancel{AgCl}} = 77\ \text{g AgCl}$$

The correct answer is (A).

Question No. 2 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

2. How many grams of $MgCl_2$ are produced if 2.4 g Mg is reacted?

$Mg\ (s) + 2\ HCl\ (aq) \rightarrow MgCl_2\ (aq) + H_2\ (g)$

(A) 0.47 g $MgCl_2$
(B) 4.7 g $MgCl_2$
(C) 9.4 g $MgCl_2$
(D) 19 g $MgCl_2$
(E) 0.94 g $MgCl_2$

Feedback

A. Incorrect!
Move from grams to mole of Mg using molar mass and then move from mole Mg to mole $MgCl_2$ using the balanced equation coefficients and then move from mole $MgCl_2$ to grams using molar mass.

B. Incorrect!
There is 1 mole of Mg for every 1 mole of $MgCl_2$.

C. Correct!
You successfully completed the stoichiometry calculation.

D. Incorrect!
Move from grams to mole of Mg using molar mass and then move from mole Mg to mole $MgCl_2$ using the balanced equation coefficients and then move from mole $MgCl_2$ to grams using molar mass.

E. Incorrect!
Move from grams to mole of Mg using molar mass and then move from mole Mg to mole $MgCl_2$ using the balanced equation coefficients and then move from mole $MgCl_2$ to grams using molar mass.

Solution

Mole ratio: 1 mole Mg = 1 mole $MgCl_2$

Molar mass: 1 mole Mg = 24.31 g Mg

Molar mass: 1 mole $MgCl_2$ = 95.21 g $MgCl_2$

$$\frac{\cancel{2.4\ g\ Mg} \quad \cancel{1\ mole\ Mg} \quad \cancel{1\ mole\ MgCl_2} \quad 95.21\ g\ MgCl_2}{24.31\ g\ Mg \quad \cancel{1\ mole\ Mg} \quad \cancel{1\ mole\ MgCl_2}} = 9.4\ g\ MgCl_2$$

Mental Math -> 2.4/24 = 0.1 then 0.1* 95 = 9.5 ---- closest answer is 9.4.

The correct answer is (C).

Question No. 3 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

3. How many liters of 0.50M HCl are needed to react with 7.4 g $Ca(OH)_2$?

$2\ HCl\ (aq) + Ca(OH)_2\ (s) \rightarrow CaCl_2\ (aq) + 2\ H_2O\ (l)$

(A) 0.40 L HCl
(B) 0.20 L HCl
(C) 0.80 L HCl
(D) 0.10 L HCl
(E) 0.05 L HCl

Feedback

A. Correct!
You correctly completed the stoichiometry calculation.

B. Incorrect!
There are 2 moles of HCl for every 1 mole of calcium hydroxide.

C. Incorrect!
There are 2 moles of HCl for every 1 mole of calcium hydroxide.

D. Incorrect!
Move from grams calcium hydroxide to moles using molar mass. Then move from moles calcium hydroxide to moles hydrochloric acid using balanced equation ratio. Finally, move from moles hydrochloric acid to liters using the concentration.

E. Incorrect!
Move from grams calcium hydroxide to moles using molar mass. Then move from moles calcium hydroxide to moles hydrochloric acid using balanced equation ratio. Finally, move from moles hydrochloric acid to liters using the concentration.

Solution

Mole ratio: 2 mole HCl consumed to make 1 mole $Ca(OH)_2$

Molar mass: 1 mole $Ca(OH)_2$ = 74.10 g $Ca(OH)_2$

Molarity: 0.50 mole HCl = 1 L HCl

7.4 g / 74.1 g per mole = 0.1 mole $Ca(OH)_2$

0.1 mole * 2 HCl = 0.2 mole of HCl required

0.2 mole HCl / 0.5 M (moles/liter) = 0.4 liter

$$\frac{7.4\ g\ Ca(OH)_2}{} \times \frac{\cancel{1\ mole\ Ca(OH)_2}}{\cancel{74.1\ g\ Ca(OH)_2}} \times \frac{\cancel{2\ mole\ HCl}}{\cancel{1\ mole\ Ca(OH)_2}} \times \frac{1\ L\ HCl}{0.50\ mole\ HCl} = 0.4\ L\ HCl$$

The correct answer is (A).

Question No. 4 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

4. How many liters of gas are formed if 62.0 g H_2CO_3 decomposes?

H_2CO_3 (s) → H_2O (l) + CO_2 (g)

(A) 62.0 L CO_2
(B) 11.2 L CO_2
(C) 44.8 L CO_2
(D) 22.4 L CO_2
(E) 5.6 L CO_2

Feedback

A. Incorrect!
The ratio of moles carbon dioxide to moles carbonic acid is 1:1.

B. Incorrect!
The ratio of moles carbon dioxide to moles carbonic acid is 1:1.

C. Incorrect!
The ratio of moles carbon dioxide to moles carbonic acid is 1:1.

D. Correct!
You successfully used the molar volume of a gas at STP in stoichiometry.
STP = **S**tandard **T**emperature and **P**ressure.

E. Incorrect!
The ratio of moles carbon dioxide to moles carbonic acid is 1:1.

Solution

Mole ratio: 1 mole H_2CO_3 decomposes to produce 1 mole CO_2 (g)

Molar mass: 1 mole H_2CO_3 = 62.03 g H_2CO_3

62 g / 62 g per mole = 1.0 mole

Molarity: 1 mole CO_2 (g) = 22.4 L at STP (This is a constant that you should learn. You will see it again)

$$\frac{62.0\text{ g } H_2CO_3}{} \times \frac{1\text{ mole } H_2CO_3}{62.03\text{ g } H_2CO_3} \times \frac{1\text{ mole } CO_2}{1\text{ mole } H_2CO_3} \times \frac{22.4\text{ L } CO_2}{1\text{ mole } CO_2} = 22.4\text{ L } CO_2$$

The correct answer is (D).

Question No. 5 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

5. How many grams of $CaCl_2$ is produced with 15 g $Ca(OH)_2$ reacts with 15 g HCl?

$2\ HCl\ (aq) + Ca(OH)_2\ (s) \rightarrow CaCl_2\ (aq) + 2\ H_2O\ (l)$

(A) 23 g $CaCl_2$
(B) 22 g $CaCl_2$
(C) 11 g $CaCl_2$
(D) 46 g $CaCl_2$
(E) 45 g $CaCl_2$

Feedback

A. Incorrect!
When you have two given quantities for stoichiometry, always complete both calculations and choose the smaller answer.

B. Correct!
You chose the smaller answer from the two stoichiometry calculations.

C. Incorrect!
The ratio of hydrochloric acid to calcium chloride is 2:1 and the ratio of calcium hydroxide to calcium chloride is 1:1.

D. Incorrect!
The ratio of hydrochloric acid to calcium chloride is 2:1 and the ratio of calcium hydroxide to calcium chloride is 1:1.

E. Incorrect!
The ratio of hydrochloric acid to calcium chloride is 2:1 and the ratio of calcium hydroxide to calcium chloride is 1:1.

Solution

Mole ratio: 2 mole HCl = 1 mole $CaCl_2$

Molar ratio: 1 mole $Ca(OH)_2$ = 1 mole $CaCl_2$

Molar mass: 1 mole $CaCl_2$ = 110.98 g $CaCl_2$

Molar mass: 1 mole $Ca(OH)_2$ = 74.10 g $Ca(OH)_2$

Molar mass: 1 mole HCl = 36.46 g HCl

$$\frac{15\ g\ Ca(OH)_2}{} \left| \frac{1\ mole\ Ca(OH)_2}{74.10\ g\ Ca(OH)_2} \right| \frac{1\ mole\ CaCl_2}{1\ mole\ Ca(OH)_2} \left| \frac{110.98\ g\ CaCl_2}{1\ mole\ CaCl_2} \right. = 22.2\ g\ CaCl_2$$

$$\frac{15\ g\ HCl}{} \left| \frac{1\ mole\ HCl}{36.46\ \sout{g\ HCl}} \right| \frac{1\ mole\ CaCl_2}{2\ mole\ HCl} \left| \frac{110.98\ g\ CaCl_2}{1\ mole\ CaCl_2} \right. = 23.3\ g\ CaCl_2$$

The first thing to recognize here is that one of the reactants is probable "limiting". The second thing to do it to determine which reactant is limiting. The third thing to do is to calculate the amount of $CaCl_2$ that can per produced from 15 gram of the limiting reactant.

The correct answer is (B).

Question No. 6 of 10

Instruction: (1) Read the problem statement and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

6. A student runs the following reaction and calculates that he should get a total of 0.75 g AgCl precipitate. After the lab is completed, he found that he only got 0.65 g AgCl. What was his percent yield?

$CaCl_2 + 2\ AgNO_3 \rightarrow 2\ AgCl + Ca(NO_3)_2$

(A) 115.3 %
(B) 13.3 %
(C) 15.4 %
(D) 72.5 %
(E) 86.7 %

Feedback

A. Incorrect!
Percent yield is found by dividing the actual yield of a reaction to the theoretical yield found through stoichiometry.

B. Incorrect!
Percent yield is found by dividing the actual yield of a reaction to the theoretical yield found through stoichiometry.

C. Incorrect!
Percent yield is found by dividing the actual yield of a reaction to the theoretical yield found through stoichiometry.

D. Incorrect!
Percent yield is found by dividing the actual yield of a reaction to the theoretical yield found through stoichiometry.

E. Correct!
Percent yield is found by dividing the actual yield of a reaction to the theoretical yield found through stoichiometry.

Solution

% yield = actual yield / expected yield $\times$ 100%

% yield = (0.65 g / 0.75 g) $\times$ 100% = 86.7%

The correct answer is (D).

Question No. 7 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

7. How many grams of HCl is needed if 2.0 g Mg is reacted?

$Mg\ (s) + 2\ HCl\ (aq) \rightarrow MgCl_2\ (aq) + H_2\ (g)$

(A) 6.00 g HCl
(B) 2.67 g HCl
(C) 5.34 g HCl
(D) 3.00 g HCl
(E) 1.50 g HCl

Feedback

A. Correct!
You converted grams magnesium to moles magnesium and then used the mole ratio from the balanced equation to reach moles HCl and then converted to grams hydrochloric acid.

B. Incorrect!
You need to convert grams to moles for magnesium and then use the molar ratio from the balanced equation to reach moles HCl before converting back to grams.

C. Incorrect!
You need to convert grams to moles for magnesium and then use the molar ratio from the balanced equation to reach moles HCl before converting back to grams.

D. Incorrect!
You need to convert grams to moles for magnesium and then use the molar ratio from the balanced equation to reach moles HCl before converting back to grams.

E. Incorrect!
You need to convert grams to moles for magnesium and then use the molar ratio from the balanced equation to reach moles HCl before converting back to grams.

Solution

Mole ratio: 1 mole Mg = 2 mole HCl

Molar mass: 1 mole Mg = 24.31 g Mg

Molar mass: 1 mole HCl = 36.46 g HCl

$$\frac{\cancel{2.0\ g\ Mg} \quad \cancel{1\ mole\ Mg} \quad \cancel{2\ mole\ HCl} \quad 36.46\ g\ HCl}{24.31\ g\ Mg \quad \cancel{1\ mole\ Mg} \quad \cancel{1\ mole\ HCl}} = 6.00\ g\ MgCl_2$$

The correct answer is (A).

Question No. 8 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

8. If 100.0 mL HCl is required to react with 3.7 g $Ca(OH)_2$, what is the concentration of the HCl?

$$2\ HCl\ (aq) + Ca(OH)_2\ (s) \rightarrow CaCl_2\ (aq) + 2\ H_2O\ (l)$$

(A) 0.17 M HCl
(B) 0.10 M HCl
(C) 0.34 M HCl
(D) 1.0 M HCl
(E) 0.68 M HCl

Feedback

A. Incorrect!
First convert the moles calcium hydroxide using the molar mass and then convert to moles HCl using the balanced equation coefficients. Finally, divide moles HCl by the liters of the acid.

B. Incorrect!
You found the moles of HCl, but the questioned asked for molarity.

C. Incorrect!
First convert the moles calcium hydroxide using the molar mass and then convert to moles HCl using the balanced equation coefficients. Finally, divide moles HCl by the liters of the acid.

D. Correct!
You successfully completed a solution stoichiometry calculation.

E. Incorrect!
First convert the moles calcium hydroxide using the molar mass and then convert to moles HCl using the balanced equation coefficients. Finally, divide moles HCl by the liters of the acid.

Solution

Mole ratio: 2 mole HCl = 1 mole $Ca(OH)_2$

Molar mass: 1 mole $Ca(OH)_2$ = 74.10 g $Ca(OH)_2$

$$\frac{3.7\ g\ Ca(OH)_2}{} \left| \begin{array}{c|c} \cancel{1\ mole\ Ca(OH)_2} & \cancel{2\ mole\ HCl} \\ \hline \cancel{74.1\ g\ Ca(OH)_2} & \cancel{1\ mole\ Ca(OH)_2} \end{array} \right. = 0.10\ mole\ HCl$$

Molarity = 0.10 mole HCl / 0.100 L HCl = 1.0 M HCl

The correct answer is (D).

Question No. 9 of 10

Instruction: (1) Read the problem statement and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

9. How many grams of water are formed with 11.5 L CO_2 at standard temperature and pressure?

H_2CO_3 (s) $\rightarrow$ H_2O (l) + CO_2 (g)

(A) 14.30 g H_2O
(B) 9.25 g H_2O
(C) 4.71 g H_2O
(D) 11.5 g H_2O
(E) 28.60 g H_2O

Feedback

A. Incorrect!
First convert liters to moles for carbon dioxide using the molar volume of a gas at STP, and then convert to moles water using the balanced equation coefficients, and finally to grams water using molar mass.

B. Correct!
You correctly completed a gas stoichiometry calculation using molar volume of a gas at STP.

C. Incorrect!
First convert liters to moles for carbon dioxide using the molar volume of a gas at STP, and then convert to moles water using the balanced equation coefficients, and finally to grams water using molar mass.

D. Incorrect!
First convert liters to moles for carbon dioxide using the molar volume of a gas at STP, and then convert to moles water using the balanced equation coefficients, and finally to grams water using molar mass.

E. Incorrect!
First convert liters to moles for carbon dioxide using the molar volume of a gas at STP, and then convert to moles water using the balanced equation coefficients, and finally to grams water using molar mass.

Solution

Mole ratio: 1 mole H_2O = 1 mole CO_2

Molar mass: 1 mole H_2O = 18.02 g H_2O

Molarity: 1 mole CO_2 = 22.4 L at STP

$$\frac{11.5\ \cancel{\text{L}}\ \cancel{CO_2}}{} \left| \frac{1\ \text{mole}\ CO_2}{22.4\ \cancel{\text{L}}\ \cancel{CO_2}} \right| \frac{1\ \text{mole}\ H_2O}{1\ \text{mole}\ CO_2} \left| \frac{18.02\ \text{g}\ H_2O}{1\ \text{mole}\ H_2O} \right. = 9.25\ \text{g}\ H_2O$$

The correct answer is (B).

Question No. 10 of 10

Instructions: (1) Read the problem and answer choices carefully (2) Work the problems on paper as needed (3) Pick the answer (4) Go back to review the core concept tutorial as needed.

Question

10. Stoichiometry ratios come from ____.

(A) The masses of reactants and products in a balanced equation.
(B) The number of moles of reactants and products in a balanced equation.
(C) The actual mass produced in a chemical reaction.
(D) The subscripts within the chemical formulas.
(E) The total number of molecules.

Feedback

A. Incorrect!
Stoichiometry is not based on masses.

B. Correct!
The mole ratio is the stoichimetric ratio.

C. Incorrect!
Stoichiometry is not based on masses.

D. Incorrect!
Stoichiometric ratio is not the subscripts within a molecule.

E. Incorrect!
Stoichiometric ratios are not based on the total number of molecules.

Solution

The number of moles of reactant and products in a balanced equation determines the stoichiometric ratio.

The correct answer is (B).