Question No. 1 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

1. How many moles are equal to 2.85×10^{26} molecules?

(A) 0.00211 mole
(B) 473 mole
(C) 1.72×10^{50} mole
(D) 4.73×10^{48} mole
(E) The chemical formula is needed to complete this problem.

Feedback

A. Incorrect!
You divided the numbers the opposite way. Check your set-up.

B. Correct!
You successfully converted molecules to moles.

C. Incorrect!
Avogadro's number needs to be placed on the bottom of the equivalent.

D. Incorrect!
Use the exponent key (EE or EXP) when calculating with scientific notation.

E. Incorrect!
A mole is always the same number of molecules, no matter what molecule it is being used with.

Solution

1 mole = 6.02×10^{23} molecules

$$\frac{2.85 \times 10^{26} \text{ molecules}}{1} \left| \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molecules}} \right. = \frac{473}{\text{mole}}$$

The correct answer is (B).

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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. Find the molar mass of $Fe_2(SO_4)_3$.

(A) 351.98 g/mole
(B) 344.06 g/mole
(C) 207.77 g/mole
(D) 399.91 g/mole
(E) 288.21 g/mole

Feedback

A. Incorrect!
You multiply the subscripts outside and inside the parenthesis, not add them.

B. Incorrect!
There are two iron atoms, not just one.

C. Incorrect!
You need to multiply the subscript outside the parenthesis by the subscripts inside the parenthesis to get the total atom count.

D. Correct!
You correctly calculated the molar mass of the compound.

E. Incorrect!
There are 2 iron cations to add into the total.

Solution

Fe $2 \times 55.85 = 111.70$

S $3 \times 32.07 = 96.21$

O $12 \times 16.00 = \underline{192.00}$

399.91 g/mole

The correct answer is (D).

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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 molecules are in 15.75 g of H_2O?

(A) 0.874 molecules
(B) 4.71×10^{-22} molecules
(C) 5.26×10^{23} molecules
(D) 5.57×10^{23} molecules
(E) 1.71×10^{26} molecules

Feedback

A. Incorrect!
You converted grams to moles, but you need to take it one step farther to get to molecules.

B. Incorrect!
Check your calculations again.

C. Correct!
You successfully converted grams to molecules.

D. Incorrect!
There are two hydrogen atoms in a water molecule.

E. Incorrect!
The 18.02 goes on the bottom of the equivalent with the gram unit.

Solution

Molar mass = grams for 1 mole

1 mole = 6.02×10^{23} molecules

Hydrogen … 2 molecules × 1.01 g/mole H = 2.02 g/mole of H_2

Oxygen … 1 molecule × 16.00 g/mole = 16.00 g/mole

18.02 g/mole

$$\frac{15.75 \text{ g } H_2O}{} \left| \frac{1 \text{ mole } H_2O}{18.02 \text{ g } H_2O} \right| \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mole } H_2O} = 5.262 \times 10^{23} \text{ molecules } H_2O$$

The correct answer is (C).

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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. Find the percent composition, by mass, of copper in $Cu(CH_3COO)_2$?

(A) 50.56 %
(B) 67.55 %
(C) 51.84 %
(D) 34.98 %
(E) 65.02 %

Feedback

A. Incorrect!
To find percent by mass, divide the mass of copper by the mass of the entire compound.

B. Incorrect!
To find percent by mass, divide the mass of copper by the mass of the entire compound.

C. Incorrect!
You need to distribute the subscript outside the parenthesis to the atoms inside the parenthesis when finding the whole molar mass.

D. Correct!
You correctly calculated the percent copper by mass.

E. Incorrect!
That is the percent composition for the acetate anion.

Solution

% = (part ÷ whole) × 100%

The “part” is the mass of Cu in the compound.

The “whole” is the molar mass of the whole compound

Cu 1 × 63.55 = 63.55

C 4 × 12.01 = 48.04

H 6 × 1.01 = 6.06

O 4 × 16.00 = 64.00

181.65 g/mole

% Cu = (63.55 ÷ 181.65) × 100% = 34.98%

The correct answer is (D).

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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. Find the empirical formula and molecular formula if the sample is composed only of nitrogen and oxygen, the nitrogen is 30.4% nitrogen, and has a molar mass of 92 g/mole?

(A) NO_2, N_2O_4
(B) NO_2, NO_2
(C) NO_2, N_3O_6
(D) N_2O_4, NO_2
(E) N_2O_4, N_2O_4

Feedback

A. Correct!
You correctly determined the empirical formula and the molecular formula.

B. Incorrect!
You correctly determined the empirical formula, but the molecular formula's mass is double that.

C. Incorrect!
You correctly determined the empirical formula, but the molecular formula's mass is double that.

D. Incorrect!
You have the empirical and molecular formulas flipped.

E. Incorrect!
The molecular formula is correct, but the empirical formula needs to be the lowest whole number ratio of the molecular formulas.

Solution

Empirical formula is the lowest whole number ratio of the moles of each atom

If percent composition is given, use the percents as grams.

The molecular formula is the actual ratio of atoms—found by finding the ratio of the empirical formula's molar mass to the molecular formula's molar mass

$$\frac{30.4\text{ g N}}{} \left| \frac{1\text{ mole N}}{14.01\text{ g N}} \right. = 2.17\text{ mole N}$$

$$\frac{69.6\text{ g O}}{} \left| \frac{1\text{ mole}}{16.00\text{ g O}} \right. = 4.35\text{ mole O}$$

$$\frac{2.17\text{ mole N}}{2.17\text{ mole}} = 1\text{ N}$$

$$\frac{4.35\text{ mole N}}{2.17\text{ mole}} = 2\text{ O}$$

Empirical formula = NO_2

Empirical formula's molar mass:

N $1 \times 14.01 = 14.01$

O $2 \times 16.00 = \underline{32.00}$

46.01 g/mole

$$\frac{92\text{ g/mole}}{46\text{ g/mole}} = 2$$

Molecular formula = $NO_2 \times 2 = N_2O_4$

The correct answer is (A).

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Question No. 6 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

6. How many moles of oxygen atoms are in 4 moles of O_2?

(A) 2
(B) 4
(C) 6
(D) 8
(E) 16

Feedback

A. Incorrect!
There are 2 moles of oxygen atoms in each mole of O_2, but this problem is asking about 4 moles of O_2.

B. Incorrect!
There are 2 moles of oxygen atoms in each mole of O_2.

C. Incorrect!
There are 2 moles of oxygen atoms in each mole of O_2.

D. Correct!
There are 2 moles of oxygen atoms in each mole of O_2 and this problem asked about 4 moles of O_2 (2*4 = 8).

E. Incorrect!
There are 2 moles of oxygen atoms in each mole of O_2 and this problem asked about 4 moles of O_2.

Solution

There are 2 moles of oxygen atoms in each mole of O_2 and this problem asked about 4 moles of O_2, which would have 8 oxygen atoms.

The correct answer is (D).

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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. What percent by mass of water is hydrogen?

(A) 2% H
(B) 67% H
(C) 5.6% H
(D) 11.2% H
(E) 88.8% H

Feedback

A. Incorrect!
There are 2 hydrogen atoms in one water molecule, but that's not percent by mass.

B. Incorrect!
To find percent by mass, divide the mass of hydrogen in water by the mass of water overall.

C. Incorrect!
There are two hydrogen atoms in water, so the mass of hydrogen in water is 2*H and then you divide that by water overall.

D. Correct!
The percent by mass of hydrogen is the mass of hydrogen in water divided by the mass of water overall.

E. Incorrect!
You found the percent by mass of oxygen in water.

Solution

H_2O : $2 \times 1.01 + 16.00 = 18.02$
%H : $(2 \times 1.01 / 18.02) \times 100\% = 11.2\%$ H

The correct answer is (D).

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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.** Which of the following is a possible molecular formula with the empirical formula CH_4? (A) C_2H_6 (B) C_2H_4 (C) CH_8 (D) C_2H_8 (E) C_3H_7
 Feedback	A. Incorrect! This one is not a 1:4 ratio. Think about multiples, not adding.
	B. Incorrect! This one is not a 1:4 ratio.
	C. Incorrect! This one is not a 1:4 ratio.
	D. Correct! This one is a 1:4 ratio.
	E. Incorrect! This one is not a 1:4 ratio. Think about multiples, not adding.
 Solution	Empirical formula is the lowest possible ratio of atoms in a molecule. The molecular formula that is possible would have the same ratio as 1:4 **The correct answer is (D).**

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Question No. 9 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

9. The molecular mass is ____.

(A) The mass, in grams, of one molecule.
(B) The mass, in grams, of one mole of molecules.
(C) The moles of one gram of molecules.
(D) The moles of one molecule.
(E) The moles of molecules.

Feedback

A. Incorrect!
Molecular mass is mass in grams, but not of one molecule.

B. Correct!
Molecular mass is the mass in grams of one mole of molecules.

C. Incorrect!
The molecular mass is a mass, not number of moles.

D. Incorrect!
The molecular mass is a mass, not number of moles.

E. Incorrect!
The molecular mass is a mass, not number of moles.

Solution

The mass, in grams, of one mole of molecules.

The correct answer is (B).

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Question No. 10 of 10

Instruction: (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. Avogrado's number is _____.

(A) The mass of 1 mole of molecules.
(B) The mass of 1 mole of atoms.
(C) The volume of 1 mole of molecules.
(D) The number of moles in 1 molecule.
(E) The number of particles in 1 mole.

Feedback

A. Incorrect!
That definition is for molecular mass.

B. Incorrect!
That definition is the average atomic mass.

C. Incorrect!
That's the molar volume of a gas.

D. Incorrect!
It's not the number of moles in 1 molecule, but the number of molecules in 1 mole.

E. Correct!
Avogadro's number is the number of particles in 1 mole.

Solution

Avogadro's number is the number of particles in 1 mole. Particles can be atoms, molecule, ions …

The correct answer is (E).

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