

Counting Atoms Worksheet Answer Key

NUMBER OF ATOMS IN A FORMULA

ANSWERS

Determine the number of atoms in the following chemical formulas.

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| 1. 2NaCl $\text{Na}=2$ $\text{Cl}=2$ | 11. $6\text{Cu}(\text{NO}_3)_2$ $\text{Cu}=6$ $\text{N}=12$ $\text{O}=36$ |
| 2. H_2SO_4 $\text{H}=2$ $\text{S}=1$ $\text{O}=4$ | 12. 4KMnO_4 $\text{K}=4$ $\text{Mn}=4$ $\text{O}=16$ |
| 3. 3KNO_3 $\text{K}=3$ $\text{N}=3$ $\text{O}=9$ | 13. $2\text{H}_2\text{O}_2$ $\text{H}=4$ $\text{O}=4$ |
| 4. CaCl_2 $\text{Ca}=1$ $\text{Cl}=2$ | 14. $3\text{H}_3\text{PO}_4$ $\text{H}=9$ $\text{P}=3$ $\text{O}=12$ |
| 5. $4\text{C}_2\text{H}_6$ $\text{C}=8$ $\text{H}=24$ | 15. $2(\text{NH}_4)_3\text{PO}_4$ $\text{N}=6$ $\text{H}=24$ $\text{P}=2$ $\text{O}=8$ |
| 6. $2\text{Ba}(\text{OH})_2$ $\text{Ba}=2$ $\text{O}=4$ $\text{H}=4$ | 16. $2\text{Fe}_2\text{O}_3$ $\text{Fe}=4$ $\text{O}=6$ |
| 7. $3\text{NH}_4\text{Br}$ $\text{N}=3$ $\text{H}=12$ $\text{Br}=3$ | 17. $\text{NaC}_2\text{H}_3\text{O}_2$ $\text{Na}=1$ $\text{C}=2$ $\text{H}=3$ $\text{O}=2$ |
| 8. $4\text{Ca}_3(\text{PO}_4)_2$ $\text{Ca}=12$ $\text{P}=8$ $\text{O}=32$ | 18. $4\text{Mg}(\text{C}_2\text{H}_3\text{O}_2)_2$ $\text{Mg}=4$ $\text{C}=16$ $\text{H}=24$ $\text{O}=16$ |
| 9. $2\text{Al}_2(\text{SO}_4)_3$ $\text{Al}=4$ $\text{S}=6$ $\text{O}=24$ | 19. $3\text{Hg}_2\text{Cl}_2$ $\text{Hg}=6$ $\text{Cl}=6$ |
| 10. $3\text{Mg}(\text{NO}_3)_2$ $\text{Mg}=3$ $\text{N}=6$ $\text{O}=18$ | 20. $2\text{K}_2\text{SO}_3$ $\text{K}=4$ $\text{S}=2$ $\text{O}=6$ |

Counting Atoms Worksheet Answer Key: Your Guide to Mastering Atomic Calculations

Are you struggling with those tricky counting atoms worksheets? Feeling overwhelmed by the seemingly endless stream of chemical formulas and subscripts? You're not alone! Many students find atomic calculations challenging, but mastering this skill is crucial for success in chemistry. This comprehensive guide provides not only the answers to common counting atoms worksheets but also a thorough explanation of the concepts involved, equipping you with the tools to confidently tackle

any similar problem you encounter. We'll break down the process step-by-step, making atomic calculations clear and understandable.

Understanding the Basics: Moles, Avogadro's Number, and Subscripts

Before diving into the answer keys, let's solidify our understanding of the fundamental principles behind counting atoms. The key players here are:

Moles: A mole is a unit of measurement in chemistry representing a specific number of particles (atoms, molecules, ions, etc.). This number is Avogadro's number, approximately 6.022×10^{23} . Think of a mole as a convenient way to count incredibly large numbers of tiny particles.

Avogadro's Number (N_A): As mentioned, this is the number of particles in one mole of a substance. It's a constant used in numerous chemical calculations.

Subscripts: In chemical formulas (e.g., H_2O), subscripts indicate the number of atoms of each element present in a single molecule. In H_2O , there are two hydrogen atoms and one oxygen atom.

Mastering the Subscript Method: A Step-by-Step Guide

The most common method for counting atoms involves carefully examining the subscripts in a chemical formula. Let's look at an example: Calculate the number of atoms in one molecule of glucose ($C_6H_{12}O_6$).

1. Identify the elements: We have Carbon (C), Hydrogen (H), and Oxygen (O).
2. Examine the subscripts: There are 6 carbon atoms, 12 hydrogen atoms, and 6 oxygen atoms.
3. Calculate the total: $6 + 12 + 6 = 24$ atoms in one molecule of glucose.

Counting Atoms Worksheet Answer Key Examples

Now, let's move to some specific examples and their solutions. Remember, understanding the process is far more important than simply memorizing answers.

Example 1: Counting Atoms in H_2SO_4

Question: How many atoms are present in one molecule of sulfuric acid (H_2SO_4)?

Answer: There are 2 hydrogen atoms, 1 sulfur atom, and 4 oxygen atoms. The total number of atoms is $2 + 1 + 4 = 7$ atoms.

Example 2: Counting Atoms in $(NH_4)_2SO_4$

Question: How many atoms are present in one formula unit of ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$?

Answer: This example involves parentheses, indicating that the entire group inside the parentheses is multiplied by the subscript outside.

NH_4 group: 1 nitrogen atom + 4 hydrogen atoms = 5 atoms

Two NH_4 groups: 5 atoms/group 2 groups = 10 atoms

SO_4 group: 1 sulfur atom + 4 oxygen atoms = 5 atoms

Total: 10 atoms + 5 atoms = 15 atoms

Example 3: Calculating Moles and Atoms

Question: How many atoms of oxygen are there in 2 moles of CO_2 ?

Answer:

1. Atoms of oxygen per molecule: There are 2 oxygen atoms in one molecule of CO_2 .
2. Molecules in 2 moles: 2 moles 6.022×10^{23} molecules/mole = 1.2044×10^{24} molecules
3. Total oxygen atoms: 1.2044×10^{24} molecules 2 atoms/molecule = 2.4088×10^{24} oxygen atoms

Beyond the Basics: More Complex Scenarios

Some worksheets might involve more complex scenarios, including hydrates (compounds with water molecules attached) or calculations involving molar mass. These require a deeper understanding of stoichiometry, a topic usually covered in more advanced chemistry courses. However, the fundamental principles of counting atoms using subscripts remain the same.

Conclusion

Mastering the art of counting atoms is fundamental to success in chemistry. By understanding the concepts of moles, Avogadro's number, and subscripts, and practicing with various examples, you can confidently tackle any counting atoms worksheet. Remember to break down complex formulas step-by-step, focusing on the individual elements and their respective subscripts. With consistent practice, you'll find these calculations become second nature.

FAQs

1. What if a chemical formula has parentheses and a subscript outside? Multiply the number of

atoms within the parentheses by the subscript outside the parentheses before adding up the total.

2. How do I handle hydrates when counting atoms? Treat the water molecules (H_2O) as separate entities and include their atoms in the total count.

3. Where can I find more practice worksheets? Many online resources and chemistry textbooks offer practice worksheets. Search for "counting atoms practice problems" online.

4. What is the difference between a molecule and a formula unit? Molecules are formed from covalent bonds (sharing electrons), while formula units represent the simplest ratio of ions in an ionic compound.

5. Can I use a calculator for these calculations? Absolutely! Especially when dealing with large numbers involving Avogadro's number, a calculator is highly recommended.

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