

Study Guide: Naming Chemical Compounds

This guide provides a review of the principles for naming ionic and molecular compounds, a quiz to test your understanding, and a glossary of essential terms based on the provided source materials.

Glossary of Key Terms	
Term	Definition
Anion	A negative ion, which is the Non-Metal component in an ionic compound.
Cation	A positive ion, which is the Metal component in an ionic compound.
Ionic Compound	A compound consisting of a Metal (Cation) and a Non-Metal (Anion).
Metal	An element that forms a positive ion (Cation) in an ionic compound.
Molecular (Covalent) Compound	A compound formed from the combination of two or more Non-Metals.
Non-Metal	An element that forms a negative ion (Anion) in an ionic compound or combines with other non-metals in a molecular compound.
Polyatomic Ion	A non-metal ion whose specific name is used directly when naming an ionic compound, without adding an "-ide" suffix. Examples include Nitrate (NO_3) and Phosphite (PO_3).
Prefix	A modifier (e.g., di, tri, tetra) added to the name of a non-metal in a molecular compound to indicate the number of atoms of that element present.
Roman Numerals	Numerals used in the name of an ionic compound to identify the specific positive charge of a transition metal that can have multiple potential charges (e.g., Iron(II) for Fe^{2+}).
Transition Metal	A type of metal that can have multiple potential charges. When naming an ionic compound containing a transition metal, a Roman numeral must be used to specify its charge.

Short-Answer Practice Quiz

Instructions: Answer the following ten questions in 2-3 sentences each, based on the provided information on chemical nomenclature.

1. What are the two main types of chemical compounds discussed, and what kinds of elements compose each?
2. Describe the general process for naming a simple ionic compound composed of a metal with a single, fixed charge and a non-metal.
3. Explain why Roman numerals are sometimes required when naming ionic compounds and provide an example from the source text.
4. How does the presence of a polyatomic ion, such as Nitrate (NO_3), alter the standard naming convention for an ionic compound?

5. What are the key rules for naming molecular (covalent) compounds? Use CCl_4 as an example.
6. Define the terms "cation" and "anion" and identify which corresponds to a metal and which to a non-metal in an ionic compound.
7. Based on the provided list of typical ionic charges, what would be the name of the compound with the formula Cu_2O ? Explain your reasoning.
8. Name the molecular compound P_4S_5 and detail how you arrived at that name using the rules for molecular compounds.
9. Based on the naming rules for molecular compounds, what is the chemical name for H_2O ? Explain the components of this name.

Essay Questions

Instructions: *The following questions are designed for longer-form, essay-style answers. Use the information from the source texts to construct comprehensive responses.*

1. Compare and contrast the rules for naming ionic and molecular compounds. Discuss the fundamental chemical difference between these two compound types that necessitates different naming systems.
2. Explain the role of element classification (metal vs. non-metal) in determining the correct naming procedure for a chemical compound. How does this initial classification guide the entire naming process for both ionic and molecular substances?
3. Using the list of typical ionic charges, construct three different valid ionic compounds that are not explicitly listed as examples in the text. For each, write the chemical formula and the correct chemical name, and provide a step-by-step justification for the name you have chosen, paying special attention to any transition metals with multiple charges.
4. Discuss the importance of prefixes in naming molecular compounds and Roman numerals in naming ionic compounds. Why is one system essential for molecular compounds, while the other is crucial for only a specific subset of ionic compounds?
5. The source provides two examples of ionic compounds containing polyatomic ions: Potassium Nitrate ($\text{K}(\text{NO}_3)$) and Calcium Phosphite ($\text{Ca}_3(\text{PO}_3)_2$). Based on the naming rule provided, what can you infer about the nature of polyatomic ions and how they function within the structure of an ionic compound?

Short Answer Practice Quiz Key

1. The two types are ionic and molecular compounds. Ionic compounds are composed of a metal and a non-metal, while molecular (covalent) compounds consist of non-metals combining with other non-metals.
2. To name a simple ionic compound, you first list the metal (cation) by its element name without any changes. Then, you list the non-metal (anion) but modify its name by adding the suffix "-ide".
3. Roman numerals are used for transition metals that can have multiple potential charges to specify which charge is present in the compound. For example, FeO is named Iron(II) Oxide because Iron (Fe) can also have a +3 charge, which would form a different compound.

4. When a polyatomic ion is present in an ionic compound, it is listed after the metal using its specific name without any modification. For instance, in $\text{K}(\text{NO}_3)$, the compound is named Potassium Nitrate, using the name of the polyatomic ion "Nitrate" directly.
5. For molecular compounds, list the first non-metal with a prefix indicating its quantity (unless there is only one). Then, list the second non-metal with a prefix for its quantity and change its ending to "-ide". CCl_4 is named Carbon Tetrachloride because it has one carbon and four chlorine atoms.
6. A cation is a positive ion, which is the metal in an ionic compound. An anion is a negative ion, which is the non-metal in an ionic compound.
7. The compound Cu_2O is named Copper(I) Oxide. Copper is a transition metal with multiple possible charges (+1 and +2), so a Roman numeral is required to specify the +1 charge state in this particular compound.
8. The name for P_4S_5 is Tetraphosphorus Pentasulfide. The prefix "Tetra-" indicates there are four phosphorus atoms, and the prefix "Penta-" means there are five sulfur atoms, with the ending for sulfur changed to "-ide".
9. The chemical name for H_2O is Dihydrogen Monoxide. The prefix "Di-" indicates there are two hydrogen atoms, while "Monoxide" means a single oxygen atom whose name ending has been changed to "-ide".