Names Behind Labels

Use naming clues and ion charges to identify compounds

CHE.5 "Students will investigate and understand the accepted nomenclature used to identify the name and chemical formulas of compounds. Use the periodic table and a list of common polyatomic ions as a model to derive chemical compound formulas..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Part 1 READ AND MARK: Underline the four everyday compound names, circle each ion written with a charge, and box one naming clue for each of these groups: stock compounds, covalent compounds, and binary acids.

What Is in the Package?

1. At a grocery store, compound names can point to useful materials. Sodium chloride seasons food, sodium bicarbonate helps dough rise, calcium carbonate appears in antacid tablets, and magnesium sulfate appears in some bath soaks. Their formulas can be built from ion charges, not guessed from the names. A periodic table helps identify common main-group ion charges, while an ion list gives polyatomic ion charges. Sodium is Na^+, calcium is Ca^{2+}, magnesium is Mg^{2+}, and chloride is Cl^-. Bicarbonate, also called hydrogen carbonate, is HCO_3^-; carbonate is CO_3^{2-}; sulfate is SO_4^{2-}. Combine ions in the smallest whole-number ratio that makes the total charge zero.

2. Names can also reveal charges that a periodic table alone cannot supply. Iron can form Fe^{2+} or Fe^{3+}; a Roman numeral in a compound name states which charge to use. For example, iron(II) sulfide contains Fe^{2+} and S^{2-}, so its formula is FeS. When reading a formula, work backward from the anion charge to find the metal charge before choosing the Roman numeral. Oxide is O^{2-}, and fluoride is F^-. Parentheses keep a polyatomic ion together when more than one is needed, as in aluminum sulfate, $Al_2(SO_4)_3$. Never change a polyatomic ion's internal subscripts while balancing charges.

3. Not every compound on a label contains ions. Covalent compounds join nonmetals, and prefixes give the number of atoms: mono- means one, di- means two, and tri- means three. The first element usually drops mono-, while the second ends in -ide. Sulfur trioxide, SO_3, follows that pattern. Acids have their own naming rules when dissolved in water. A binary acid, made with hydrogen and one other element, uses hydro- and -ic acid: HCl(aq) is hydrochloric acid. An acid containing an oxygen-rich polyatomic ion is ternary; nitrate, NO_3^-, gives HNO_3(aq), called nitric acid. Acid formulas balance H^+ with the negative ion.

2 ANSWER WITH EVIDENCE

Use the passage

1 Part 2 QUESTIONS, 1. Use the ion charges in the passage to write the formula for calcium chloride.

2 2. Name Fe_2O_3. Include a Roman numeral.

3 3. Use the prefix rules to name N_2O_3.

4 4. Write the formula for hydrofluoric acid dissolved in water.

3 YOUR TURN

Your own words

Part 3 YOUR TURN: Choose two everyday compounds named in the first paragraph. For each, derive its formula and state its use from the passage; then show how the ion charges balance in one of your formulas.

Names Behind Labels

PART 1 · READ AND MARK

Part 1 READ AND MARK: Underline the four everyday compound names, circle each ion written with a charge, and box one naming clue for each of these groups: stock compounds, covalent compounds, and binary acids. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Part 2 QUESTIONS, 1. Use the ion charges in the passage to write the formula for calcium chloride.	**$CaCl_2$. One Ca^{2+} balances two Cl^- ions.**
2	2. Name Fe_2O_3. Include a Roman numeral.	**Iron(III) oxide. Three O^{2-} ions require two Fe^{3+} ions.**
3	3. Use the prefix rules to name N_2O_3.	**Dinitrogen trioxide.**
4	4. Write the formula for hydrofluoric acid dissolved in water.	**HF(aq). H^+ and F^- balance in a 1:1 ratio.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Sodium chloride is NaCl and seasons food. Calcium carbonate is $CaCO_3$ and is used in antacid tablets. Ca^{2+} and CO_3^{2-} balance in a 1:1 ratio.

Accept any two of the four compounds in the first paragraph with correctly derived formulas and matching uses. The charge explanation must show a ratio that gives zero total charge.