Decode the Label

Use ion charges to write and read compound formulas.

CHE.5.1 "Use the periodic table and a list of common polyatomic ions as a model to derive chemical compound formulas from compound names and compound names from chemical formulas."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB In each of the three worked compound names, underline the positive ion and circle the negative ion, then write beside its formula how many of each ion it contains.

Labels at the Water-Testing Station

1. At a water-testing station, a faded bottle label can be more than a spelling problem. A chemical name tells which ions are present, while a formula shows how many of each ion make a neutral compound. Start with the positive ion, usually a metal, and then the negative ion. The periodic table helps: lithium, in group 1, forms Li^+, while oxygen, in group 16, forms O^{2-}. Two lithium ions balance one oxide ion, so lithium oxide is Li_2O. The subscript counts atoms, not charge. A missing subscript means one.

2. The same station tests water for dissolved ions. A reference card lists the polyatomic ions carbonate, CO_3^{2-}; phosphate, PO_4^{3-}; hydroxide, OH^-; and ammonium, NH_4^+. Each polyatomic ion is a bonded group that stays together when you build a formula. Sulfide, S^{2-}, is a single-atom ion instead. For a worked example, potassium is K^+ and sulfate is SO_4^{2-}. Potassium sulfate becomes K_2SO_4 because two potassium ions balance one sulfate ion. Keep the atoms inside each ion in their listed order; only change how many whole ions are used.

3. Some bottles contain metals that can form more than one charge. In iron(III) nitrate, the Roman numeral gives iron a 3+ charge, written Fe^{3+}. Nitrate is NO_3^-, so three nitrate ions balance one iron ion: $Fe(NO_3)_3$. Parentheses show that the outside subscript counts whole nitrate groups. For labels you must decode, the periodic table gives sodium as Na^+ and calcium as Ca^{2+}. A name with copper(II) gives Cu^{2+}. To name a formula, read its positive ion first and its negative ion second, and check that the total positive and negative charges cancel.

2 ANSWER WITH EVIDENCE

Use the passage

1. Write the formula for sodium carbonate.

2. Name $Ca_3(PO_4)_2$.

3. Write the formula for copper(II) hydroxide.

4. Name $(NH_4)_2S$.

3 YOUR TURN

Your own words

Choose one positive ion and one negative ion from the passage that are not paired together in the passage or Questions 1 to 4. Write your compound's name and formula, then explain how its charges balance.

Decode the Label

PART 1 · READ AND MARK

In each of the three worked compound names, underline the positive ion and circle the negative ion, then write beside its formula how many of each ion it contains. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Write the formula for sodium carbonate.	**Na_2CO_3**
2	Name $Ca_3(PO_4)_2$.	**Calcium phosphate**
3	Write the formula for copper(II) hydroxide.	**$Cu(OH)_2$**
4	Name $(NH_4)_2S$.	**Ammonium sulfide**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Calcium carbonate is $CaCO_3$. One Ca^{2+} ion and one CO_3^{2-} ion have charges that cancel.

For the marking job, the worked formulas contain two positive ions and one negative ion, two positive ions and one negative ion, and one positive ion and three negative ions, respectively. For Your Turn, accept any new pairing of ions from the passage with a correct name, neutral formula, and charge explanation.