

Formula Detective

Read chemical formulas by tracking each element symbol and subscript.

7.6.B “use the periodic table to identify the atoms and the number of each kind within a chemical formula;”

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline every element symbol and circle every subscript in the passage, then write the total number of atoms for each element above its symbol.

Atoms in a Formula

- ① At a water treatment plant, technicians record chemical formulas so everyone knows which atoms are present. A formula uses chemical symbols from the periodic table. Each capital letter begins a new element symbol. A lowercase letter, such as the l in Cl, stays with the capital letter before it. In CH_4 , C means carbon and H means hydrogen. No subscript after C means one carbon atom. The subscript 4 after H means four hydrogen atoms in each molecule.
- ② Some formulas name compounds with several kinds of atoms. In NaCl , Na is sodium and Cl is chlorine. Since neither symbol has a subscript, one sodium atom and one chlorine atom are in each formula unit. In MgO , Mg is magnesium, not manganese, because Mg is one two-letter symbol. A periodic table helps you match each symbol to its element name. Read from left to right, then record every element and its number of atoms.
- ③ A subscript applies only to the symbol immediately before it, unless parentheses group symbols together. In $\text{Al}_2(\text{SO}_4)_3$, there are two aluminum atoms. The 3 outside the parentheses multiplies every atom inside: one sulfur becomes three sulfur atoms, and four oxygen atoms become twelve oxygen atoms. Do not add subscripts from different elements. Instead, list each element separately and count it. This careful inventory lets scientists compare substances and check whether formulas have been copied correctly.

2 ANSWER WITH EVIDENCE Use the passage

- 1 Use the periodic table and the rule in the passage to identify the atoms in NH_3 . How many nitrogen atoms and hydrogen atoms are present?

- 2 What elements are in MgCl_2 , and how many atoms of each element are present?

- 3 Make an atom inventory for Fe_2O_3 . Name each element and give its number of atoms.

- 4 In $\text{Ca}(\text{OH})_2$, how many calcium, oxygen, and hydrogen atoms are present?

3 YOUR TURN Your own words

Choose three formulas from this list: KBr , CO_2 , $\text{Ca}(\text{OH})_2$, and Al_2O_3 . Complete the table to make an atom inventory for each formula you choose.

FORMULA	ELEMENT SYMBOLS	NUMBER OF EACH ATOM

PART 1 • READ AND MARK

Underline every element symbol and circle every subscript in the passage, then write the total number of atoms for each element above its symbol. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Use the periodic table and the rule in the passage to identify the atoms in NH_3 . How many nitrogen atoms and hydrogen atoms are present?	Nitrogen: 1 atom. Hydrogen: 3 atoms.
2	What elements are in MgCl_2 , and how many atoms of each element are present?	Magnesium: 1 atom. Chlorine: 2 atoms.
3	Make an atom inventory for Fe_2O_3 . Name each element and give its number of atoms.	Iron: 2 atoms. Oxygen: 3 atoms.
4	In $\text{Ca}(\text{OH})_2$, how many calcium, oxygen, and hydrogen atoms are present?	Calcium: 1 atom. Oxygen: 2 atoms. Hydrogen: 2 atoms.

PART 3 • YOUR TURN (SAMPLE ANSWER)

FORMULA	ELEMENT SYMBOLS	NUMBER OF EACH ATOM
KBr	K, Br	K: 1; Br: 1
CO_2	C, O	C: 1; O: 2
$\text{Ca}(\text{OH})_2$	Ca, O, H	Ca: 1; O: 2; H: 2

Accept element names or correct periodic-table symbols in the inventory. For formulas with parentheses, students must multiply the atoms inside the parentheses by the outside subscript.