

Welcome!

This is a lesson covering *how to name* and write formulas for *covalent compounds*.

The lesson also includes a Review Quiz covering all the Chemical Nomenclature topics we have covered in this chapter.

I will guide you step-by-step.

I will be asking you many questions along the way.

Each time I ask a question, **you should attempt to answer the question on your own** before you scroll down to view my answer.

This is a lesson in the chapter “Atoms, Molecules, and Compounds”, which is part of the series “Chemistry, Explained Step by Step”.

This lesson builds on the material covered in previous lessons:

[Distinguishing Ionic and Covalent Compounds](#)

[Naming Ionic Compounds](#)

[Writing Formulas for Ionic Compounds](#)

[Writing Formulas for Ionic Compounds with Transition Metals](#)

[Naming Ionic Compounds with Transition Metals](#)

[Ionic Compounds with Oxyanions: Names and Formulas](#)

[Names and Formulas Involving Other Polyatomic Ions](#)

You should complete those lessons before attempting this lesson.

This lesson was written by Freelance-Teacher.

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I offer **tutoring** in chemistry, and a variety of other subjects.

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1. Is $\text{Ca}(\text{NO}_3)_2$ an ionic compound or a covalent compound?

As we learned in the lesson on [Distinguishing Ionic and Covalent Compounds](#), the rule is:
If the formula contains a metal and a nonmetal, it usually represents an ionic compound.
If the formula contains only nonmetals, it usually represents a covalent compound.

MgCl_2 contains
a metal (magnesium)
and a nonmetal (chlorine).

Based on the rule above, we conclude that
 MgCl_2 is an ionic compound.

2. Is OCl_2 an ionic compound or a covalent compound?

OCl_2 contains
two nonmetals (oxygen and chlorine).

Based on the rule above, we conclude that
 OCl_2 is a covalent compound.

In earlier lessons, we learned that “ions” are charged atoms (or charged groups of atoms).

In earlier lessons, we learned that the structure of an ionic compound is composed of ions.

For example, consider the ionic compound CaBr_2 .

We can say that one formula unit of CaBr_2 contains
one monatomic Ca^{2+} cation, and
two monatomic Br^- anions.

For another example, consider the ionic compound Na_3PO_4 .

We can say that one formula unit of Na_3PO_4 contains
three monatomic Na^+ cations, and
one polyatomic PO_4^{3-} anion.

In contrast, *covalent compounds are **not** composed of ions.*

Rather, covalent compounds are composed of separate *molecules*.

Therefore, in this chapter,

we will *not* assign charges to individual atoms (or groups of atoms) inside a covalent compound.

In this chapter, we will treat each atom inside the covalent compound as neutral (zero charge).

For example, consider the covalent compound H_2SO_4 .

We can say that the one molecule of H_2SO_4 contains
two neutral hydrogen (H) atoms,
one neutral sulfur (S) atom, and
four neutral oxygen (O) atoms.

(In later chapters, we will see that the situation is actually more complicated.

But for the time being, for this chapter,

it will be best to think of each atom inside a covalent compound as “neutral”.)

A covalent compound is typically composed of two or more nonmetals.

For example: H_2O , NH_3 , CO_2 , OCl_2 , $\text{C}_6\text{H}_{12}\text{O}_6$, H_2SO_4 , HNO_3

A *binary covalent compound* is a covalent compound formed by *exactly two* nonmetals.

For example:

H_2O , NH_3 , CO_2 , and OCl_2 are all binary covalent compounds,
because they are each composed of exactly two different nonmetallic elements.

$\text{C}_6\text{H}_{12}\text{O}_6$, H_2SO_4 , HNO_3 are covalent compounds,
but they are not *binary* covalent compounds,
because they are each composed of three different nonmetallic elements.

In this lesson, we will learn how to name binary covalent compounds.

Here are six rules for naming binary covalent compounds.

1. The elements appear *in the same order* in the name as in the chemical formula.
2. The element that appears first in the name is referred to by the same name in the compound as the name of the element.
3. The element that appears second in the name is referred to in the compound by a name that ends with the suffix *-ide*.
4. Unlike ionic compounds, covalent compounds use Greek prefixes to represent the number of atoms of each element in the chemical formula.
5. The second element in the name *always* takes a Greek prefix.
6. The first element in the name always takes a Greek prefix, with the EXCEPTION that, when the prefix would be *mono-*, the prefix for the first element is omitted.

The prefix *mono-* can be used for the second element in the name, but never for the first element. All other prefixes can be used for both elements in the name.

Here are the Greek prefixes:

Number	Prefix
1	mono-
2	di-
3	tri-
4	tetra-
5	penta-
6	hexa-

For example:

3. What is the name of the compound represented by the chemical formula N_2O_4 ?

Answer: the name of N_2O_4 is *dinitrogen tetroxide*

Analysis:

First, we must check whether N_2O_4 is an ionic compound or a covalent compound.

N_2O_4 contains
two nonmetals (nitrogen and oxygen)
so N_2O_4 is a covalent compound.

Therefore, in order to name N_2O_4 properly,
we must follow the rules we just learned on this page for naming *covalent* compounds,
rather than the rules we learned in earlier lessons for naming ionic compounds.

The correct name for N_2O_4 is *dinitrogen tetroxide*.

Notice that:

The elements appear in the same order in the name as in the chemical formula.

Nitrogen appears first in both the name and the formula.

Oxygen appears second in the name, with the suffix *-ide*.

The formula contains two nitrogens and four oxygens, so we use the prefixes *di-* and *tetra-*.

4. What is the name of the compound represented by the chemical formula CO?

Answer: the name of CO is *carbon monoxide*

Analysis:

First, we must check whether CO is an ionic compound or a covalent compound.

CO contains

two nonmetals (carbon and oxygen)

so CO is a covalent compound.

The name of CO is *carbon monoxide*.

Notice that:

The elements appear in the same order in the name as in the chemical formula.

Carbon appears first in both the name and the formula.

Oxygen appears second in the name, with the suffix -ide.

The formula contains one carbon and one oxygen,

but the prefix mono- is omitted for the *first* element in the name,

so we use the prefix mono- only for the oxygen, not for the carbon.

You have probably heard of carbon monoxide.

It is a poisonous gas present in car exhaust fumes.

5. What is the name of CO₂?

Answer: the name of CO₂ is *carbon dioxide*

Analysis:

First, we must check whether CO₂ is an ionic compound or a covalent compound.

CO₂ contains
two nonmetals (carbon and oxygen)
so CO₂ is a covalent compound.

The name of CO₂ is *carbon dioxide*.

Notice that:

The elements appear in the same order in the name as in the chemical formula.

Carbon appears first in the name and formula.

Oxygen appears second in the name, with the suffix -ide.

The formula contains one carbon and two oxygens,

but the prefix mono- is omitted for the *first* element in the name,
so we use only the prefix di-.

No doubt you have heard of carbon dioxide.

It is the gas exhaled by animals, and absorbed by plants.

Notice that a small change in the chemical formula, CO₂ versus CO,
can mean the difference between a harmless gas and a poisonous one.

That's why it's important to report the names and chemical formulas for compounds accurately!

6. What is the name of the compound represented by the chemical formula NF_3 ?

Answer: the name of NF_3 is *nitrogen trifluoride*

Analysis:

First, we must check whether NF_3 is an ionic compound or a covalent compound.

NF_3 contains
two nonmetals (nitrogen and fluorine)
so NF_3 is a covalent compound.

The name of NF_3 is *nitrogen trifluoride*.

Notice that:

The elements appear in the same order in the name as in the chemical formula.

Nitrogen appears first in both the name and the formula.

Fluorine appears second in the name, with the suffix -ide.

The formula contains one nitrogen and three fluorines,
but the prefix mono- is omitted for the *first* element in the name,
so we use only the prefix tri-

7. What is the name of the compound represented by the chemical formula P_4S_3 ?

Answer: the name of P_4S_3 is *tetraphosphorus trisulfide*

Analysis:

First, we must check whether P_4S_3 is an ionic compound or a covalent compound.

P_4S_3 contains
two nonmetals (phosphorus and sulfur)
so P_4S_3 is a covalent compound.

The name of P_4S_3 is *tetraphosphorus trisulfide*.

Notice that:

The elements appear in the same order in the name as in the chemical formula.

Phosphorus appears first in both the name and the formula.

Sulfur appears second in the name, with the suffix -ide.

The formula contains four phosphorus atoms and three sulfur atoms,
so we use the prefixes tetra- and tri- to indicate the numbers of each.

Remember, **the prefix is omitted for the first element in the name *only* when the prefix would be mono-;**

otherwise, *both* elements in the name of a covalent compound should have a Greek prefix.

8. What is the name of the compound AlF_3 ?

Answer: the name of AlF_3 is *aluminum fluoride*.

Analysis:

First, we must check whether AlF_3 is an ionic compound or a covalent compound.

AlF_3 contains
a metal (aluminum), and
a nonmetal (fluorine).

So AlF_3 is an **ionic** compound;
one formula unit of AlF_3 is composed of
one monatomic Al^{3+} cation, and
three monatomic F^- anions.

So we must follow the rules we learned for naming *ionic* compounds in previous lessons,
rather than the rules for naming covalent compounds from this lesson.

The correct name for the ionic compound AlF_3 is *aluminum fluoride*.

Notice that **no Greek numerical prefixes are ever used in the names of ionic compounds;**
Greek numerical prefixes are used only for the names of covalent compounds.

9. What is the chemical formula for the compound dinitrogen tetrachloride?

Answer: the formula for dinitrogen tetrachloride is N_2Cl_4 .

Analysis:

The first step is to check whether dinitrogen tetrachloride is an ionic compound or a covalent compound.

Dinitrogen tetrachloride contains two nonmetals (nitrogen and chlorine).

So dinitrogen tetrachloride is a covalent compound.

So we follow the rules for binary covalent compounds.

The correct formula for dinitrogen tetrachloride is N_2Cl_4 .

Notice that:

The elements appear in the same order in the chemical formula as in the name.

For a *covalent* compound, the Greek prefixes from the name of the compound tell us the subscripts for the chemical formula.

10. What is the chemical formula for iodine trichloride?

Answer: the formula for iodine trichloride is ICl_3

Analysis:

The first step is to check whether iodine trichloride is an ionic compound or a covalent compound.

Iodine trichloride contains

two nonmetals (iodine and chlorine),

so iodine trichloride is a covalent compound.

The correct formula for iodine trichloride is ICl_3 .

Notice that:

The elements appear in the same order in the chemical formula as in the name.

For a *covalent* compound, the Greek prefixes from the name of the compound tell us the subscripts for the chemical formula.

The prefix mono- is generally omitted for the first element in the name,

so the name iodine trichloride indicates the presence of *one* iodine and three chlorines.

It is conventional to omit the subscript 1 from a chemical formula,

so the conventional formula is ICl_3 , not I1Cl3 .

11. What is the chemical formula for barium chloride?

Answer: The chemical formula for barium chloride is BaCl_2 .

Analysis:

First, check whether you're dealing with an ionic or a covalent compound.

BaCl_2 contains
a metal (Ba), and
a nonmetal (Cl).

So BaCl_2 is an **ionic** compound.

So we do not apply the rules for covalent compounds from this lesson.

Instead, we apply the rules for ionic compounds we learned in previous lessons.

When writing the formula for an *ionic* compound, it is *your job* to figure out the subscripts.

Ionic compounds have zero net charge.

So our job is to pick subscripts that will result in a net charge of zero.

As described in the earlier lessons,
we can use the following notation to confirm that
choosing subscripts of ₁ for barium and ₂ for chlorine
will result in a net charge of zero.

group charges	+2	-2
	Ba_1	Cl_2
individual charges	+2	-1

So the correct subscripts are ₁ for barium and ₂ for chlorine.

So the correct formula is BaCl_2 .

The previous problem reminds us that

when writing the formula for an *ionic* compound, it is *your job* to figure out the subscripts.

On the other hand, when writing the formula for a *covalent* compound, the subscripts are indicated by the Greek prefixes in the name.

As a result, as you may have noticed,

writing the correct formula is easier for covalent compounds than for ionic compounds.

12. From memory, write down all the numerical Greek prefixes, from one to six.

Number	Prefix
1	mono-
2	di-
3	tri-
4	tetra-
5	penta-
6	hexa-

You need to memorize these prefixes!

It's possible that your professor may also require you to memorize additional Greek prefixes for seven through ten:

Number	Prefix
7	hepta-
8	octa-
9	nona-
10	deca-

Let's review what we've learned in this lesson.

13. True or false? If false, how would you rewrite the statement so that it is true?

Names for ionic compounds use Greek prefixes to represent the number of atoms of each element in the chemical formula.

False.

Names for ionic compounds do *not* use Greek prefixes to represent the number of atoms of each element in the chemical formula;
rather, names for *covalent* compounds use Greek prefixes to represent the number of atoms of each element in the chemical formula.

14. True or false? If false, how would you rewrite the statement so that it is true?

When naming a binary covalent compound, the first element in the name never takes a Greek numerical prefix.

False.

When naming a binary covalent compound, the first element in the name *always* takes a Greek numerical prefix,
with the EXCEPTION of the prefix mono-.

The prefix mono- is always omitted for the *first* element in the name.

15. True or false. If false, how would you rewrite the statement so that it is true?

When naming a binary covalent compound, the second element in the name always takes a Greek numerical prefix.

True.

When naming a binary covalent compound, the second element in the name *always* takes a Greek numerical prefix.

Any Greek prefix can be used with the second element in the name,
including the prefix mono-.

16. True or false? If false, how would you rewrite the statement so that it is true?
When writing the chemical formula for a covalent compound, it is *your job* to figure out the correct subscripts for the formula.

False.

When writing the chemical formula for a covalent compound, the subscripts for the chemical formula are indicated by the Greek numerical prefixes in the name of the compound;
in contrast, when writing the chemical formula for an *ionic* compound, it is *your* job to figure out the correct subscripts for the formula.

Now I will give you a Review Quiz covering all the chemical nomenclature topics that we have covered in the last few lessons.

CHEMICAL NOMENCLATURE REVIEW QUIZ

17. From memory, write down the names and formulas, including net charges, for *all* the polyatomic cations and polyatomic anions (including oxyanions) that we have covered in these lessons.

Here's what you should have written down:

Table of Oxyanions

Formula	Name	Formula	Name	Formula	Name	Formula	Name	Formula	Name
ClO_4^-	perchlorate	—	—	—	—	—	—	—	—
ClO_3^-	chlorate	NO_3^-	nitrate	CO_3^{2-}	carbonate	SO_4^{2-}	sulfate	PO_4^{3-}	phosphate
ClO_2^-	chlorite	NO_2^-	nitrite	—	—	SO_3^{2-}	sulfite	—	—
ClO^-	hypochlorite	—	—	—	—	—	—	—	—

Other polyatomic anions:
hydroxide, HO^- or OH^-
cyanide, CN^-

Polyatomic cation:
ammonium, NH_4^+

Your professor may require you to be familiar with other polyatomic ions as well.

The Nomenclature Review Quiz continues on the next page.

NOMENCLATURE REVIEW QUIZ, continued

18. What is the name of SnCl_2 ?

Answer: The name of SnCl_2 is tin(II) chloride.

Analysis:

SnCl_2 contains

a metal (tin) and

a nonmetal (chlorine),

so SnCl_2 is an ionic compound.

You should have memorized that tin takes two possible charges, so we have to figure out the charge on the tin.

We use the following notation to figure out what the charge on each individual tin cation would have to be in order for the compound to have zero net charge.

group charges	+2	-2
	Sn_1	Cl_2
individual charges	?	-1

Each individual tin cation must have a charge of +2.

Therefore, the correct name for SnCl_2 is tin(II) chloride.

19. What is the chemical formula for phosphorus pentabromide?

Answer: The chemical formula for phosphorus pentabromide is PBr_5 .

Analysis:

Phosphorus pentabromide contains two nonmetals (phosphorus and bromine).

Therefore, phosphorus pentabromide is a covalent compound.

The elements appear in the same order in the name as in the formula.

"Penta-" means 5 bromine atoms.

Since there is no prefix on phosphorus, one atom is implied.

Therefore, the correct formula for phosphorus pentabromide is PBr_5 .

20. What is the chemical formula for aluminum cyanide?

Answer: The chemical formula for aluminum cyanide is $\text{Al}(\text{CN})_3$.

Analysis:

Aluminum cyanide contains

a metal (aluminum) and

two nonmetals (carbon and nitrogen)

Therefore, aluminum cyanide is an ionic compound.

When writing formulas for ionic compounds, it is your job to determine the subscripts.

We choose subscripts that will result in a net charge of zero.

The following notation demonstrates that subscripts of $_1$ for Al^{3+} and $_3$ for CN^- will result in a net charge of zero.

group charges	+3	-3
	Al_1	$(\text{CN})_3$
individual charges	+3	-1

Therefore, the correct formula for aluminum cyanide is $\text{Al}(\text{CN})_3$.

21. What is the chemical formula for dinitrogen tetrafluoride?

Answer: The chemical formula for dinitrogen tetrafluoride is N_2F_4 .

Analysis:

Dinitrogen tetrafluoride contains two nonmetals (nitrogen and fluorine).

Therefore, dinitrogen tetrafluoride is a covalent compound.

The elements appear in the same order in the name as in the formula.

"Di-" means two nitrogen atoms.

"Tetra-" means four fluorine atoms.

Therefore, the correct formula for dinitrogen tetrafluoride is N_2F_4 .

22. What is the name of $\text{Fe}_2(\text{SO}_4)_3$?

Answer: The name of $\text{Fe}_2(\text{SO}_4)_3$ is iron(III) sulfate.

Analysis:

$\text{Fe}_2(\text{SO}_4)_3$ contains

a metal (iron) and

two nonmetals (sulfur and oxygen)

Therefore, $\text{Fe}_2(\text{SO}_4)_3$ is an ionic compound.

Iron is a transition metal that takes two possible charges, so we have to figure out the charge on the iron cation.

We use the following notation to figure out what the charge on the iron cation would have to be in order for the compound to have zero net charge.

group charges	+6	-6
	Fe_2	$(\text{SO}_4)_3$
individual charges	?	-2

Each iron cation must have a charge of +3.

Therefore, the correct name for $\text{Fe}_2(\text{SO}_4)_3$ is iron(III) sulfate.

23. What is the name of P_2S_3 ?

Answer: The name of P_2S_3 is diphosphorus trisulfide.

Analysis:

P_2S_3 contains

two nonmetals (phosphorus and sulfur).

So, P_2S_3 is a covalent compound.

The elements appear in the same order in the name as in the formula.

There are two phosphorus atoms, so we use the prefix di-.

There are three sulfur atoms, so we use the prefix tri-.

Therefore, the correct name for P_2S_3 is diphosphorus trisulfide.

24. What is the chemical formula for zinc nitrate?

Answer: The chemical formula for zinc nitrate is $Zn(NO_3)_2$.

Analysis:

Zinc nitrate contains

a metal (zinc) and

two nonmetals (nitrogen and oxygen).

Therefore, zinc nitrate is an ionic compound.

When writing formulas for ionic compounds, it is your job to determine the subscripts.

We choose subscripts that will result in a net charge of zero.

You should have memorized that nitrate has formula and charge NO_3^- .

You should have memorized that, although it is a transition metal, zinc cations commonly take only one charge, namely, +2.

The following notation demonstrates that subscripts of $_1$ for the zinc cation and $_2$ for the nitrate anion will result in a net charge of zero.

group charges	+2	-2
	Zn_1	$(NO_3)_2$
individual charges	+2	-1

Therefore, the correct formula for zinc nitrate is $Zn(NO_3)_2$.

25. What is the name of $(\text{NH}_4)_2\text{CO}_3$?

Answer: The name of $(\text{NH}_4)_2\text{CO}_3$ is ammonium carbonate.

Analysis:

We learned in a [previous lesson](#) that compounds containing an NH_4 group are ionic, even though they contain nonmetals only.

Therefore, $(\text{NH}_4)_2\text{CO}_3$ is an ionic compound.

We name the cation first (ammonium),
and the anion second (carbonate).

Names for ionic compounds do not use Greek prefixes.

Therefore, the correct name for $(\text{NH}_4)_2\text{CO}_3$ is ammonium carbonate.

The Nomenclature Review Quiz continues on the next page.

NOMENCLATURE REVIEW QUIZ, continued

26. What is the chemical formula for diphosphorus pentasulfide?

Answer: The chemical formula for diphosphorus pentasulfide is P_2S_5 .

Analysis:

Diphosphorus pentasulfide contains two nonmetals (phosphorus and sulfur). Therefore, it is a covalent compound.

The elements appear in the same order in the name as in the formula.

“Di-” means two phosphorus atoms.

“Penta-” means five sulfur atoms.

Therefore, the correct formula for diphosphorus pentasulfide is P_2S_5 .

27. What is the chemical formula for chlorine trifluoride?

Answer: The chemical formula for chlorine trifluoride is ClF_3 .

Analysis:

First, check whether chlorine trifluoride is ionic or covalent.

Chlorine trifluoride contains two nonmetals (chlorine and fluorine).

So chlorine trifluoride is a covalent compound.

The elements appear in the same order in the formula as in the name.

The prefix “tri-” means three fluorine atoms.

No prefix on chlorine means one atom.

Therefore, the correct formula for chlorine trifluoride is ClF_3 .

28. What is the name of PCl_5 ?

Answer: The name of PCl_5 is phosphorus pentachloride.

Analysis:

PCl_5 contains

two nonmetals (phosphorus and chlorine).

Therefore, PCl_5 is a covalent compound.

The elements appear in the same order in the name as in the formula.

No prefix is used for the first element “phosphorus,” because the prefix mono- is omitted for the first element in the name.

The second element in the name is referred to with the suffix -ide.

Therefore, the correct name for PCl_5 is phosphorus pentachloride.

29. What is the chemical formula for calcium carbonate?

Answer: The chemical formula for calcium carbonate is CaCO_3 .

Analysis:

Calcium carbonate contains

a metal (calcium) and

two nonmetals (carbon and oxygen),

so calcium carbonate is an ionic compound.

When writing formulas for ionic compounds, it is your job to determine the subscripts.

We choose subscripts that will result in a net charge of zero.

You should have memorized that the formula and charge for carbonate ion is CO_3^{2-} .

The following notation demonstrates that subscripts of 1 for Ca^{2+} and 1 for CO_3^{2-} will result in a net charge of zero.

group charges	+2	-2
	Ca_1	$(\text{CO}_3)_1$
individual charges	+2	-2

Therefore, the correct formula for calcium carbonate is CaCO_3 .

30. What is the name of AgClO_3 ?

Answer: The name of AgClO_3 is silver chlorate.

Analysis:

AgClO_3 contains

a metal (silver) and

two nonmetals (chlorine and oxygen).

So AgClO_3 is an ionic compound.

The cation is named first (silver).

You should have memorized that, although it's a transition metal, silver cations commonly take only one charge (+1), so no roman numeral is necessary in the name.

The anion is named second (chlorate).

Names for ionic compounds do not use Greek prefixes.

Therefore, the correct name for AgClO_3 is silver chlorate.

31. What is the chemical formula for tin(II) chloride?

Answer: The chemical formula for tin(II) chloride is SnCl_2 .

Analysis:

Tin(II) chloride contains

a metal (tin) and

a nonmetal (chlorine),

so tin(II) chloride is an ionic compound.

When writing formulas for ionic compounds, it is your job to determine the subscripts.

We choose subscripts that will result in a net charge of zero.

Tin(II) means the tin has a +2 charge.

The following notation demonstrates that subscripts of ₁ for Sn^{2+} and ₂ for Cl^- will result in a net charge of zero.

group charges	+2	-2
	Sn_1	Cl_2
individual charges	+2	-1

Therefore, the correct formula is SnCl_2 .

32. What is the chemical formula for chromium(III) oxide?

Answer: The chemical formula for chromium(III) oxide is Cr_2O_3 .

Analysis:

Chromium(III) oxide contains
a metal (chromium) and
a nonmetal (oxygen),
so chromium(III) oxide is an ionic compound.

When writing formulas for ionic compounds, it is your job to determine the subscripts.
We choose subscripts that will result in a net charge of zero.

Chromium(III) means the chromium has a +3 charge.

The following notation demonstrates that subscripts of ₂ for Cr^{3+} and ₃ for O^{2-} will result in a net charge of zero.

group charges	+6	-6
	Cr_2	O_3
individual charges	+3	-2

Therefore, the correct formula for chromium(III) oxide is Cr_2O_3 .

The Nomenclature Review Quiz continues on the next page.

NOMENCLATURE REVIEW QUIZ, continued

33. What is the name of NO?

Answer: The name of NO is nitrogen monoxide.

Analysis:

NO contains

two nonmetals (nitrogen and oxygen).

So, NO is a covalent compound.

The elements appear in the same order in the name as in the formula.

There is one nitrogen atom, but the prefix mono- is omitted for the first element.

There is one oxygen atom, so we use the prefix mono- for the second element.

Therefore, the correct name for NO is nitrogen monoxide.

34. What is the name of ClF₃?

Answer: The name of ClF₃ is chlorine trifluoride.

Analysis:

ClF₃ contains

two nonmetals (chlorine and fluorine).

So ClF₃ is a covalent compound.

The elements appear in the same order in the name as in the formula.

There is one chlorine atom, but the prefix mono- is usually omitted for the first element.

There are three fluorine atoms, so we use the prefix tri-.

Therefore, the correct name for ClF₃ is chlorine trifluoride.

35. What is the chemical formula for phosphorus pentachloride?

Answer: The chemical formula for phosphorus pentachloride is PCl_5 .

Analysis:

Phosphorus pentachloride contains two nonmetals (phosphorus and chlorine), so phosphorus pentachloride is a covalent compound.

No prefix on "phosphorus" means one phosphorus atom.
"Pentachloride" means five chlorine atoms.

Therefore, the correct formula for phosphorus pentachloride is PCl_5 .

36. What is the name of $\text{Cd}(\text{OH})_2$?

Answer: The name of $\text{Cd}(\text{OH})_2$ is cadmium hydroxide.

Analysis:

$\text{Cd}(\text{OH})_2$ contains one cadmium cation and two hydroxide anions.
So $\text{Cd}(\text{OH})_2$ is an ionic compound.

We do not use Greek prefixes in the name for ionic compounds.

Cadmium is a transition metal, but you should have memorized that cadmium typically takes only one form, Cd^{2+} , so there is no need to use a roman numeral in the name.

Therefore, the correct name for $\text{Cd}(\text{OH})_2$ is cadmium hydroxide.

37. What is the chemical formula for lead(IV) oxide?

Answer: The chemical formula for lead(IV) oxide is PbO_2 .

Analysis:

Lead(IV) oxide contains
a metal (lead) and
a nonmetal (oxygen),
so lead(IV) oxide is an ionic compound.

When writing formulas for ionic compounds, it is your job to determine the subscripts.
We choose subscripts that will result in a net charge of zero.

Lead(IV) means the lead has a +4 charge.

The following notation demonstrates that subscripts of ₁ for Pb^{4+} and ₂ for O^{2-} will result in a net charge of zero.

group charges	+4	-4
	Pb_1	O_2
individual charges	+4	-2

Therefore, the correct formula is PbO_2 .

You have reached the end of the lesson.

You have now completed the chapter on “Atoms, Molecules, and Compounds”.

The next lesson is not yet available, but I hope to post it shortly.

When it's available, the next lesson will be listed on my website:

www.freelance-teacher.com