

Naming and Formula Review

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Elements

Most elements are monatomic (just write the symbol), some are diatomic and a few are polyatomic. The diatomic elements are hydrogen (H_2), nitrogen (N_2), oxygen (O_2), fluorine (), chlorine (), bromine (), and iodine (). The polyatomic elements are sulphur (S_8) and phosphorous (P_4).

Complex or Polyatomic Ions

Most complex ions contain oxygen combined with another element.

Nitrate NO_3^- Sulphate SO_4^{2-} Phosphate PO_4^{3-}

The most common forms have the ending "**ate**" and a selection of these ions are found on page three of the data booklet. However this is not a complete list, but other ions can be generated by following family trends. A representative from each family is provided on the chart.

Halogen "ates"

Chlorate ClO_3^- bromate BrO_3^- iodate is _____ and fluorate is _____.

Column 16 "ates"

Sulphate SO_4^{2-} What is selenate? _____

Column 14 "ates"

Carbonate CO_3^{2-} What is silicate? _____

When the ending is changed to "**ite**" this tells us that the formula has one less oxygen than the "ate" form, but the charge remains the same.

Nitrate NO_3^- nitrite NO_2^-

Chlorate ClO_3^- What is chlorite? _____

What is bromite? _____ iodite? _____

Phosphate PO_4^{3-} What is phosphite? _____

When the prefix "**per**" is combined with the ending "**ate**" this tells us that the formula has one more oxygen than the "ate" form, but the charge remains the same.

What is perchlorate? _____ perbromate? _____ periodate? _____

What is peroxide? _____ perphosphate? _____ persulphate? _____

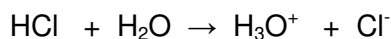
When the prefix "**hypo**" is combined with the ending "**ite**" this tells us that the formula has two less oxygen than the "ate" form (or one less than the "ite" form), but the charge remains the same.

What is hypochlorite? _____ hypobromite? _____ hypoiodite? _____

What is hypophosphite? _____ hyposulphite? _____ hypocarbonite? _____

Acids

Acids are recognized by the presence of an "H" in the front of the formula. Acids are covalently bonded molecules, but they are named ionically. This is because acids react with water to produce ions. This is similar to salts (ionic compounds) which are pulled apart by water to produce ions.



Write the formula for the following acids:

Hydrogen sulphate _____ Hydrogen phosphite _____

Hydrogen perbromate _____ Hydrogen hypoiodite _____

Name the following acids. We use the ionic rules for naming.

HClO_3 _____ H_2CO_3 _____

H_2S _____ HIO_3 _____

Unfortunately the common names for acids are still used. These names need to be translated into their IUPAC form in order to write the correct formula. The translations are as follows:

<u>Common Name</u>		<u>IUPAC</u>
Hydro _____ ic acid	BECOMES	hydrogen _____ ide
_____ ic acid	BECOMES	hydrogen _____ ate
_____ ous acid	BECOMES	hydrogen _____ ite

"_____" is the root name for the element. The following are examples chlor, brom, iod, sulphur, phosphor, nitr, carbon, cyan....

Write the IUPAC name and the formula for each of the following acids.

Common Name	IUPAC Name	Formula
Sulphurous acid		
Phosphoric acid		
Hydroiodic acid		
Perbromic acid		
Hypochlorous acid		
Nitrous acid		
Fluoric acid		

Practice these rules!

Naming and Formula Practice

Name: _____

**Use the periodic table of elements for transition metal charges that are not on page 3 of the data booklet.

1. Practice for “ates”. Ate is the suffix used for the most common polyatomic ion.

Write the correct name:

- | | |
|--------------------------------|------------------------------|
| a. $\text{Ca}(\text{ClO}_3)_2$ | f. NiSO_4 |
| b. NaBrO_3 | g. CdSeO_4 |
| c. $\text{Zn}(\text{IO}_3)_2$ | h. Na_2CO_3 |
| d. $\text{Fe}(\text{NO}_3)_3$ | i. Cs_2SiO_3 |
| e. H_3PO_4 | |

Write the correct formula:

- | | |
|--------------------------|--------------------------|
| a. Palladium (II) iodate | f. Nickel (III) chlorate |
| b. Barium carbonate | g. Radium phosphate |
| c. Hydrogen silicate | h. Lithium selenate |
| d. Gold (III) sulphate | i. Lead (II) nitrate |
| e. Potassium bromate | |

2. Practice for “ites”. What does “ite” tell you about the charge and number of oxygen?

Write the correct name:

- | | |
|---------------------------------|---------------------------------|
| a. NaClO_2 | e. $\text{Cd}(\text{NO}_2)_2$ |
| b. $\text{Al}_2(\text{SO}_3)_3$ | f. $\text{Hg}_2(\text{IO}_2)_2$ |
| c. H_2CO_2 | g. $\text{Sr}(\text{BrO}_2)_2$ |
| d. Cu_3PO_3 | |

Write the correct formula:

- | | |
|--------------------------|-------------------------|
| a. Platinum (IV) iodite | e. Lead (II) nitrite |
| b. Magnesium chlorite | f. Mercury (II) bromite |
| c. Nickel (III) sulphite | g. Cesium carbonite |
| d. Potassium phosphite | |

3. Practice for “per...ates”. What does “per” tell you about the charge and number of oxygen?

Write the correct name:

- | | |
|--------------------------------|-------------------------------|
| a. $\text{Au}(\text{BrO}_4)_3$ | d. H_2SO_5 |
| b. $\text{Sr}(\text{ClO}_4)_2$ | e. $\text{Fe}(\text{IO}_4)_2$ |
| c. Na_2O_2 | f. H_2O_2 |

Write the correct formula:

- | | |
|-----------------------------|-----------------------------|
| a. Mercury (II) perchlorate | d. Zirconium periodate |
| b. Tungsten (V) perbromate | e. Nickel (III) perfluorate |
| c. Potassium peroxide | |

4. Practice for “hypo...ites”. What does “hypo” tell you about the charge and number of oxygen?

Write the correct name:

- | | |
|-------------------|-------------------------------|
| a. CsBrO | d. $\text{Sc}(\text{NO})_3$ |
| b. HClO | e. $\text{Mn}(\text{SO}_2)_2$ |
| c. NaIO | |

Write the correct formula:

- a. Calcium hypoiodite
- b. Palladium (IV) hypochlorite
- c. Cobalt (III) hyponitrite
- d. Titanium (III) hypobromite
- e. Francium hyposulphite

5. Practice for elements. What are the seven diatomic elements? What are the two polyatomic elements?

Write the correct name:

- a. Al
- b. S₈
- c. N₂
- d. I₂
- e. Au

Write the correct formula

- a. Silver
- b. Oxygen
- c. Chlorine
- d. Phosphorous
- e. Tin

6. Practice for the acids. You must be able to write formulas from common names. This means you must memorize the translation to the IUPAC name.

Common Name	IUPAC translation
Hydro_____ic acid becomes	_____
_____ic acid becomes	_____
Per_____ic acid becomes	_____
_____ous acid beomes	_____
Hypo_____ous acid becomes	_____

Write the IUPAC and common name:

- a. HBrO₂
- b. HBr
- c. HClO₄
- d. H₂SO₄
- e. H₃PO₄
- f. H₃PO₃
- g. HBrO₃
- h. HIO
- i. HClO₂
- j. HNO₃
- k. HNO₂

Write the formula:

- a. Iodous acid
- b. Hydrosulphuric acid
- c. Perbromic acid
- d. Hypophosphorous acid
- e. Sulphurous acid
- f. Nitrous acid
- g. Hydrofluoric acid

