What's Going On?

Checking In

Minds on What's my Chemical Formula?

Action! Multivalent Elements and Polyatomic Ions

Consolidation Say My Name!

Learning Goal - I will be able to name ionic compounds and write their chemical formulae.

Minds on

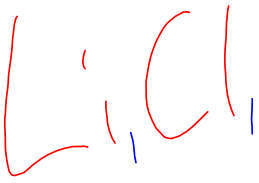
What's my Chemical Formula?

I'm going to give you the name of an ionic compound, you identify the formula.

lithium chloride

1. Identify the ions.

2. Determine the number of each ion required to balance the compound. (create a neutral charge)



beryllium sulfide

1. Identify the ions.

Be^{2+} S^{2-}

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

BeS

aluminum phosphide

1. Identify the ions.

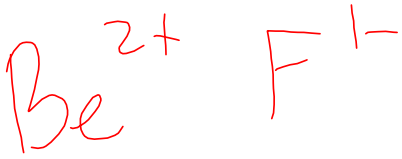
Al^{3+} P^{3-}

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

AlP

beryllium fluoride

1. Identify the ions.



2. Determine the number of each ion required to balance the compound. (create a neutral charge)

magnesium nitride

1. Identify the ions.

Mg^{2+} N^{3-}

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

aluminum sulfide

1. Identify the ions.

Al^{3+} S^{2-}

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

Al^{3+} Al^{3+} S^{2-} S^{2-} S^{2-} Al_2S_3

Action!

Multivalent Elements

Not all elements have a single, set, charge.

Some metals can form more than one type of ion.

For example, iron has **two** stable ions:

Fe^{2+} and Fe^{3+}

Action!

Multivalent Elements

Naming ionic compounds with multivalent elements can be tricky, as we need to know which ion is present in the compound.

To identify the ion in the compound, we use Roman Numerals.

If we have Fe^{2+}, we write Iron (II) and if we have Fe^{3+}, we write Iron (III).

Example Problem

Example Problem

Write the name of the ionic compound Cu_3N.

1. Identify the ions that form the compound: ___Cu?___ and ___N^{3-}___
2. Use the charge of the non-metal ion and the rule that the total positive and negative charges in the formula must balance:

   Cu^{1+} Cu^{1+} Cu^{1+} N^{3-}
3. Name the metal ion: ___Copper (I)___
4. Name the non-metal ion: ___Nitride___
5. Combine the names: ___Copper (I) Nitride___

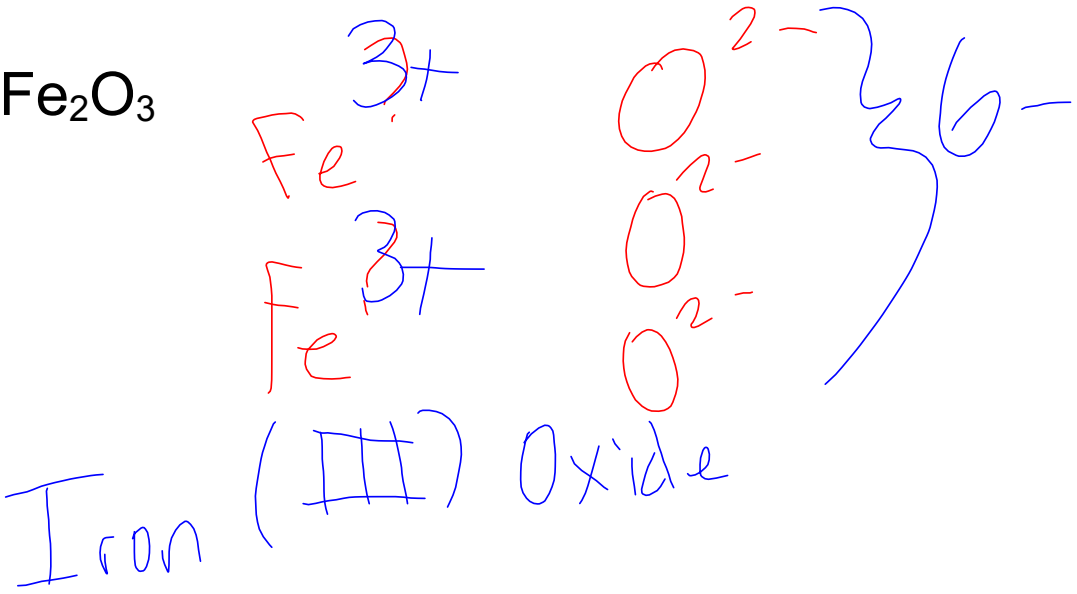
Action!

Multivalent Elements

Examples

Write the name of each compound below.

a. Fe_2O_3



Action!

Multivalent Elements

Examples

Write the name of each compound below.

b. $FeBr_2$

Fe^{2+} Br^{-1}

Br^{-1}

Iron (II) Bromide

Action!

Multivalent Elements

Examples

Write the name of each compound below.

c. $FeBr_3$

Iron (III) Bromide

Action!

Polyatomic Ions

Sometimes, a group of atoms of different elements act as a single ion, called a polyatomic ion.

OH^-	Hydroxide
SO_4^{2-}	Sulphate
CO_3^{2-}	Carbonate
PO_4^{3-}	Phosphate

Action!

Polyatomic Ions

As with other ionic compounds, we can use the chemical formula of a compound with a polyatomic ion to write the compound's name.

$CaCO_3$ Calcium carbonate

$NaOH$ Sodium hydroxide

$Mg(OH)_2$ Magnesium hydroxide

$AlPO_4$ Aluminum phosphate

Action!

Polyatomic Ions

We can also move from the name of the compound to the chemical formula.

Example Problem

Example Problem

$3 \times 2+ = 6+$ $2 \times 3- = 6-$

Write the formula for magnesium phosphate.

1. Identify the ions and their charges: Mg^{2+} and $(PO_4)^{3-}$
2. Determine the numbers of each ion needed to balance the charges:

Mg^{2+} Mg^{2+} Mg^{2+} PO_4^{3-} PO_4^{3-}

3. Note the ratio of positive to negative ions: 3 Mg^{2+} for every 2 PO_4^{3-}
4. Use the ratio to determine subscripts: Mg_3 and $(PO_4)_2$
   *Be sure to include brackets for the polyatomic ion and place the subscript outside the brackets.
5. Write the formula: $Mg_3(PO_4)_2$

sodium hydroxide

1. Identify the ions.

Na^{1+} OH^{1-}

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

NaOH

zinc hydroxide

1. Identify the ions.

Zn^{2+} OH^-

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

Zn^{2+} OH^- OH^-

$Zn(OH)_2$

aluminum sulphate

1. Identify the ions.

Al^{3+} SO_4^{2-}

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

Al^{3+} SO_4^{2-}

Al^{3+} SO_4^{2-}

SO_4^{2-}

$Al_2(SO_4)_3$

sodium phosphate

1. Identify the ions.

Na^{1+} PO_4^{3-}

2. Determine the number of each ion required to balance the compound. (create a neutral charge)

Na^{1+}
Na^{1+}
Na^{1+} PO_4^{3-}

Na_3PO_4

Consolidation

Practice

Attachments

1D CHEM - B1 (History of the Atom) - Atomic Theory.mp4