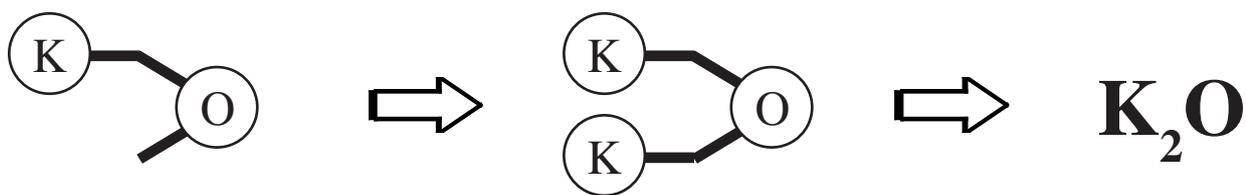


Formula & Equation Writing

Book 1



lithium

column 1	column 2	
Li 1	Be 2	Li
Na 1	Mg 2	Li
K 1	Ca 2	Li

Ionic Equations

Ionic Formulae

Balanced Equations

Formula Equations

Word Equations

Transition Metals

Using Brackets

Awkward Customers

More than 2 Elements

2 Elements Only

Using the Name Only

carbonate

CO₃

valency 1	valency 2		
name	formula	name	formula
ammonium	NH ₄	carbonate	CO ₃
cyanoide	CN	chromate	CrO ₄
hydroxide	OH	sulphate	SO ₄
nitrate	NO ₃	sulphite	SO ₃



These sheets belong to _____

What is a Formula ?

The *form* of a *comp* tells you two things about the *comp* :-



i) *which ele* are in the compound using *sym*,

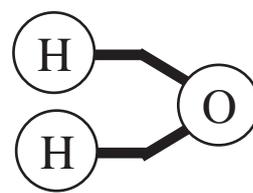
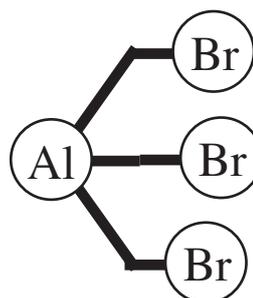
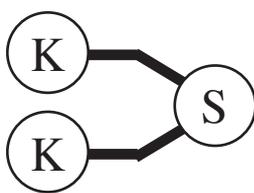
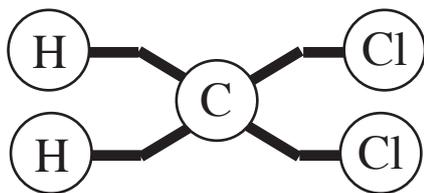


and

ii) *how ma* atoms of each *ele* are in the compound using *num*.

Test Yourself

What would be the formula for each of the following?

**Using the Name Only**

Some *comp* have extra information in their *na* that allow people to work out and write the correct *form*.

carbon *monoxide* CO

carbon *dioxide* CO_2

dinitrogen tetroxide N_2O_4

The *na* of the elements appear as usual but this time the *num* of each type of atom is included using

mono- = 1 *di-* = *tri-* = *tetra-* = *penta-* = *hexa-* =

Test Yourself 1

What would be the formula for each of the following?

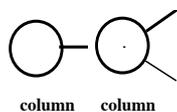
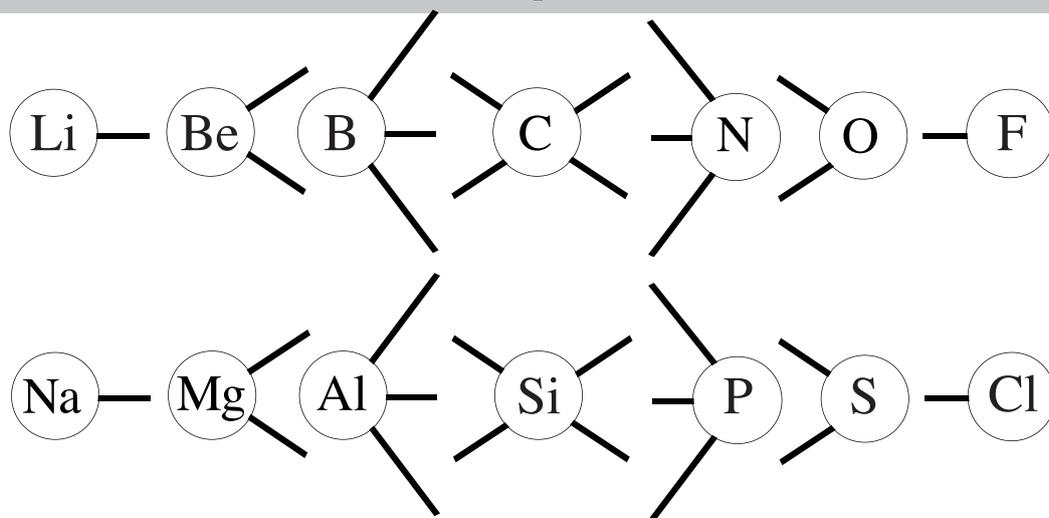
- | | | |
|---------------------------|-----------------------|--------------------------------|
| 1. sulfur trioxide | 6. nitrogen monoxide | 11. diphosphorus pentachloride |
| 2. silicon tetrafluoride | 7. nitrogen dioxide | 12. dinitrogen pentoxide |
| 3. dinitrogen oxide | 8. tin dibromide | 13. xenon hexafluoride |
| 4. phosphorus trichloride | 9. nitrogen triiodide | 14. phosphorus trihydride |
| 5. dinitrogen tetroxide | 10. sulfur dioxide | 15. carbon tetrachloride |

Valency Numbers

Apart from the *Noble Gases* (column 8), all *at* can form *bo* and join to other atoms in *comp*.

The *num* of bonds an atom can form is called its *Valency* and depends on which *Group* in the Periodic Table an atom belongs to.

Group	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
Valency No.	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>3</i>	<i>2</i>	<i>1</i>



Li 1	Be 2
Na 1	Mg 2
K 1	Ca 2

lithium \Leftarrow *Name*

Li \Leftarrow *Symbol*



Li \Leftarrow *Valency Picture*

To begin with, you may be given a special *Per Table* which you can use to find the *Val Num* of an *Ele*.

Use the *Na* of the *Ele* to find its *Sym* and then draw the correct *Val Picture*.

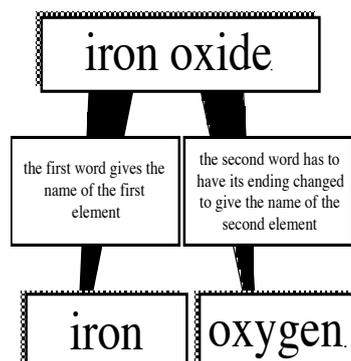
Test Yourself 2

Draw the Valency Picture for each of these Elements.

- | | | | |
|--------------|------------|-------------|--------------|
| 1. beryllium | 2. boron | 3. nitrogen | 4. fluorine |
| 5. sodium | 6. silicon | 7. sulfur | 8. calcium |
| 9. chromium | 10. cobalt | 11. arsenic | 12. selenium |

2 Elements Only

The name of a 2-element *comp* usually lists *both* the *ele* in the compound.

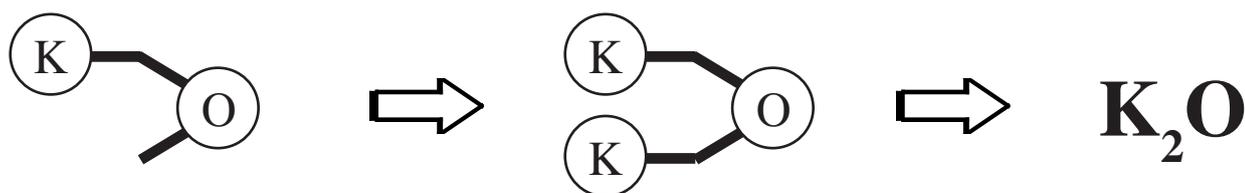


-ide endings are used to emphasise that there are *only two elements* in the compound.

exceptions: compounds ending *hydroxide* or *cyanide* have *more* than 2 elements in them

Writing a *correct formula* is all about looking up the *correct symbol*, identifying the *correct valency number* and then *balancing* the two halves of the *compound*. This is easier if you use *Valency Pictures*.

For example, to work out the formula for *potassium oxide*.



1. Draw the Valency Pictures for atoms of *potassium* and *oxygen*.
2. Draw them as shown. This valency picture is not complete.
3. Draw another *potassium* atom to complete the picture.
4. Now write the correct formula for *potassium oxide*.

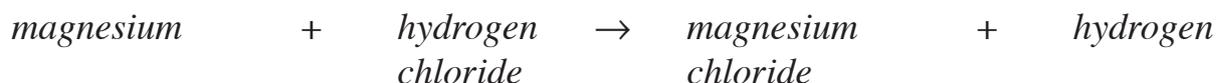
Test Yourself 3

Work out the formula for each of these compounds.

- | | | |
|-----------------------|----------------------|------------------------|
| 1. sodium chloride | 7. barium bromide | 13. magnesium nitride |
| 2. lithium iodide | 8. magnesium iodide | 14. strontium chloride |
| 3. potassium fluoride | 9. lithium sulfide | 15. gallium sulfide |
| 4. rubidium bromide | 10. potassium oxide | |
| 5. beryllium oxide | 11. aluminium iodide | |
| 6. calcium sulfide | 12. aluminium oxide | |

Word Equations

We write a "**Word Equation**" to describe the *change* that take place during a *chemical reaction*.



- The + sign means *and*.
- The → sign means *change into*.
- The chemicals which react are called the **Reactants** and are written on the *left*.
- The chemicals which are produced are called the **Products** and are written on the *right*.

Test Yourself 4

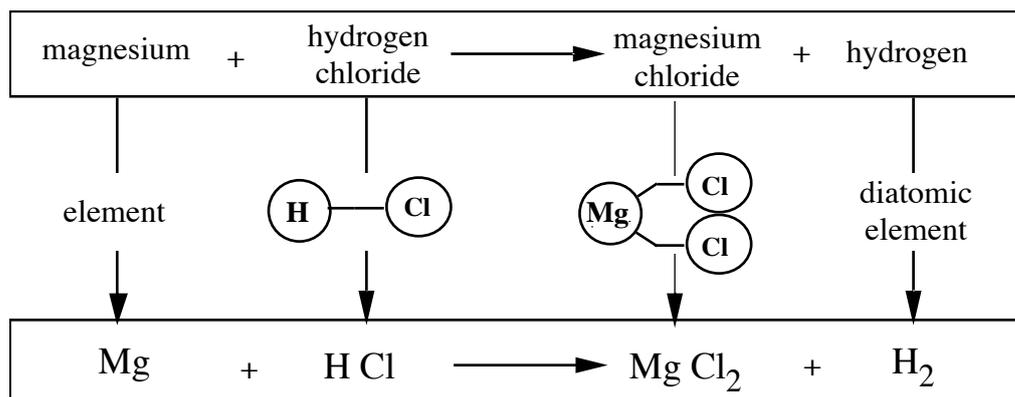
Write a **Word Equation** for each of the reactions described below.

- When magnesium ribbon burns, it reacts with oxygen in the air to form magnesium oxide, a white powder.
- In the Blast Furnace, iron is made by reacting diiron trioxide with carbon monoxide gas. Carbon dioxide gas is also produced.
- In the Haber Process, nitrogen, which we get from the air, reacts with hydrogen gas in the presence of a platinum catalyst to form ammonia (nitrogen hydride) which can be used to make many things including fertilisers.
- When calcium metal is added to water, a gas is given off and calcium oxide solution is formed. When tested with a burning splint, the hydrogen gas "popped".
- Aluminium is a reactive metal but protected by a layer of corroded metal. Chlorine gas can penetrative the corrosion to produce aluminium chloride.

Formula Equation

The next stage is to replace all the *names* of chemicals with their *formulas*, ie write a **Formula Equation**. e.g.

word equation



formula equation

Elements in Equations



“The Diatomic 7”

h *gen*
n *gen*
o *gen*
f *ine*
c *ine*
b *ine*
i *ine*

An easy way to remember this is **GENuINE** –

the diatomic elements end in **GEN** or **INE**!

Most *ele* are easy. They are simply represented by their *symbol*.

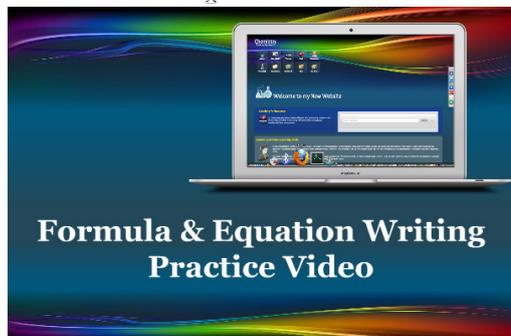
There are, however, 7 *elem* which are made up of *mol*, each with 2 *at*. This needs to be shown in their *form*, such as H_2 for *hydr*.

H_2										----->	He
											Ne
											Ar
											Kr
											Xe
											Rn

Test Yourself 5

Write a **Formula Equation** for each of the reactions described by the **Word Equations** shown below.

1. *magnesium* + *oxygen* → *magnesium oxide*
2. *diiron trioxide* + *carbon monoxide* → *carbon dioxide* + *iron*
3. *nitrogen* + *hydrogen* → *nitrogen trihydride*
4. *calcium* + *water* → *calcium oxide* + *hydrogen*
5. *aluminium* + *chlorine* → *aluminium chloride*



Going Further

You may be shown a series of video demonstrating various reactions.

For each one, write a *Word Equation* and then try to write the correct *Formula Equation*.

www.new.chemistry-teaching-resources.com/EquationWriting.html

'Starting' Set 1 - magnesium with dry ice

Word Equation:

Formula:

'Starting' Set 1 - combustion of sulfur

Word Equation:

Formula:

'Starting' Set 2 - aluminium with chlorine

Word Equation:

Formula:

'Starting' Set 3 - thermite reaction

Word Equation:

Formula:

'Starting' Set 3 - making salt

Word Equation:

Formula:

