

What's Going On?

Checking In

Minds on

Valence Electrons

Action!

Ions and Ionic Compounds

Consolidation

Dot-Cross Diagrams

Learning Goal - I will be able to describe how ionic compounds are formed.

Minds on

Valence Electrons

<u>Hydrogen</u> 1	Let's look back at your homework.						<u>Helium</u> 2
<u>Lithium</u> 1	<u>Beryllium</u> 2	<u>Boron</u> 3	<u>Carbon</u> 4	<u>Nitrogen</u> 5	<u>Oxygen</u> 6	<u>Fluorine</u> 7	<u>Neon</u> 8
<u>Sodium</u> 1	<u>Magnesium</u> 2	<u>Aluminum</u> 3	<u>Silicon</u> 4	<u>Phosphorus</u> 5	<u>Sulphur</u> 6	<u>Chlorine</u> 7	<u>Argon</u> 8

Minds on

Unstable Atoms

Most atoms are not stable because their valence shells are not full.

Atoms with full valence shells are stable.

Atoms tend to lose and gain electrons in order to achieve a stable arrangement.

Minds on

Valence Electrons

a. Which elements are considered "stable"?

b. What is the easiest way for an atom of each element below to become "stable"?

i. Sodium *lose 1 electron*

ii. Chlorine *gain 1 electron*

<u>Hydrogen</u> 1								<u>Helium</u> 2
<u>Lithium</u> 1	<u>Beryllium</u> 2	<u>Boron</u> 3	<u>Carbon</u> 4	<u>Nitrogen</u> 5	<u>Oxygen</u> 6	<u>Fluorine</u> 7	<u>Neon</u> 8	
<u>Sodium</u> 1	<u>Magnesium</u> 2	<u>Aluminum</u> 3	<u>Silicon</u> 4	<u>Phosphorus</u> 5	<u>Sulphur</u> 6	<u>Chlorine</u> 7	<u>Argon</u> 8	

Action!

Ions

An atom, or group of atoms, that has lost or gained electrons is referred to as an ion.

If an atom loses ^{negative} electrons, it becomes a positive ion.

If an atom gains electrons, it becomes a negative ion.

Action!

Metals vs. Non-Metals

Some atoms do not form ions.

Can you guess which ones?

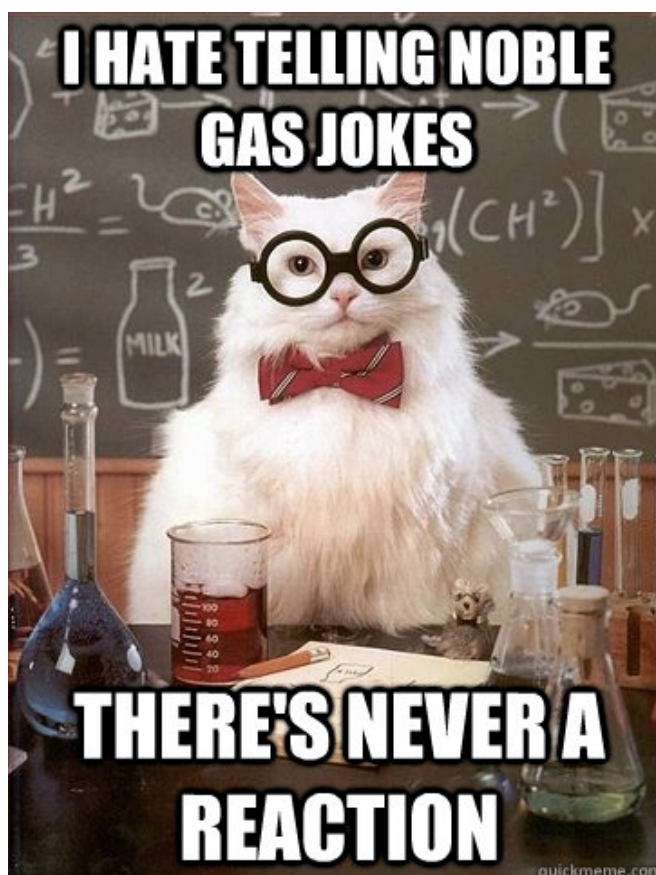
Action!

Ion Charges



The atoms in the periodic table have differing valence charges. These charges tell us what the atoms of the element tend to do.

<u>Hydrogen</u> +1								<u>Helium</u> 0
<u>Lithium</u> +1	<u>Beryllium</u> +2	<u>Boron</u> +3	<u>Carbon</u> +/-4	<u>Nitrogen</u> -3	<u>Oxygen</u> -2	<u>Fluorine</u> -1	<u>Neon</u> 0	
<u>Sodium</u> +1	<u>Magnesium</u> +2	<u>Aluminum</u> +3	<u>Silicon</u> +/-4	<u>Phosphorus</u> -3	<u>Sulphur</u> -2	<u>Chlorine</u> -1	<u>Argon</u> 0	

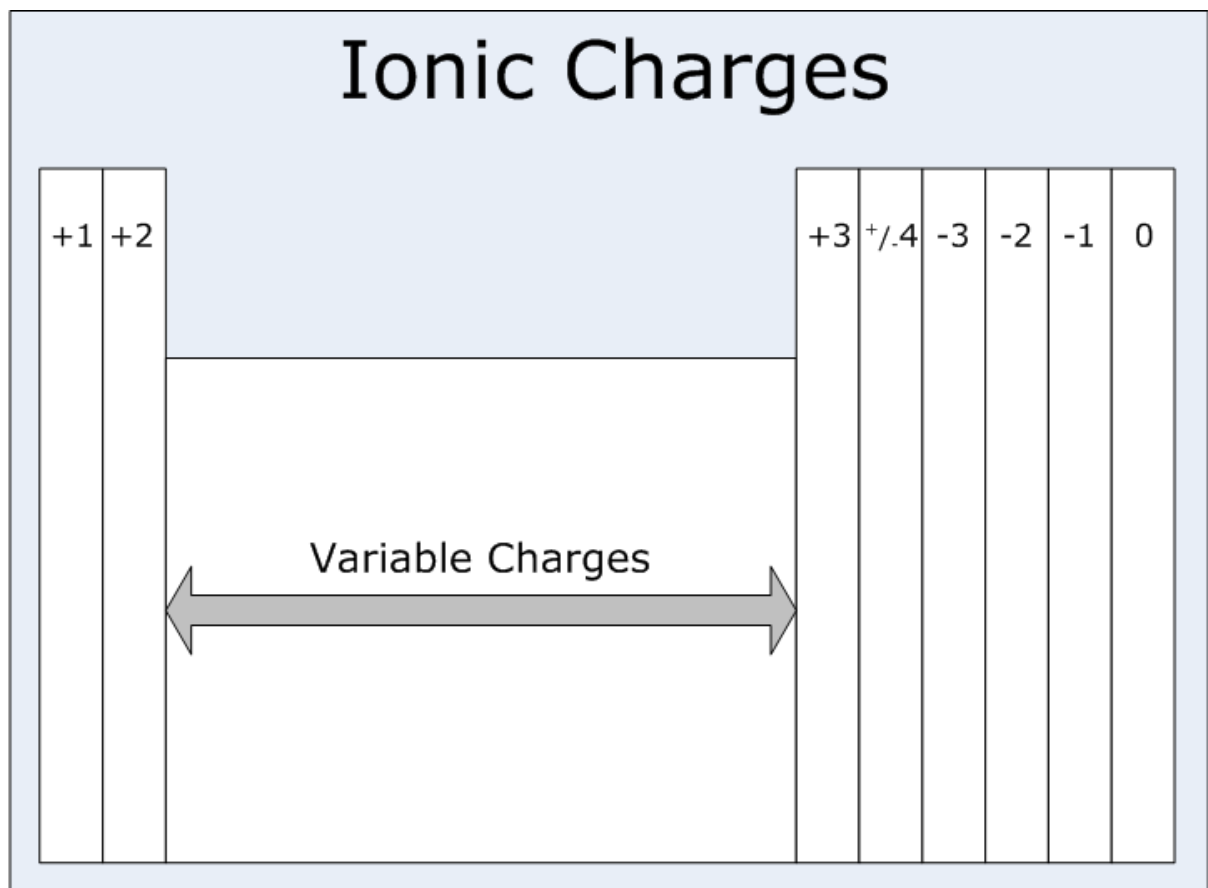


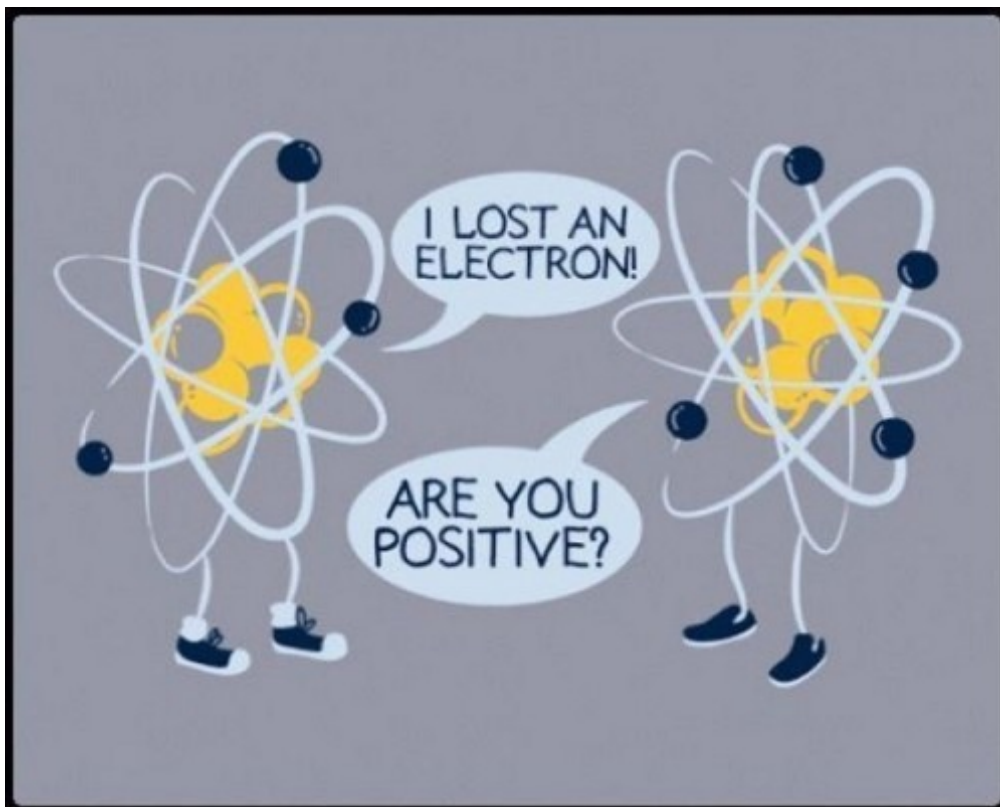
Action!

Metals vs. Non-Metals

Metal atoms tend to lose electrons.

Non-Metal atoms tend to gain electrons.





Action!

Ionic Compounds

When two ions combine, an **ionic compound** is formed.

An ionic compound is a pure substance usually consisting of at least one metal and one non-metal.

Action!

Ionic Compounds

Ionic compounds usually have the following properties:

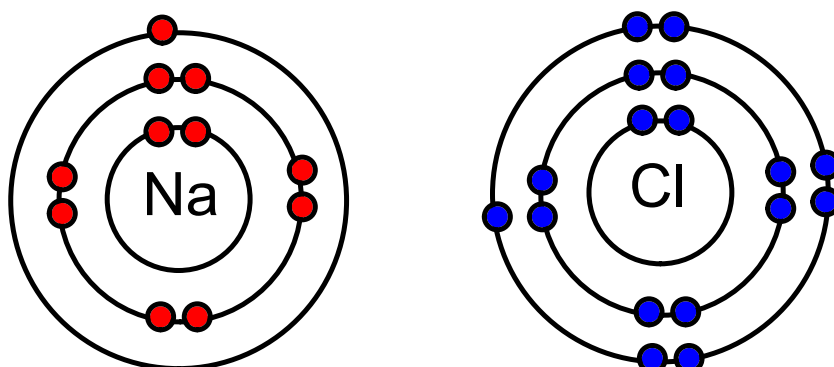
- high melting points
- form crystals
(regular arrangements of particles)
- dissolve in water to form solutions that conduct electricity

Action!

Ionic Compounds

Example 1

The sodium and chlorine atoms below each have no charge. (# protons = # electrons)



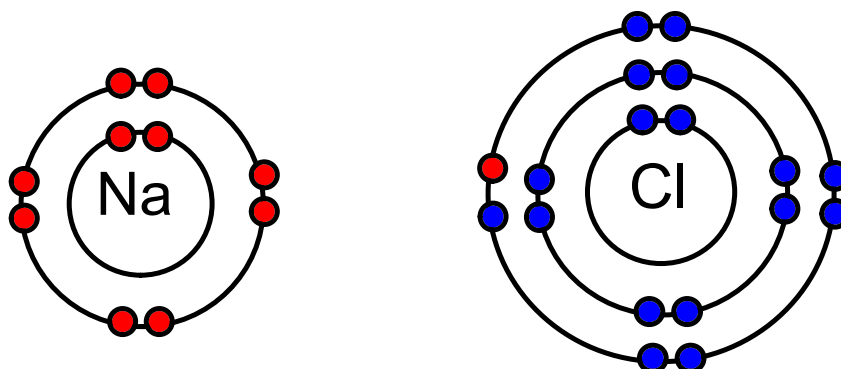
Action!

Ionic Compounds

Example 1

Neither atom is stable

- The sodium atom only has **1 electron** in its valence shell (it needs to **lose one** to be stable)
- The chlorine atom has **7 electrons** in its valence shell (it needs to **gain one** to be stable)



Action!

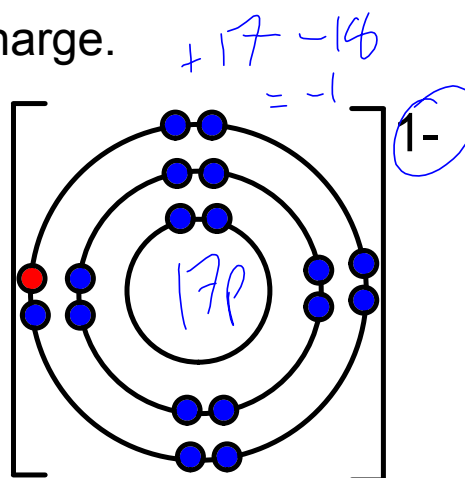
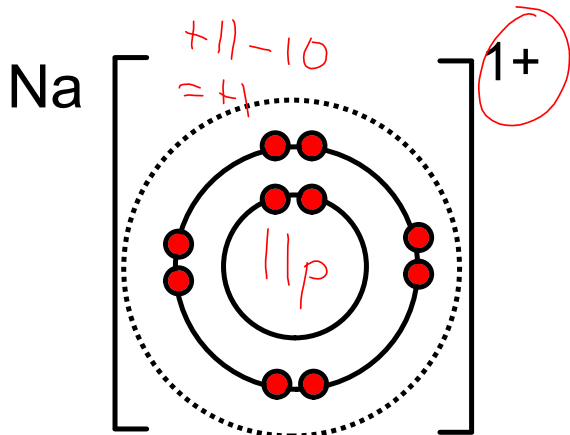
Ionic Compounds

Example 1

The sodium atom gives up its one valence electron and becomes a sodium ion with 1+ charge.

Cl

The chlorine atom picks up one more valence electron and becomes a chloride ion with a 1- charge.

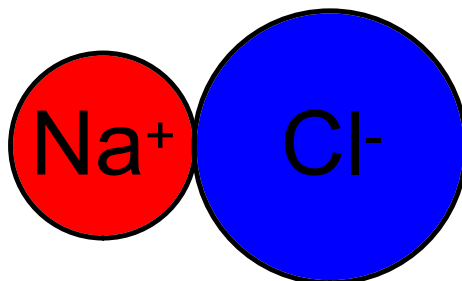


Action!

Ionic Compounds

Example 1

The positively charged sodium atom and the negatively charged chloride ion are attracted to each other (opposite charges attract) and connect forming an **ionic bond**.

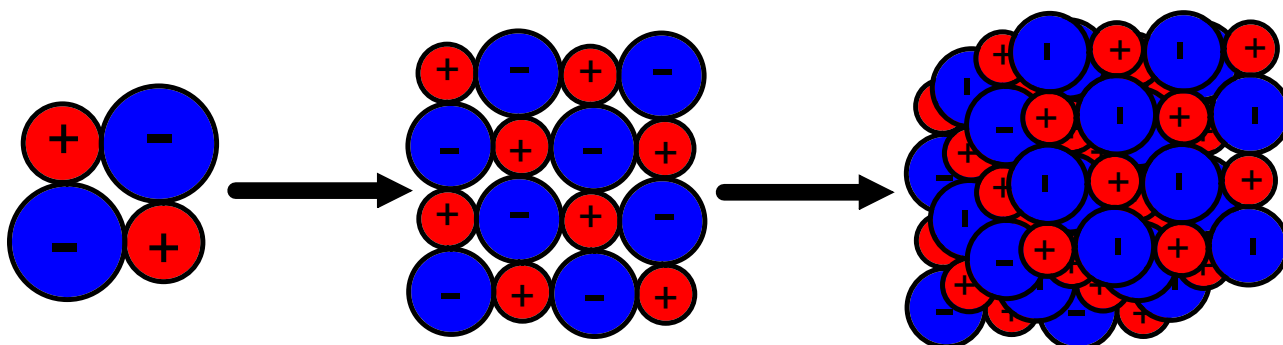


Action!

Ionic Compounds

Example 1

The ionic bonds cause the ions to group together in an alternating pattern known as a crystal arrangement.



[BBC Bitesize](#)

[PBS Lesson](#)

Consolidation

Writing Ionic Formulas

Not all ionic compounds exist with two types of atoms in a ratio of 1:1 like NaCl.

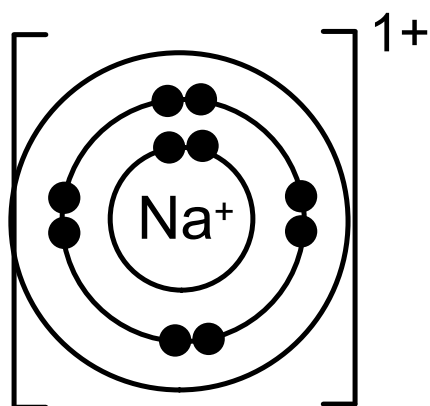
How can we determine the chemical formula of an ionic compound given its elements?

Consolidation

Dot-Cross Diagrams



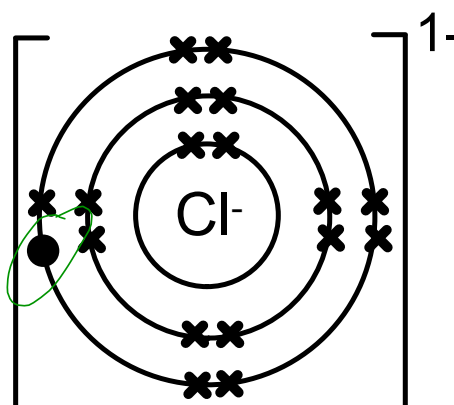
sodium chloride



~~Neutral Sodium Atom~~

Positive

Ion



~~Neutral Chlorine Atom~~

Negative

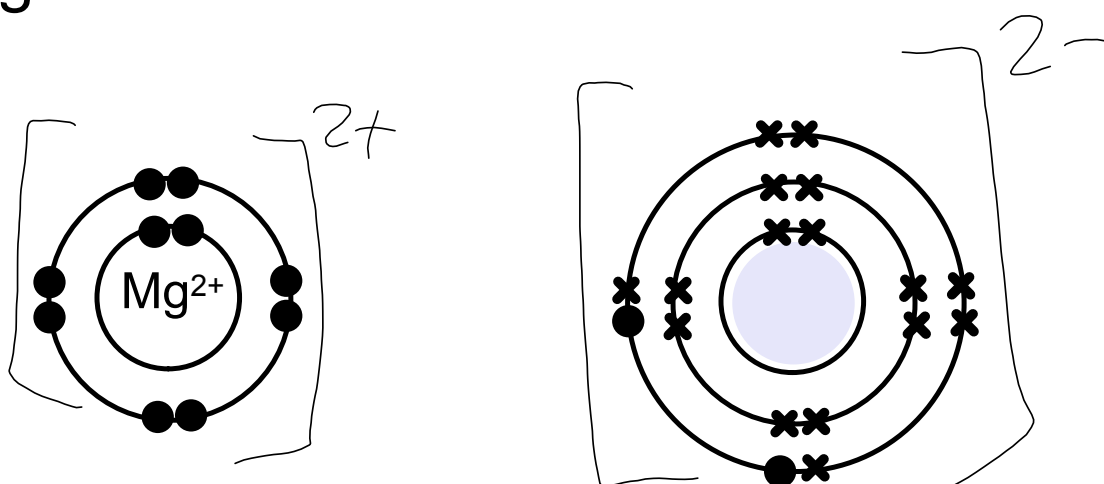
Ion

Consolidation

Dot-Cross Diagrams

● ×

magnesium sulfide



MgS

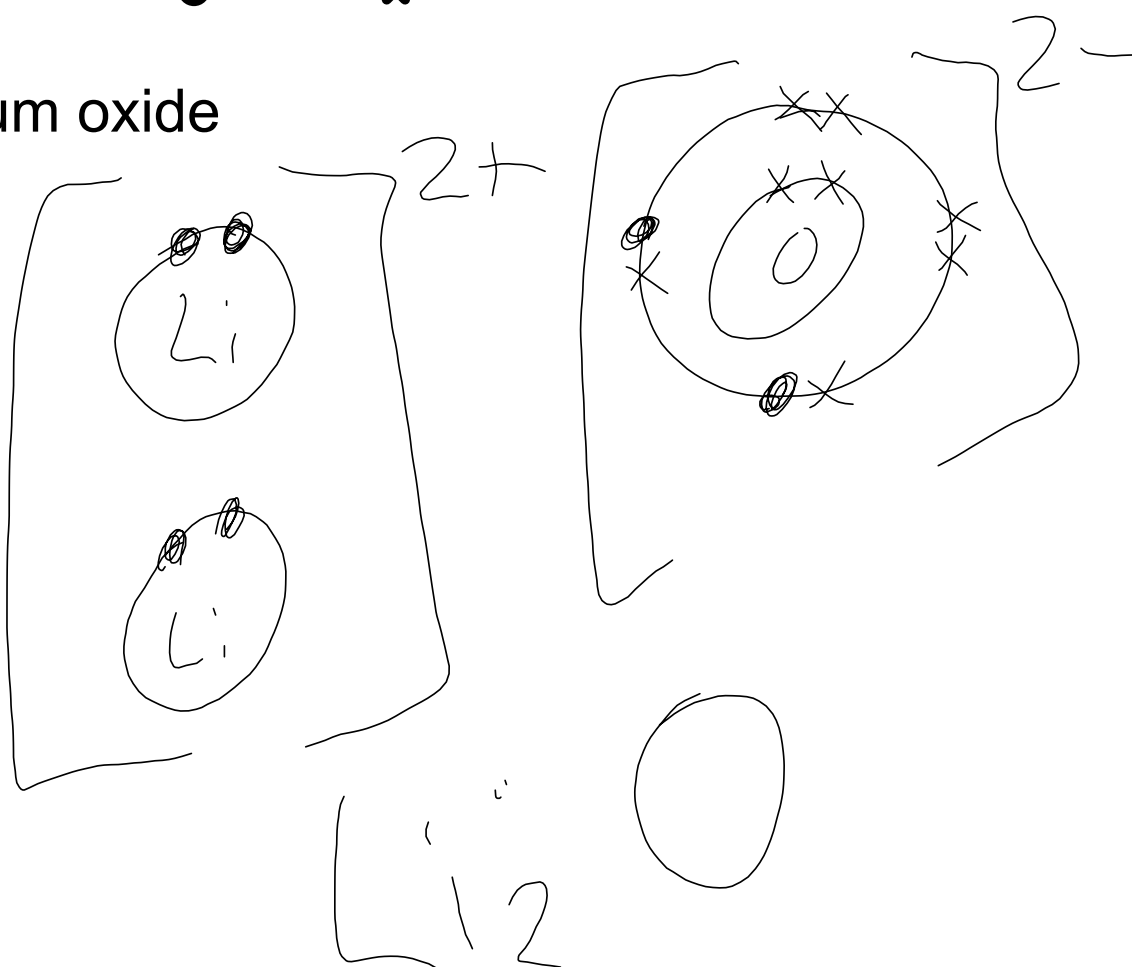


Consolidation

Dot-Cross Diagrams

● ×

lithium oxide



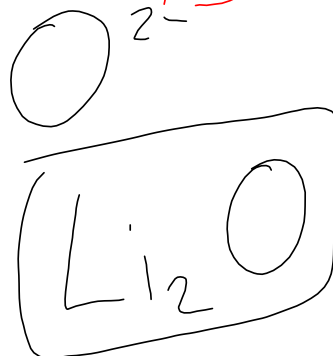
Consolidation

Dot-Cross Diagrams

● ×

lithium oxide

1. Write the ions

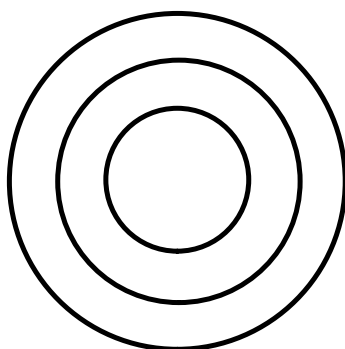


Consolidation

Dot-Cross Diagrams

● ×

calcium nitride



Attachments



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