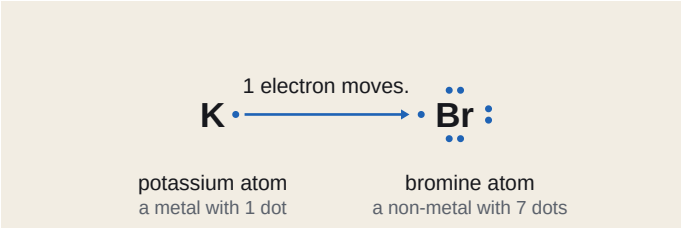
A3 · Ionic bonds · Notes

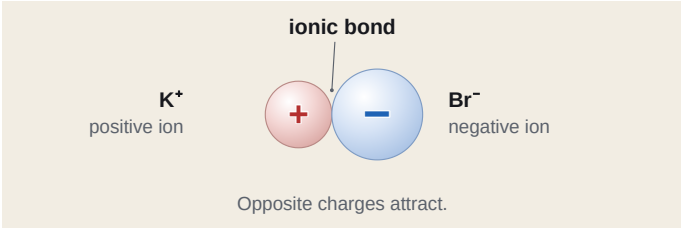
Goals: Explain an ionic bond as electrons moving from a metal atom to a non-metal atom, and the ions attracting. Draw electron dot diagrams for ions. Show an ionic bond forming with electron dot diagrams, and explain the ratio of ions.

Name: _____ Date: _____

Slide 1 of 6 · Electrons move from a metal atom to a non-metal atom

In lesson A2, metals lost electrons and non-metals gained them. Today you see both happen at once. One atom loses the electron that the other gains.





Key ideas

A metal atom _____ electrons and a non-metal atom _____ them.

The electron moves from the _____ atom to the bromine atom.

Opposite charges _____. This attraction is an _____.

Example

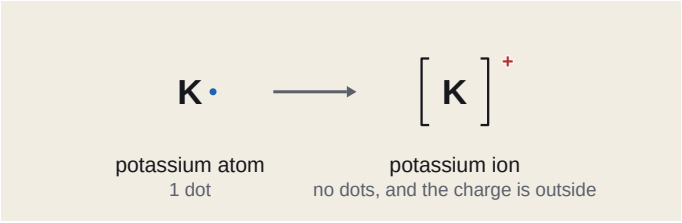
A potassium atom gives 1 electron to a bromine atom, which had 7. How many valence electrons does the bromine have now?

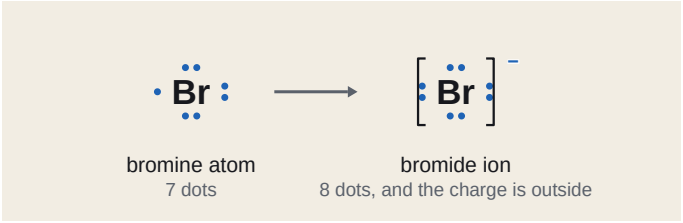
Try it

A sodium atom gives 1 electron to an iodine atom. What two ions form, and what holds them together?

Slide 2 of 6 · Electron dot diagrams for ions

You just saw K^+ and Br^- form. In A2 you drew dot diagrams for atoms. Now you draw them for ions.





Key ideas

A positive ion has _____. The metal atom lost all its valence electrons.

A negative ion has _____ dots, in four pairs.

Put the symbol in _____. Write the _____ outside, at the top right.

Example

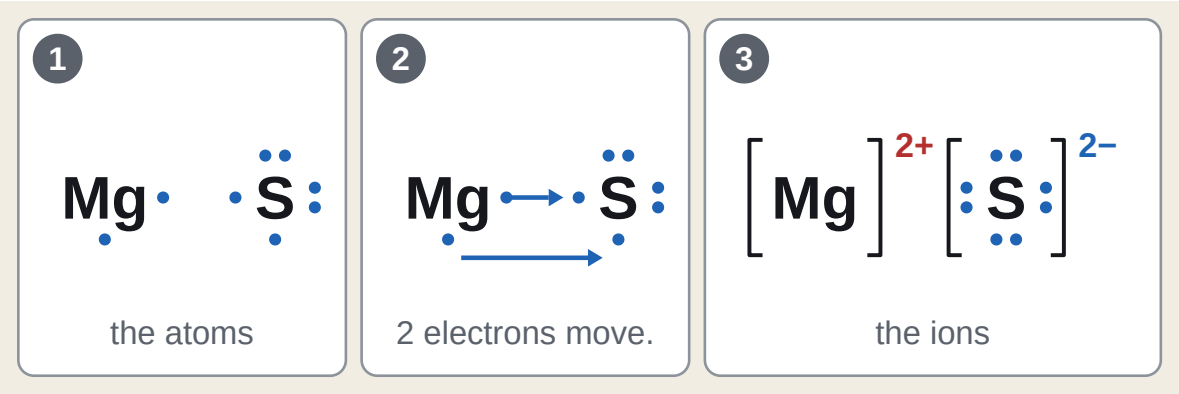
A calcium atom has two dots. What does the electron dot diagram of a calcium ion look like?

Try it

An oxygen atom has six dots. What does the electron dot diagram of an oxide ion look like?

Slide 3 of 6 · A one-to-one transfer

You can now draw an atom and an ion. Next you draw a whole ionic bond forming. Moving electrons from one atom to another is called a transfer.



Key ideas

First _____ each atom with its dots.

Then _____ electrons from the metal to the non-metal.

Then draw the ions. Each ion has a _____ outer level.

The charges 2+ and 2− add to _____.

Example

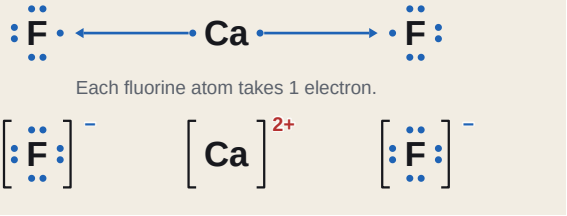
Why is one magnesium atom enough for one sulfur atom?

Try it

Barium has 2 valence electrons and oxygen has 6. How many barium atoms does one oxygen atom need? Write the formula.

Slide 4 of 6 · When the numbers of electrons do not match

On the last slide, magnesium gave 2 electrons and sulfur took 2. The numbers matched. Sometimes they do not match.



$$Ca(s) + F_2(g) \rightarrow CaF_2(s)$$

(s) means solid (g) means gas → means "gives"

One F_2 molecule holds the two fluorine atoms.

Key ideas

Calcium has 2 valence electrons to lose. Fluorine needs only _____.

So a _____ fluorine atom is needed.

A _____ has the same atoms on both sides.

In a _____, (s) means solid and (g) means gas.

Example

Strontium has two valence electrons and chlorine needs one. How many chlorine atoms does one strontium atom need?

Try it

Magnesium has 2 valence electrons and nitrogen needs 3. How many atoms of each are needed? Write the formula.

Slide 5 of 6 · Method: how to show an ionic bond forming

You have now drawn three ionic bonds forming. Each time you did the same four things. Here they are as steps.

1. **Draw** each atom's electron dot diagram.
2. **Move** electrons from the metal to the non-metal.
3. **Add** atoms until every atom is full.
4. **Draw** the ions in brackets, with charges.



Check: electrons lost equal electrons gained.

Used again in: lessons A4 and A7

Key ideas

Step 1: _____ the electron dot diagram of each atom.

Step 2: _____ electrons from the metal to the non-metal.

Step 3: _____ atoms until every atom is full.

Step 4: draw the ions in _____, with charges.

Example

Use the four steps to show the ionic bond forming between potassium and sulfur.

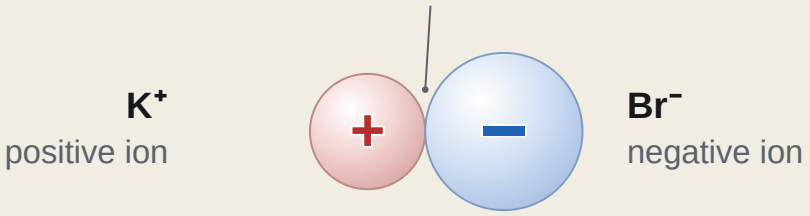
Try it

Use the four steps to show the ionic bond forming between calcium and bromine.

Slide 6 of 6 · Forces inside a substance

All lesson you have drawn ionic bonds. An ionic bond belongs to a family of forces. The family has a name.

An ionic bond is an intramolecular force.



It is a force that holds the ions of a compound together.

Key ideas

A bond is a _____ that holds atoms or ions together.

A force inside a compound is an _____.

"Intra" means _____.

An _____ is one kind of intramolecular force.

Example

Is an ionic bond an intramolecular force? Say why.

Try it

What does "intra" mean? Use it to say what an intramolecular force is.