

5.2 Ionic Bonds

1. Review

What is the electron configuration of an oxide ion (O^{2-})? $1s^2 2s^2 2p^6$

What is the charge of a sulfide ion? $2-$

Is a magnesium ion an anion or a cation?

What do you call a negative ion of hydrogen?
hydride ion

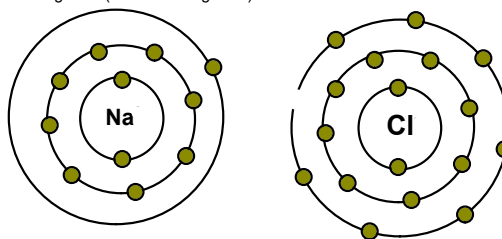
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Terms

Ionic Bond = Electrostatic force that holds oppositely charged particles together.

Ionic Compounds: Electrically neutral substance bound by ionic bonds. No net charge.

Example: sodium loses an electron to chlorine (click 3s electron), then they stick together (move ions together).



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Common Binary Ionic Compounds

Def: ionic compounds made of only two elements.

Table salt: sodium chloride ($NaCl$)



Fluorite (mineral): calcium fluoride (CaF_2) - used in toothpaste.



Lime (cement): calcium oxide (CaO)

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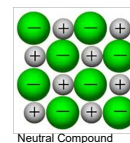
Charge

Ionic compounds are neutrally charged: equal numbers of positive and negative charges.

Conceptually, it's a balancing act between the different charges.

Chemical formulas are written showing numbers of each ion with a subscript (positive ion first).

Ex: Potassium Oxide: K_2O .



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2. Formula Example

What is the formula of magnesium chloride? Use your ions list (Resources 3).

Magnesium ion: Mg^{2+}

Chloride ion: Cl^-

One magnesium ion is neutralized by two chloride ions: Formula = $MgCl_2$

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3. More Formulas

Use your ions resource.

What is the formula of sodium nitride?
 Na_3N

What is the formula of aluminum chloride?
 $AlCl_3$

What is the formula of calcium sulfide?
 CaS

What is the formula of aluminum sulfate?
 $Al_2(SO_4)_3$

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Chem 5.2 Notes - Ionic Bonds.notebook

4. Formula Error Example

Which of the following formulas is wrong? Fix them! Some are correct as written.



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5. Formula Fixing Example

Fix the following formulas.



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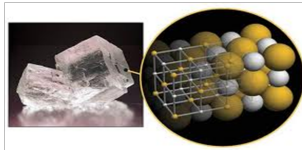
Properties of Ionic Compounds

Form a repeating system of ions called a crystal lattice.

They tend to have high melting and boiling points.

Solutions of ionic solids conduct electricity – called electrolytes. (Demo.)

Hard, rigid, brittle solids.



Salt Crystals

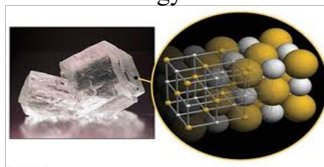
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Lattice Energy

Def: Energy required to break the bonds of a mole (6.02×10^{23} particles) of an ionic compound during melting.

Depends on size and charge of ions:

- The smaller the ion, and/or the larger the ionic charge, the greater the lattice energy.
- The larger the ion and smaller the charge, the lower the lattice energy.



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6. Lattice Energy Example

Which compound has greater lattice energy, potassium fluoride (KF) or potassium iodide (KI)?

Compare ions: K is in both formulas - same size.

Fluoride is smaller than iodide, so KF has a greater lattice energy.

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7. Ranking Example

Rank the following compounds melting points from least to greatest:



Answer: KCl NaCl NaF LiF

Homework

Preview 5.3

5.2 Problems in your Booklet
Due: Next Class

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