Compare 2 ionic compounds

"Which has the larger lattice energy?"

"Which is stronger bond?"

\[ F = \frac{kQ_1Q_2}{r^2} \]

→ Size of charge

→ Size of ions, \( l \)

Evidence: \( r_{mp} \) smaller, stronger the bond

Why do ions combine in the ratios they do?

→ Maximize the \( E \) (exothermic)

\( \neq \) sharing just the \( \text{electronic} \) w/ stable gas using \( x4 \)

1. \( E \) input needed to ionize

\( \text{IE}_1, \text{IE}_2, \text{IE}_3 \text{ etc. } \Delta H(+) \)

2. \( E \) input needed to add \# e’s > 1

\[ \begin{align*}
    o^+ + e^- & \rightarrow o^- \quad \Delta H(-) \\
    o^- + e^- & \rightarrow o^{2-} \quad \Delta H(-)
\end{align*} \]

3. \( E \) released by \( EA1 \)

4. \( E \) released by bond formation \( \Delta H(+) \)

if \( (3 \times 4) > (1 \times 2) \) the bond forms

\[ \text{E} \]

\[ 1 \times 2 \]

3 \& 4 combined
Compare 2 ionic compounds

Which has the larger lattice energy?

Which is stronger bond?

\[ F = \frac{kQ_1Q_2}{r^2} \]

\[ \rightarrow \text{Size of charges} \]

\[ \rightarrow \text{Size of ions, } 1:1 \]

Evidence: \( r_{mp} \) 1mp stronger the bond

Why do ions combine in the ratios they do?

\[ \rightarrow \text{maximize the E lowering} \]

\( \neq \) just isoelectronic

\( \neq \) noble gas usage

1. E input needed to ionize
\[ e \rightarrow I.E. \_1, I.E. \_2, I.E. \_3 \ldots \Delta N(+) \]

2. E input needed to add # e\(^-\)'s > 1

\[ O^+ + e^- \rightarrow O^- \quad \Delta N(-) \]

\[ O^- + e^- \rightarrow O^{2-} \quad \Delta N(+) \]

3. E released by \( E_{\Delta 1} \)

4. E released by bond formation \( \Delta N(+) \)

if (3+4) > (1+2) the bond forms

\[ E \]

\[ \text{atom} \rightarrow 1+2 \]

\[ 3+4 \text{ compound} \]
**CovAlent Bonding**

2 e⁻ shared by 2 atoms

→ results in covalent (molecular) compounds

**Molecule**

\[ \text{H}_2 \text{O} : \text{H} \]

**Nonmetals**

\[ \text{Representative Elements} \]

\[ \text{C} - \text{C} \quad \text{C} = \text{C} \quad \text{C} = \text{C} \]

Weakest

Longest

Strongest

Shortest

**IOnIC**

- Electrostatic attractions

→ Non-directional

**CovAlENT**

- Directional bonding

→ Molecules

**Solids**

\[ \uparrow \text{mp} \]

- Often H₂O soluble
- Often electrolytes

**NH₃**

\[ \text{PH}_₃ \text{F} \]

\[ \text{H} : \text{H} \quad \text{N} \quad \text{H} \quad \text{N} \quad \text{H} \]

\[ \begin{array}{c}
\text{5} \\
\text{3} \\
\text{1} \\
\text{0}
\end{array} \quad \begin{array}{c}
\text{8e}^- \\
\text{2e}^- \\
\text{2e}^- \\
\text{2e}^-
\end{array} \]

\[ \text{H} \quad \text{P} \quad \text{F} \]

\[ \begin{array}{c}
\text{5} \\
\text{7} \\
\text{6} \\
\text{8e}^- \\
\text{2e}^-
\end{array} \]

* NON ELECTROLYTES