Hello everyone! Good job, y’all made it through another week!

I’ll be posting weekly resources on the topics that will be covered in class the following week. Reach out to me if you need help with anything. Also do let me know if there are any specific resources you find helpful in the discussion board. If you cannot make it to Group Tutoring, remember these resources are available to you on the tutoring center website.

Our Group Tutoring sessions will be every Wednesday from 5:15-6:15 PM. We will go over important topics that you will be covering in class and we will practice problems that you will need to be familiar with. You can reserve a spot at https://baylor.edu/tutoring. I hope to see you there!

Some topics I’ll be covering:
Electrostatic Potential Energy, Ionic bonds, covalent bonds, bond polarity and electronegativity, dipole moment, ionic compounds

Keywords:
Potential Energy, Bonding, Electronegativity, Bond Length, Dipole Moment

<table>
<thead>
<tr>
<th>TOPIC OF THE WEEK</th>
<th>Bond Energies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Bond energies are used to calculate approximate values for reactions</td>
<td></td>
</tr>
<tr>
<td>The formula for energy change is:</td>
<td></td>
</tr>
</tbody>
</table>

$$\Delta E = \sum \frac{n \times D \ (bonds \ broken)}{\text{Energy \ required}} - \sum \frac{n \times D \ (bonds \ formed)}{\text{Energy \ released}}$$

- $\Sigma = \text{The sum of terms}$
- $D = \text{Bond dissociation energy per mole of bonds}$
- $D$ is always positive
- $n = \text{Moles of a particular type of bond}$

Bond energy (E) is defined as the amount of energy required to break apart a mole of molecules into its component atoms. It measures the strength of a chemical bond and is also known as bond enthalpy (H) or simply as bond strength.
**HIGHLIGHT #1: Electrostatic Potential Energy Formula:**

\[ U_e = k \frac{q_1 q_2}{r} \]

\[ k = 9 \times 10^9 \frac{N \cdot m^2}{C^2} \]

\( q_1, q_2 = \text{charge of each object} \)

\( r = \text{distance between the charges} \)

E = \((2.31 \times 10^{-19} \text{ J nm}) (Q_1 Q_2 / r)\)

Directly proportional to the product of charges and inversely proportional to the distance between ions

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**HIGHLIGHT #2: Bonding**

**What is chemical bonding?**
It is the force that holds atoms together

**Types of Bonding:**

**Ionic bonding:**

- Occurs when there is a complete transfer of valence electrons between atoms
- It produces two oppositely charged ions
- The metal loses electrons to become a **positively charged cation**, the non-metal **accepts** these electrons to become a **negatively charged anion**
Like charges will **repel**

Opposite charges attract

Resulting from the electrostatic attraction between cation and anion

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**Covalent Bonds**

- Occurs between atoms that **share** electrons
- Non-metals tend to form covalent bonds between them

**Bond length**: the distance between nuclei of two atoms joined via a bond

**Bond energy**: the energy needed to break one mole of covalent bonds
The table below notes down the major differences between metallic bonding, ionic bonding, and covalent bonding.

<table>
<thead>
<tr>
<th>Metallic Bonding</th>
<th>Ionic Bonding</th>
<th>Covalent Bonding</th>
</tr>
</thead>
<tbody>
<tr>
<td>metal + metal</td>
<td>metal + non-metal</td>
<td>non-metal + non-metal</td>
</tr>
<tr>
<td>atoms seek stability</td>
<td>atoms seek stability</td>
<td>atoms seek stability</td>
</tr>
<tr>
<td>atoms release their electrons to become cations</td>
<td>atoms give off or accept electrons</td>
<td>atoms share electrons with other atoms</td>
</tr>
<tr>
<td>happens between atoms of great difference in electronegativity</td>
<td>happens between atoms of little difference in electronegativity</td>
<td></td>
</tr>
<tr>
<td>can be bented without breaking</td>
<td>easily breaks</td>
<td>fragility depends on state</td>
</tr>
<tr>
<td>can conduct electricity and heat</td>
<td>ability to conduct may depend on state</td>
<td>ability to conduct may depend on the atoms</td>
</tr>
<tr>
<td>high melting and boiling point</td>
<td>high melting and boiling point</td>
<td>low melting and boiling point</td>
</tr>
</tbody>
</table>

HIGHLIGHT #3: Bond Polarity and Electronegativity

- The unequal sharing of electrons results in the bond having a dipole moment.
- The polar bond will be the product.
- Polar bonds can be canceled by molecular symmetry.
- Electronegativity: It is the tendency of an atom to attract a shared pair of electrons.
- If the electronegativity difference is larger, the bond will be more polar.

Electronegativity difference between bonded atoms

<table>
<thead>
<tr>
<th>Bond Type</th>
<th>Electronegativity Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure covalent</td>
<td>&lt; 0.4</td>
</tr>
<tr>
<td>Polar covalent</td>
<td>between 0.4 and 1.8</td>
</tr>
<tr>
<td>Ionic</td>
<td>&gt; 1.8</td>
</tr>
</tbody>
</table>

Bond character decreases, ionic character increases.
**Dipole moment**: It is the measure of bond polarity

\[ \mu = qr \]

Ionic compounds:

- Compounds that are composed of ions are held together by electrostatic forces called ionic bonding.
- The compound is neutral overall, however, is composed of positively charged ions called cations and negatively charged ions called anions

Some youtube videos that helped me understand these concepts:
(These videos include all the topics y’all are going to learn in Chapter 8 this week in class)

https://www.youtube.com/watch?v=ven0_jZoLcs&t=1s
https://www.youtube.com/watch?v=QNCmhfmWLPc&t=10s
CHECK YOUR LEARNING

Practice:

1. Are the following covalent bonds or ionic bonds?
   a. $\text{H}_2\text{O}$
   b. NaBr
   c. LiF
   d. CO$_2$

2. Which of the following groups of elements tend to form cations?
   a. Nonmetals
   b. Metalloids
   c. Metals
   d. Noble gases
   e. Radioactive elements

THINGS YOU MAY STRUGGLE WITH

- Writing lewis structures:
  Remember:
  -only valence electrons are included
  -dots represent electrons

- Breaking the Octet Rule: Remember that elements form stable molecules when surrounded by **eight** electrons

- **Two exceptions to the octet rule:**
  -Boron tends to form compounds in which the boron atom has fewer than eight electrons around it; it does not have a complete octet
  -Observed only in elements in Period 3 of the periodic table and beyond, the elements exceed the octet rule

Thank you!! Hope y’all have a great time learning chemistry! Please reach out if you have any questions and don’t forget to visit the Tutoring Center website for further information at www.baylor.edu/tutoring.

Answer key:

1. a. Covalent, b. Ionic, c. ionic, d. Covalent
2. c