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. **Don’t forget that I conduct group tutoring sessions every Wednesday from 5:15 pm to 6:15 pm via Microsoft Teams.** We will go over common topics that you may need help with and do a bunch of practice problems. You can reserve a spot at www.baylor.edu/tutoring :)  

**Topics I’ll be covering in this resource:** Vocabulary, Strong Electrolytes, Weak Electrolytes, Nonelectrolytes, Molarity, Dilution, Types of Solution Reaction  

**Keywords:** Electrolytes, Molarity, Solution Reactions  

**Vocabulary:** Make sure you go over these definitions as they will be very important for the problems you will encounter in these chapters.  

- **Solute:** Substance dissolved.  
- **Solvent:** Liquid substance, often water, but it can be anything where a solute is dissolved in.  
- **Electrical conductivity:** Ability of a solution to conduct electricity.  
- **Solutions with high electrical conductivity are strong electrolytes**  
- **Solutions with low electrical conductivity are weak electrolytes**  
- **Nonelectrolytes** do not conduct electricity  

**Strong Electrolytes:**  
These are substances that are completely ionized upon dissolution. In other words, they will be split up when dissolved in a solvent. The table below show examples of common electrolytes and their classification  

**Strong electrolytes can be classified as:**  

**Soluble Salts**  
- Sodium chloride produces Na+ and Cl– ions when dissolved  

**Strong Acids**  
- Undergo ionization reactions to produce H+ ions  
- Represented in the aqueous form in equations  
- Completely dissociate into ions  

**Strong bases**  
- Soluble ionic compounds that possess OH– ions  
- Bitter to taste and slippery to touch  

<table>
<thead>
<tr>
<th>6 Strong Acids</th>
<th>6 Strong Bases</th>
</tr>
</thead>
<tbody>
<tr>
<td>HClO₄ perchloric acid</td>
<td>LiOH lithium hydroxide</td>
</tr>
<tr>
<td>HCl hydrochloric acid</td>
<td>NaOH sodium hydroxide</td>
</tr>
<tr>
<td>HBr hydrobromic acid</td>
<td>KOH potassium hydroxide</td>
</tr>
<tr>
<td>HI hydroiodic acid</td>
<td>Ca(OH)₂ calcium hydroxide</td>
</tr>
<tr>
<td>HNO₃ nitric acid</td>
<td>Sr(OH)₂ strontium hydroxide</td>
</tr>
<tr>
<td>H₂SO₄ sulfuric acid</td>
<td>Ba(OH)₂ barium hydroxide</td>
</tr>
</tbody>
</table>

https://opentextbc.ca/chemistry/chapter/14-3-relative-strengths-of-acids-and-bases/
Weak Electrolytes:
These are substances that produce lesser ions when dissolved and they conduct a small amount of electricity.

Weak electrolytes can be classified as:
Weak acids
  • Acids that produce a low amount of ions in an aqueous solution. Examples include formic acid (HCOOH, which is what ants inject when they bite) and acetic acid (CH3COOH, also known as vinegar – what you use to make salad vinaigrettes).
Weak bases
  • Bases that produce a low amount of ions in an aqueous solution. Examples include ammonia (NH3) and methylamine (NH2CH3)

Non-electrolytes:
Opposite to electrolytes, non-electrolytes are substances that do not produce any ions when dissolved. They will not split up and will keep their molecular conformation even if they are in solution. Also, remember that they Do Not conduct electricity.

The above diagram illustrates the basic difference between electrolytes and non-electrolytes. As shown in the diagram, the electrolytes produce ions (charge molecules) when dissolved, whereas non-electrolytes do not produce any ions when dissolved.

Ok, now that we have those concepts and definitions clear, let’s go into a little more complex concepts and example problems. We will begin talking about Molarity.

Molarity corresponds to the number (amount) of moles of solute per volume of solution IN LITERS!! This is super important to remember – to report molarity you will always consider it in terms of liters of solvent.

Let’s look at an example: What is the molarity of a solution formed from 6.75 NaCl dissolved in water to make a solution with a total volume of 452 mL?

Key concepts to remember are: number of moles and volume in liters. Therefore we solve this problem as:

\[
\text{Molarity} = \frac{\text{moles of solute}}{\text{volume of solution (in liters)}} = \frac{6.75 \text{ g NaCl}}{452 \text{ mL}} \times \frac{1 \text{ mol NaCl}}{58.4 \text{ g NaCl}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 0.256 \text{ mol/L}
\]
**Pro tip:** The first step should be to convert the grams given in the question to moles. It simplifies the problem. Additionally, remember to convert milliliter to liter because the definition of molarity is moles per liter of solution.

**Take the time to Practice with the following examples:**

- Determine the molarity for each of the following solutions:
  1. 0.444 mol of CoCl₂ in 0.654 L of solution
  2. 98.0 g of phosphoric acid, H₃PO₄, in 1.00 L of solution
  3. 0.2074 g of calcium hydroxide, Ca(OH)₂, in 40.00 mL of solution
  4. 10.5 kg of Na₂SO₄·10H₂O in 18.60 L of solution
  5. 7.0 × 10⁻³ mol of I₂ in 100.0 mL of solution
  6. 1.8 × 10⁴ mg of HCl in 0.075 L of solution

Alright, moving on! Now we will look into further definitions as to start building the ground for different types of reactions. First, let’s define **Dilution**.

A dilution corresponds to the addition of a solvent to a concentrated solution in order to achieve the desired molarity. An alternate way to express this concept is by the following equation:

\[ M_1 V_1 = M_2 V_2 \]

Where, \( M_1 \) and \( V_1 \) represent the molarity and volume of the solution before dilution and \( M_2 \) and \( V_2 \) represent the molarity and volume of the diluted solution.

Let’s look at the **Types of Solution Reactions**

**Precipitation Reactions:** These are reactions where one of the products is a solid that separates from the solution and “falls down” to the bottom. **The solid that falls to the bottom is known as the precipitate and the leftover solution (liquid portion) is the supernatant.**

https://chem.libretexts.org/Courses/Valley_City_State_University/Chem_121/Chapter_4%3A_Solution_Chemistry/4.2%3A_Precipitation_Reactions
**Acid–Base Reactions**: These are very simple as they literally mean an acid reacting with a base. The diagram below represents a generalized form of an acid-base reaction, when acid reacts with a base, and they produce a salt and water.

![Acid-Base Reaction](https://www.chemistrylearner.com/chemical-reactions/acid-base-reaction)

**Oxidation–Reduction Reactions**: In this type of reaction, there is an exchange of electrons, where one substrate will lose electrons and the other will gain them. Oxidation-reduction reactions are also called redox reactions and involve both oxidation and reduction occurring simultaneously.

In the diagram to the right, molecule A is getting oxidized to A+ and molecule B is getting reduced to B-. An important concept to remember through the pneumonic OIL and RIG is:

**OIL**: Oxidation is the loss of electrons  
**RIG**: Reduction is gain in electrons

![Oxidation-Reduction Reaction](https://byjus.com/jee/redox-reactions/)

That’s it for this week. I Hope y’all have a great time learning chemistry and don’t forget to sign up for the weekly group tutoring session. Also, make sure you take advantage of the many resources offered to you at the tutoring center. You can find more info at baylor.edu/tutoring

**Answers for Practice**

1. 0.679 M  
2. 1.00 M  
3. 0.06998 M  
4. 1.75 M  
5. 0.070 M  
6. 6.6 M