**Chemistry**

**Packet#15**

***Concentrations of Solutions***

***Acids/Bases***

***Edmodo Group Code:*** *ozm60q* (http://www.edmodo.com)

***Class Website:*** http://mrgchem.weebly.com

***Mr. Gutierrez’s email:*** gutierrez.br@elizabeth.k12.nj.us

Text Messaging Reminders: Text @aofchem to 23559



*Note: You are expected to work on this packet during the allotted class practice time.*

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| **Packet Points** |
| / | Completed Class Notes |
| / | Writing Name on Every Page |
| / | Handed Packet in on Time  |
| / | Homework |
| / | Followed Classroom Policies |
| / | Classwork Participation |
| / | TOTAL POINTS |

Name of Chemist:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_

***DUE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

*\*All Classnotes + Questions MUST be finished for HOMEWORK if not done in class.*

**Unit#12: Acids and Bases**

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**Packet Grading:**

Remember you get TWO types of grades for your packet:

1. Packet participation grade (getting stamps at the end of the period)
2. Each “Class Work” section gets a separate grade

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the concentration of a solution given mass of solute and volume of solvent.** |

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| **Class Notes** |
| **Solutions**A ***solution*** is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of two or more substances in a single phase.

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| **Solute** |  |
| **Solvent** |  |

**Concentration of Solutions****\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the number of moles of solute in one liter of solution.

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| ***Molarity Formula\****Molarity (M) =  |

NOTE: **Volume MUST be in LITERS**. If not in LITERS, you must convert.**Molarity Calculations***Example#1*You have 3.50 L of solution that contains 90.0 g of sodium chloride. What is the molarity of that solution?*Example#2*You have 0.8 L of 0.5 *M* HCl solution. How many moles of HCl does this solution contain?*Example#3*You are given 90 g of sodium chloride and are required to make a 1.5 M solution. What volume of water do you need to make this solution?**Molarity Practice Samples***You may try Sample A with a partner if you still do not feel comfortable. Complete Sample B INDEPENDENTLY. SHOW ALL YOUR WORK.*

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| **Practice Sample A** | Determine the molarity of a solution with 50 grams of sodium fluoride dissolved in 3 L of water. |
| **Practice Sample B** | How many moles of potassium hydroxide is found in a 500 mL sample of 6.0 M of solution? (Remember, volume MUST be in L.) |

**Once you are finished, have Mr. Gutierrez check your work before continuing to the next question.** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the concentration of a solution given mass of solute and volume of solvent.** |

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| **CLASS WORK*****Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework.  |
| 1. What is the molarity of a solution composed of 5.85 g of potassium iodide dissolved in enough water to make 0.125 L of solution?
2. How many moles of H2SO4 are present in 0.500 L of a 0.150 M H2SO4 solution?
3. What volume of 3.00 M NaCl is needed for a reaction that requires 146.3 g of NaCl?
4. We dissolve 5.00 grams of sugar, C12H22O11, in water to make a 1.000 L of solution. What is the concentration of this solution expressed as a molarity?
5. How many grams of solute are needed to make 2.50 L of a 1.75 M solution of Ba(NO3)2?
6. How many moles of NaOH are contained in 65.0 mL of a 2.20 M solution of NaOH?
7. A solution is made by dissolving 26.42 g of (NH4)2SO4 in 50.00 mL of solution. Calculate its molarity.
8. What is the molarity of a solution of 14.0 g of carbon tetrafluoride in 150 mL of solution?
9. Na2SO4 is dissolved in water to make 450. mL of a 0.250 M solution.
10. What is the molar mass of sodium sulfate?
11. How many moles of sodium sulfate are needed?
12. How many Liters of solution are needed to make 1.0 M of AgNO3 if you have 169.9 g of pure AgNO3?
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the concentrations or volumes of solutions after a dilution.** |

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| **Class Notes** |
| **Dilutions**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| ***Dilution Formula\**** |

**Dilution Calculations***Example#1*If you dilute 175 mL of a 1.6 M solution of lithium chloride to 1.0 L, determine the new concentration of the solution.*Example#2*You need to make 10.0 L of 1.2 KNO3. What molarity would the potassium nitrate solution need to be if you were to use only 2.5 L of it? *Example#3*How many milliliters of 5.0 M copper (II) sulfate solution must be added to 160 mL of water to create a 0.30 M of copper (II) sulfate solution?**Dilution Practice Samples***You may try Sample A with a partner if you still do not feel comfortable. Complete Samples B and C INDEPENDENTLY. SHOW ALL YOUR WORK.*

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| **Practice Sample A** | What is the final volume of 500 mL of a 1.75 M H2SO4 with a final concentration of 8.61 M H2SO4? |
| **Practice Sample B** | You have 505 mL of a 0.125 M HCl solution and you want to dilute it to exactly 0.100 M. How much water should you add? Assume volumes are additive. |
| **Practice Sample C** | Water is added to 25.0 mL of a 0.866 M KNO3 solution until the volume of the solution is exactly 500 mL. What is the concentration of the final solution? |

**Once you are finished, have Mr. Gutierrez check your work before continuing to the next question.** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT calculate the concentrations or volumes of solutions after a dilution.** |

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| **CLASS WORK*****Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework.  |
| 1. A solution has an initial volume of 2 liters and a molarity 3.5 M. If its final molarity is 1.75 M, what is the final volume?
2. A solution has a final volume of 750 mL and a final molarity 2.0 M. If its initial volume was 500 mL, what was the initial molarity?
3. If 100 mL of 1.25 M HCl solution is diluted to a final volume of 200 mL, what is the molarity of the final solution?
4. What will the molarity of a solution be if 25mL of water are added to 125mL of a 0.15 M NaOH solution?
5. How many liters of 5M H2SO4 are produced from a dilution of 2.5L of 1M solution?
6. How much water would need to be added to a 500mL of 2.4M KCl solution to make a 1.0M solution?
7. Determine the final volume if you wish to prepare 1.00 L of 0.646 M HCl solution starting with 2.00 M HCl solution.
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT list the five general properties of acids and bases. SWBAT define acid and base according to Arrhenius’s theory of ionization.** |

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| **Class Notes** |
| **Acids and Bases**

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| **ACIDS** | **BASES** |
| According to Arrhenius, an acid is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | According to Arrhenius, a base is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **FIVE GENERAL PROPERTIES**Page 468 for Acid properties.Page 471 for Base properties. |
| 1.2.3.4.5. | 1.2.3.4.5. |
| ***Examples of Strong Acids*** | ***Examples of Strong Bases*** |
| Strong acid =  | Strong base =  |
| ***Examples of Weak Acids*** | ***Examples of Weak Bases*** |
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**Ionization Reactions** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT list the five general properties of acids and bases. SWBAT define acid and base according to Arrhenius’s theory of ionization.** |

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| **CLASS WORK*****Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework.  |
| 1. What are the five general properties of aqueous acids?
2. What are the five general properties of aqueous bases?
3. Label each reactant in the reaction below as a *proton donor* or a *proton acceptor* and as *acidic* or *basic.*

KOH + HCl 🡪 KCl + H2O1. Explain what it means to be a “strong acid.” Give two examples of a strong acid.
2. Explain what it means to be a “weak acid.” Give two examples of a weak acid.
3. Which of the following is NOT a characteristics of an acid?
4. An acid changes the color of an indicator
5. An acid has a bitter taste
6. An acid ionizes in water
7. An acid produces hydronium ions in water
8. When an acid reacts with an active metal,
9. hydronium ion concentration increases
10. metal forms anions
11. hydrogen gas is produced
12. carbon dioxide gas is produced
13. Write a reaction that shows the dissociation of hydrofluoric acid (HF) in water.
14. What is the chemical formula of acetic acid?
15. Name the following acids:
16. HNO3
17. HF
18. HCl
19. HI
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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT explain the process of neutralization. SWBAT classify a reactant or product as a base, acid, or salt in a neutralization reaction.** |

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| **Class Notes** |
| **Acids-Base Neutralization**When a strong acid and strong base react, your products will always produce a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_. A salt is an \_\_\_\_\_\_\_\_\_\_\_ compound made up of a \_\_\_\_\_\_\_\_ and an \_\_\_\_\_\_\_\_\_.***Examples of Neutralization Reactions*** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT explain the process of neutralization. SWBAT classify a reactant or product as a base, acid, or salt in a neutralization reaction.** |

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| **CLASS WORK*****Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework.  |
| 1. Complete and balance the equations for the following acid-base reactions
2. HCl (aq) + NaOH (aq) 🡪
3. HNO3 (aq) + KOH (aq) 🡪
4. Ca(OH)2 (aq) + HNO3 (aq) 🡪
5. Magnesium hydroxide reacting with hydrochloric acid
6. Label the acid, base, and the salt in the chemical reactions above.
7. Complete and balance the following acid-base reactions:
8. Hydrogen bicarbonate reacts with strontium hydroxide
9. HClO4 + NaOH 🡪
10. Hydrobromic acid reacts with barium sulfate
11. Baking soda reacting with sulfuric acid (H2SO4)

**Additional Notes/Problems**: |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objectives: SWBAT explain and use the pH. SWBAT calculate pH given the hydronium ion concentration.** |

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| **Class Notes** |
| **The pH Scale**The \_\_\_\_\_\_\_\_\_ of a solution is defined as the negative of the common logarithm of the hdydronium ion concentration, [H3O+]. In simple terms, the pH tells us \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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| **pH Formula**pH = Note: For strong acids, you may assume that [H3O+] = [Strong Acid] for now. |

* If the pH is less than 7, the solution is considered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* If the pH is greater than 7, the solution is considered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* If the pH is equal to 7, the solution is considered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**pH Calculations***Example#1*What is the pH of a solution if the [H3O+] is 3.4 x 10-5 M?*Example#2*What is the pH of a solution if the [H3O+] is 6.7x 10-4 M?*Example#3*Determine the pH of a 2.5 x 10-6 M HNO3 solution.*Example#4*What is the hydronium ion concentration of an aqueous solution with a pH of 4.0?**[H3O+] = antilog(-pH) = 10-pH** |

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| **Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Objective: SWBAT explain the process of neutralization. SWBAT classify a reactant or product as a base, acid, or salt in a neutralization reaction.** |

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| **CLASS WORK*****Class Work (Independent Practice*) Directions*:*** Finish as many questions as you can during class. Refer to your notes and ask at least three classmates before asking me for help. If you do not finish these questions in class, you must finish them for homework.  |
| 1. Why does a pH of 7 represent a neutral solution at room temperature?
2. Calculate the pH of hydrochloric acid with a concentration of 4.5 x 10-3 M.
3. Determine the pH of each solution below.
4. 1.0 x 10-2 M
5. 1.0 x 10-3 M
6. 1.0 x 10-4 M
7. 2.0 x 10-5 M
8. 4.7 x 10-7 M
9. 3.8 x 10-3 M
10. Determine the pH of the following strong acids.
11. 1.0 x 10-2 M HCl
12. 3.0 x 10-3 M HNO3
13. 5.0 x 10-5 M HBr
14. 1.0 x 10-4 M HI
15. Given the following pH values, determine the hydronium ion concentration for each solution.
16. 3.0
17. 7.00
18. 11.0
19. 5.0
20. 6.00
21. 9.32
22. 10.53
23. If you are given 5.5 L solution of HNO3, a strong acid that has a pH of 2.70, how many moles of acid are present in this solution?
24. The pOH of a base is simply the antilog of the hydroxide ion concentration. Calculate the pOH of a 5.0 x 10-3 M solution of NaOH.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Additional Problems/Notes\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*** |

Make sure Mr. Gutierrez stamps/signs this by the end of the period. You CANNOT get the stamp/signature for a day later on. It is your responsibility to remind Mr. Gutierrez. You will NOT receive a stamp if you did not follow all classroom policies or actively work on the practice problems during the allotted class time.A stamp means you received all 10 points. No stamps means you’ve received zero points. If you completed some work, I may give you partial credit based on my discretion. ***If you are absent, write the date on the day you were absent and write the word “Absent.” DO NOT LOSE THIS SHEET!!!*** (If you lose this sheet, you will lose all of your participation points. NO EXCEPTIONS.)

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| **Day of Week** | **Followed All Classroom Policies** (Respectful, on time, prepared, engaged…) | **Class work Participation** | **Homework** |
| *Monday* | /10 | /10 | /10 |
| *Tuesday* | /10 | /10 | /10 |
| *Wednesday* | /10 | /10 | /10 |
| *Thursday* | /10 | /10 | /10 |
| *Friday* | /10 | /10 | /10 |

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| **Classroom Policy Violation Codes**P = PhoneC = CursingT = TalkingL = Late to classO.T. = Off TaskH.D. = Head DownN.iP = Did not bring iPadUnp = Unprepared (no pencil, no iPad, no emergency passes, no periodic table, etc.) |

**Teacher Comments:**