

Name:

Period:

Seat#:

Write equation for each term.

| 1) Molarity (M) | 2) Molality (m) | 3) Mole Fraction ( $\chi$ ) | 4) Weight Percent (%) |
|-----------------|-----------------|-----------------------------|-----------------------|
|                 |                 |                             |                       |

Each of these concentrations involves grams or moles of solute, solvent, or solution.  
Determine those values based on the information at the top of the chart.

*Assume you dissolve 2.56 g of malic acid,  $C_4H_6O_5$ , in half a liter of water (500.0 g).*

**Work and answer**

|                                 |  |
|---------------------------------|--|
| 5) Molarity of acid in solution | 6) Mole fraction of acid in solution     |
| 7) Molality of acid in solution | 8) Weight percentage of acid in solution |

Perform the following calculations, be sure to include units and show work to an AP level.

|   |
|---|
| 9) Calculate the concentration of the following solution in units of <u>molarity, M, moles per liter</u> :<br>5.00 grams of glucose, $C_6H_{12}O_6$ , in 900 mL of solution |
| 10) Calculate the concentration of the following solution in units of <u>percent mass composition</u> :<br>25.0 moles of NaOH is dissolved in 650 mL of water               |
| 11) 92.3 grams of potassium fluoride, KF, are dissolved in 1000.0 grams of water.<br>What is the percent by mass <u>of water</u> ?  |

12) What mass of ammonium chloride would you use to prepare 85.0 mL of 1.20 M solution? 5.457 g

13) A mass of 98.0 g of sulfuric acid,  $\text{H}_2\text{SO}_4$ , is dissolved in water to prepare a 0.500 M solution. What is the volume of the solution? 2.00 L

14) What mass of copper(II) nitrate, is present in 50.00 mL of a  $4.55 \times 10^{-3}$  M aqueous solution?  $4.27 \times 10^{-2}$  g

15) A perchloric acid solution is composed of 168.75 g of perchloric acid and 81.25 mL of pure water. What is the % by mass of the perchloric acid solution? The density of water is 1.000 g/mL. 67.5%

16) The density of the above perchloric acid solution is 1.138 g/mL. What is the molarity of the perchloric acid solution from question #15? 7.64M

17) If 80.5 mL of the above perchloric acid solution is added to 169.5 mL of water, what is the new concentration of the perchloric acid solution? 2.46M

18) If 43.2 mL of the diluted  $\text{HClO}_4$  solution completely reacts with a 75.0 mL sample of a sodium hydroxide solution, what is the molarity of the sodium hydroxide solution? 1.41 M NaOH

**19)** Use Question #18 to answer the following:

- a. Write a complete ionic and a net ionic equation for the reaction in Q#18
- b. What are the spectator ions in the reaction?
- c. What type of reaction is this (remember the five main types)?

**20)** How much of a 15.0 M stock solution do you need to prepare 250 ml of a 2.35 M HF solution?

**21)** If 65.5 ml of HCl stock solution is used to make 450 ml of a 0.675 M HCl dilution, what is the molarity of the stock solution?

**22)** If 45 mL of water are added to 250 mL of a 0.75 M  $K_2SO_4$  solution, what will the molarity of the diluted solution be?

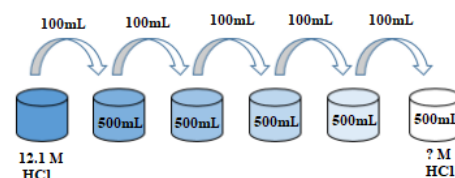
**23)** If 550 mL of a 3.50 M KCl solution are set aside and allowed to evaporate until the volume of the solution is 275 mL, what will the molarity of the solution be?

**24)** How much water would need to be added to 750 mL of a 2.8 M HCl solution to make a 1.0 M solution?

**25)** Which solution is more concentrated? Solution "A" contains 50.0 g of calcium carbonate in 500.0 mL of solution. Solution "B" contains 6.0 moles of ammonium sulfite in 4.0 L of solution.

**26)** 125  $cm^3$  of an aqueous solution contains 3.5 moles of solute. What is the molarity of the solution?

27) You perform a serial dilution starting with 12.1 M concentrated HCl. If you perform 5 dilutions, with 100mL of the stronger concentration solution being added to 500mL of water each time, what will the final concentration of your last dilution end up being?



28) A 20.0–milliliter sample of 0.200–molar  $K_2CO_3$  solution is added to 30.0 milliliters of 0.400–molar  $Ba(NO_3)_2$  solution. Barium carbonate precipitates. The concentration of barium ion,  $Ba^{2+}$ , in solution after reaction is:

29) When 100 mL of 1.0 M  $Na_3PO_4$  is mixed with 100 mL of 1.0 M  $AgNO_3$ , a yellow precipitate forms and  $[Ag^+]$  becomes negligibly small. Which of the following is a correct listing of the ions remaining in solution in order of increasing concentration?

- A)  $[PO_4^{3-}] < [NO_3^-] < [Na^+]$
- B)  $[PO_4^{3-}] < [Na^+] < [NO_3^-]$
- C)  $[NO_3^-] < [PO_4^{3-}] < [Na^+]$
- D)  $[Na^+] < [NO_3^-] < [PO_4^{3-}]$
- E)  $[Na^+] < [PO_4^{3-}] < [NO_3^-]$

30) If 200. mL of 0.60 M  $MgCl_2(aq)$  is added to 400.mL of distilled water, what is the concentration of  $Cl^-(aq)$  ions in the remaining solution?

31) Go to the “Lab Skills” PowerPoint on the Lab Tab of the class website. Read the slides and watch the videos related to the lab techniques that are part of this chapter. Jot down a few points that stand out to you.

1. Using a graduated cylinder
2. Using a volumetric flask
3. Making a solution
4. Performing serial dilutions
5. UV-VIS Spectroscopy

Fill in the blanks in the table. Aqueous solutions are assumed. Show all work.

**Remember** – if you do not have the density of the solute, or other information, then assume the solute does not change the volume of the solution. We don't always know how much space the solute takes up!

| Compound | Molarity | Weight Percent | Mole Fraction |
|----------|----------|----------------|---------------|
| 32) NaI  | 0.15     |                |               |

| Compound                             | Molarity | Weight Percent | Mole Fraction |
|--------------------------------------|----------|----------------|---------------|
| 33) C <sub>2</sub> H <sub>5</sub> OH |          | 5.0            |               |

| Compound  | Molarity | Weight Percent | Mole Fraction |
|---|----------|----------------|---------------|
| 34) C <sub>12</sub> H <sub>22</sub> O <sub>11</sub> | 0.15     |                |               |

| Compound                | Molarity | Weight Percent | Mole Fraction |
|-------------------------|----------|----------------|---------------|
| 35) Iron(IV)<br>Nitrite |          |                | 0.030         |