1. Calculate the molarity: 22.615 g $AgClO_4$ in 250 mL solution. [mass to moles to M].

   0.436 M

2. Calculate osmolality: 16.49 g NaCl in 500 mL water. [mass to moles x #particles to M].

   1.128.osm

3. Calculate #moles: 50.0 mL of 0.40 M KBr. [volume to #moles].

   0.0500 x 0.40 = **0.029 moles**

4. Calculate molarity: 10.0 mL 2.50 M NaOH is diluted to a final volume of 500 mL. [MV = MV].

   2.50 x 10/500 = **0.0500 M**

5. Calculate mass (g): 20.0 mL of 0.427 M HNO_3 solution. [#moles (MV) to mass].

   0.538 g

6. Calculate molarity: 36.09 g NaCl in 500 mL solution. [mass to moles to M].

   36.09/(58.45 x 0.500) = **1.235 M**

7. Calculate molarity: The solution in #6 is diluted, 10 mL to 250 mL. [dilution factor].

   25x dilution. **0.494 M**

8. What volume of 0.100 M acetic acid is required to give 0.024 moles?

   V = 0.024/0.100 = **0.24 L**

9. Balanced equation: $Al(OH)_3 + 3\ HCl \rightarrow AlCl_3 + 3\ HOH$. What volume of 02.00 M HCl is needed to completely react with 16.47 g $Al(OH)_3$? [mass to moles to moles to volume].

   (16.47/78)(3/1)(1/2.00) = **0.316 L**

10. $3CuCl_2 + 2Al \rightarrow 3Cu + 2AlCl_3$; How many grams of Al are needed to completely react with 100 mL of 0.200 M $CuCl_2$? [M(CuCl2) to moles(CuCl2) to moles Al to mass Al].

    0.100 x 0.200 x (2/3) x 27 = **0.360 g**

11. How would you prepare 500 mL of a 0.20 M solution of sucrose ($C_{12}H_{22}O_{11}$, mol wt 342.3) using a balance (0.01 g) and a 500.0 mL volumetric flask?

    0.500 x 0.20 = 0.10 moles sucrose; 0.10 x 342 g/mol = **34.20 g** sucrose; dissolve in water to the mark of the 500 mL volumetric flask.

12. What is the molar concentration of a solution made up by dissolving 20.05 g $MgSO_4$ in enough water to give a final volume of 250 mL?

    $MgSO_4$ (120.3 g/mol). (20.05/120.3)/0.250 = **0.667 M**

13. What is the osmolality of a solution made up by dissolving 40.27 g of $MgSO_4$ in 500 g water? [mass to moles times #particles to osmolality].

    2 particles per mole. {(40.27/120.3)/0.500} x 2 = **1.34 osm**

14. How many moles of HCl are contained in 50 mL of a 0.127 M solution? [MV = moles].

    0.050 x 0.127 = **0.0064 moles**

15. 10.00 mL of an aqueous solution of HNO_3 is exactly neutralized by 23.21 mL of 0.25 M NaOH. What is the molar concentration of HNO_3? [Balanced equation?].

    1:1 mole ratio. M = (23.21 x 0.25)/10.0 = **0.58 M**

16. Which solution would be subjected to the greater osmotic pressure vs. water: 0.40 M NaCl or 0.30 M $BaCl_2$? Compare osmolarities: NaCl = 0.80 osm; **$BaCl_2$ = .090 osm**.

17. 100 ML of 2.00 M HCl is diluted to 250 mL. What is the concentration of the new solution?

    Molarity = 2.00 x 100/250 = **0.80 M**

18. 5.28 g $Ba(OH)_2$ is dissolved in enough water to give 500 mL solution. What is the molar concentration of hydroxide ion in the solution?

    2 moles hydroxide ion per mole of $Ba(OH)_2$. {(5.28/171)/0.500} x 2 = **0.124 M**

19. 50 mL of 0.100 M NaCl is mixed with 250 mL of 0.25 M NaCl. How many grams of NaCl are contained in the new solution?

    No moles = 0.050 x 0.100 + 0.250 x 0.25 = 0.0675 moles. Then 0.0675 x 58.45 = **3.95 g.**

20. $2HNO_3 + Ba(OH)_2 \rightarrow Ba(NO_3)_2 + 2\ HOH$; 10.0 g $Ba(OH)_2$ reacts exactly with how many mL of 0.5M HNO_3? [moles $Ba(OH)_2$ to moles HNO_3 to volume HNO_3].

    10.0/171 = 0.0585 moles. Multiply by 2 (moles HNO3 per mole of Ba(OH)2) to get 0.1170 moles of HNO3. Then 0.1170/0.5 = **0.234 L**