Complete on lined paper. Show all your work and watch your significant figures!

1) Calculate the molar concentration of the following solutions:

   a.  2.8 moles of HNO₃ in 4.0 L of solution
   b.  0.0700 moles of NH₄Cl in 50.0 L of solution
   c.  25.0 grams of NaCl in 250.0 mL of solution
   d.  10.0 grams of Cr(NO₃)₃•9H₂O in 325 mL of solution

2) How many grams of the substance would be used to prepare the following solutions?

   a.  1.00 L of 3.00 M NH₄Cl
   b.  125 mL of 0.500 M Ba(NO₃)₂
   c.  250.0 mL of 0.100 M SbCl₃
   d.  2.75 L of 0.0120 M NaOH

3) How many moles of AlCl₃ are contained in 350.0 mL of 0.250 M AlCl₃?

4) What volume of 2.40 M HCl can be made from 100.0 g of HCl?

5) How many moles of Sr(NO₃)₂ are contained in 55.0 mL of 1.30 x 10⁻³ M Sr(NO₃)₂?

6) What volume of 2.8 x 10⁻² M NaF contains 0.15 g of NaF?

7) The density of water at 4°C is 1.000 kg/L. What is the molar concentration of H₂O in pure water at 4°C? (Hint: how many moles of H₂O are contained in 1L)

8) The density of acetic acid, CH₃COOH is 1049 g/L. What is the molarity of pure acetic acid?

9) The molar concentration of pure HClO₄ is 17.6 M. What is the density of pure HClO₄?

10) How many grams of CaCl₂ are contained in 225 mL of 0.0350 M CaCl₂ solution?

11) Acetone has a density of 0.790 g/mL. What mass of acetone and benzoic acid, C₆H₅COOH, is required to make 350.0 mL of a 0.0100 M solution of benzoic acid dissolved in acetone? Ignore the contribution which the benzoic acid makes to the volume. Based on your answer, why does it seem appropriate that you can ignore the contribution made by benzoic acid to the total volume?

12) If 1 drop (0.050 mL) of 0.20 M NaBr is added to 100.00 mL of water, what is the molarity of the NaBr in the resulting solution?
13) Concentrated HNO$_3$ is 15.4 M. How would you prepare 2.50 L of 0.375 M HNO$_3$ from the concentrated solution?

14) Concentrated H$_3$PO$_4$ is 14.6 M. How would you prepare 45.0 L of 0.0600 M H$_3$PO$_4$?

15) If 300.0 mL of solution A contains 25.0 g of KCl and 250.0 mL of solution B contains 60.0 g of KCl, what is the molarity of the KCl in the solution resulting from mixing solutions A and B?

16) If 500.0 mL of 0.750 M NaCl is boiled down until the final volume is reduced to 300.0 mL, what is the final molarity of the NaCl? (Assume no salt is lost during the boiling process.)

17) How would you prepare 250.0 mL of 0.350 M HCl, starting with 6.00 M HCl?

18) What mass of NaCl is needed to prepare 500.0 mL of 0.400 M NaCl?

19) What is the concentration of the NaOH solution produced by mixing 125.0 mL of 0.250 M NaOH with 200.0 mL of 0.175 M NaOH?

20) What volume of 12.0 M NaOH is required in order to prepare 3.00 L of 0.750 M NaOH?

21) What is the concentration of CaCl$_2$ produced when 55.0 mL of 0.300 M HCl is mixed with 80.0 mL of 0.550 M CaCl$_2$?

22) When 350.0 mL of 0.250 M MgCl$_2$ is boiled down to a final volume of 275.0 mL, what is the molarity of the MgCl$_2$ in the resulting solution?

23) If 20.0 mL of 0.350 M NaCl and 75.0 mL of 0.875 M NaCl are mixed and the resulting solution is boiled down to a volume of 60.0 mL, what is the molarity of the NaCl in the final solution?

24) A solution is made by mixing 100.0 mL of 0.200 M BaCl$_2$ and 150.0 mL of 0.400 M NaCl. What is the concentration of sodium chloride in the final solution?

25) What is the molarity of each of the following solutions?
   a. 5.62 g of NaHCO$_3$ is dissolved in enough water to make 250.0 mL
   b. 184.6 mg of K$_2$CrO$_4$ is dissolved in enough water to make 500.0 mL
   c. 0.584 g of oxalic acid (H$_2$C$_2$O$_4$) is diluted to 100.0 mL

26) What is the concentration of solution produced when:
   a. 125 mL of 3.55 M LiOH is mixed with 475 mL of 2.42 M LiOH
   b. 150.0 mL of water is added to 200.0 mL of 0.250 M NaCl
   c. 75 mL of water is mixed with 5.0 mL of 2.50 M KBr
   d. 50.0 mL of 0.125 M HCl is mixed with 75.0 mL of 0.350 M HCl
27) What is the molarity of the solution produced when:
   a. 250.0 mL of 0.750 M KBr is boiled down to a volume of 175.0 mL?
   b. 350.0 mL of water and 75.0 mL of 0.125 M NaNO₃ are mixed and boiled down to
      325.0 mL
   c. 150.0 mL of 0.325 M LiBr and 225.0 mL of 0.500 M LiBr are mixed and boiled down
      to 275.0 mL

28) What mass of solid solute is present in:
   a. 5.0 L of 2.5 M KBr
   b. 225 mL of 0.135 M MgI₂
   c. 350.0 mL of 0.250 M NaCl

29) What is the molarity of the following pure liquids?
   a. C₈H₁₈, d = 0.7025 g/mL
   b. CH₃COCH₃, d = 789.9 g/L
   c. POCl₃, d = 1.675 g/mL

30) What volume of 3.00 M HCl is required to make up 5.00 L of 0.250 M HCl?

31) What volume of 15.4 M HNO₃ is needed to make up 500.0 mL of 0.100 M HNO₃?

32) What mass of KBr is contained in 500.0 mL of 0.235 M KBr?

33) How many moles of LiCl are contained in 5.50 L of 0.850 M LiCl?

34) What is the density of pure liquid CHBr₃? (molarity = 11.4 M)

35) What volume of 0.0675 M Ba(NO₃)₂ contains 2.55 g of Ba(NO₃)₂?

36) How many moles of FeCl₃ are contained in 1.50 L of 0.368 M FeCl₃?

37) What volume of 0.995 M HCl is required to make 3.50 L of 0.0450 M HCl?

38) What is the molarity of NaCl made by mixing 185.0 mL of water with 55.0 mL of 0.543 M
    NaCl?

39) What is the concentration of CaCl₂ produced by mixing 145 mL of 0.550 M CaCl₂ with 55
    mL of 0.135 M CaCl₂?

40) What is the molarity of pure liquid C₆H₆ (d = 0.8787 g/mL)?