Show your work on all numerical problems to receive full credit. Molar masses for all compounds on a page are indicated at the bottom of the page. Just because a molar mass is given doesn’t mean you will need it.

(12) 1.  a. What is the molarity of a BaBr\textsubscript{2} solution made by dissolving 55.4-g of BaBr\textsubscript{2} in 750-mL of total solution?

b. What is the molality of a solution made by dissolving 75.0-g of C\textsubscript{2}H\textsubscript{6}O\textsubscript{2} in 400-g of water?

c. Find the mole fraction of Cl\textsuperscript{-} in a solution made by dissolving 45.0-g of BaCl\textsubscript{2} in 300.0-g of water.

d. How many moles of C\textsubscript{2}H\textsubscript{6}O are contained in 75.0-mL of a 0.15-M solution of C\textsubscript{2}H\textsubscript{6}O?

Molar Masses: BaBr\textsubscript{2} = 297;  C\textsubscript{2}H\textsubscript{6}O\textsubscript{2}=62;  BaCl\textsubscript{2}=208;  C\textsubscript{2}H\textsubscript{6}O=46;
2. Describe the preparation of 1000-mL of a 0.150-M HNO₃ solution from a 15.8-M HNO₃ stock solution.

3. A 0.250-M H₂SO₄ is titrated with a NaOH solution in order to determine the concentration of the NaOH solution. If 50.00-mL of the H₂SO₄ required 34.88-mL of the NaOH solution to reach the equivalence point, what is the concentration of the NaOH solution?

Molar Masses: H₂SO₄=98; NaOH=40; HNO₃=63
(10) 4. Rank the following aqueous solutions in order from lowest osmotic pressure to highest osmotic pressure. **CLEARLY EXPLAIN YOUR REASONING.**

0.065-M RbCl, 0.050-N BaCl₂, 0.100-M C₂H₆O₂, 0.035-M Al(NO₃)₃

(10) 5. A solution is made by dissolving 75.0-g of CaCl₂ in 950-g of water. Find the freezing point, boiling point, and vapor pressure at 70 °C for this solution. K_f for water is 1.86 °C/m, K_b is 0.52 °C/m, and the vapor pressure of water at 70 °C is 234 torr.

Molar Mass CaCl₂ = 111; RbCl=121; BaCl₂=208; C₂H₆O₂=62; Al(NO₃)₃=203

\[ \Delta T_f = K_f m \quad \Delta T_b = K_b m \quad P_A = X_A P_A^\circ \quad II = MRT \quad R = 0.08206 \text{ L-atm/mol-K} \]