1. Give the name for the following compounds and state whether they are ionic or not
   A. Ba(NO$_3$)$_2$
   B. NaH
   C. PCl$_5$
   D. CO
   E. NH$_4$OH
   F. Ca(MnO$_4$)$_2$
   G. N$_2$O$_4$
   H. NaHSO$_4$
   I. CuSO$_4$$\cdot$5H$_2$O
   J. SnCl$_4$
   K. KCH$_3$CO$_2$
   L. CaS
   M. AlBr$_3$
   N. CH$_3$CH$_2$CH$_3$
   O. CuO
   P. PbS

2. Give the chemical formula for the following named compounds.
   A. gold(III) nitrate
   B. barium acetate
   C. potassium dihydrogen phosphate
   D. Calcium oxylate
   E. Tetr phosphous heptasulfide
   F. Tin(IV) chloride
   G. Lithium hydride
   H. Ethanol
   I. Aluminum Nitrate nonahydrate
   J. Ammonium bromide
   K. Iron(III)dichromate
   L. Ethene
   M. Hydrogen sulfite

3. What is the charge on the cation in (NH$_4$)$_3$PO$_4$?

4. What is the charge on the anion in K$_2$Cr$_2$O$_7$?

5. An ionic compound has the formula M$_2$CO$_3$. What is the charge on M?

6. What is the molar mass of ammonium nitrate?

7. How many oxygen atoms are present in 1.00 × 10$^{-3}$ mole of ozone, O$_3$?

8. What is the mass percent oxygen in copper(II) sulfate pentahydrate?

9. The molar mass of hydrazine is 32 g/mol and its empirical formula is NH$_2$. What is its molecular formula?
10. Ketoprofen is an anti-inflammatory drug which is 75.57% C, 5.55% H, and 18.88% O. If the molecular mass of ketoprofen is 254 g/mol, what is its molecular formula?

11. How many oxygen atoms are in 1.00 mol SO$_3$ is ________.

12. Which of the following 1.0 M solutions contains the most particles?
   
   A) magnesium sulfate
   B) sodium sulfate
   C) glucose
   D) ethylene glycol
   E) potassium chloride

13. How many grams of solid NaOH are needed to make 500.0 mL of a 2.0 M NaOH solution?

14. How many grams of CaCl$_2$ are required to prepare a 250 mL solution with a concentration of 0.46 M?

15. What is the concentration of Aluminum cations in a 0.43 M solution of aluminum sulfate?

16. If a 160. mL solution of 0.50 M HNO$_3$ is diluted to a total volume of 600. mL. What is the molarity of the resulting solution?

17. Calculate the molarity of a solution that contains 4.6 g of NaCl in 350 mL of solution.

18. What is the total ion concentration of a 0.43 M solution of potassium oxalate?

19. How many grams of potassium sulfate are needed to make 300 mL of a 0.062 M solution?

20. A Chemistry student goes into the laboratory and takes 25.0 mL of 0.60 M HCl and adds 75.0 mL of water. What is the final concentration of the dilution?

21. A 0.45 M solution of acetic acid with a volume of 10 ml was added to 153 ml of water. What is the new concentration of the acetic acid solution?

22. A stock solution of sodium acetate was made with a concentration of 2.0 M. What volume of the stock solution and water must you add together to make 50.0 ml of a 0.80 M solution?
23. When the mole fraction of solute is 1.0, there is
   A) 1.0 g of solute per 100 g of solution.
   B) a 1:1 ratio of solute to solvent.
   C) only solute present.
   D) 1.0 mole of solute and 99 moles of solvent.
   E) only solvent present.

24. Calculate the mole fraction of sucrose (molar mass, 342.3 g/mol) in a solution prepared by dissolving 50.0 g of sucrose in 200.0 g of water (molar mass, 18.0 g/mol).

25. How many moles of glucose should be added to 450 g of water to prepare a 0.600 m solution?

26. What is the molality of a solution prepared by dissolving 15.1 g KNO₃ in 250 g water?

27. The mole fraction of glucose in an aqueous solution is 0.100. Calculate the molality of glucose in the solution. The molar mass of glucose is 342 g/mol and that of water is 18.0 g/mol

28. Commercial nitric acid (molar mass, 63.0 g/mL) has a density of 1.42 g/mL. If the molarity of HNO₃(aq) is 16.0 M, calculate the molality of HNO₃(aq).

29. Calculate the molality of 9.98 M NaOH(aq). The density of the solution is 1.33 g/mL.

30. Calculate the molality of ethyl alcohol in a bottle of wine that is 19.0% C₂H₅OH by mass.

31. A solution contains 4.50 g of calcium nitrate in 430.0 g of water. Express the concentration as
   A. Mass percent
   B. Mole fraction
   C. Molality

32. How many moles of hydrogen peroxide are present in 25.0 g of a 3.0% solution?

33. What is the molality of silver nitrate in an aqueous 0.10% solution of that compound?
34. A solution contains 12.0 g of hexane (C₆H₁₄), 20.0 g of octane (C₈H₁₈) and 98.0 g of benzene (C₆H₆). What is the mole fraction of benzene in the solution?

35. What is the mole fraction of nitrous oxide (N₂O) in an aqueous 0.020 molal solution?

36. A water solution of sodium hypochlorite (NaOCl) is used as a laundry bleach. The concentration of sodium hypochlorite is 0.75 M. Express this concentration as mole fraction.

37. A 10.0 percent solution of sucrose (C₁₂H₂₂O₁₁) in water has a density of 1.038 g/ml. Express the concentration of the sugar as:
   A. Molality
   B. Molarity
   C. Mole fraction

38. Vinegar is a 5.0% solution of acetic acid (CH₃CO₂H) in water. The density of vinegar is 1.0055 g/ml. Express the concentration of acetic acid as:
   A. Molality
   B. Molarity
   C. Mole fraction

39. A 0.631 M H₃PO₄ solution in water has a density of 1.031 g/ml. Express the concentration of this solution as:
   A. Molality
   B. Molarity
   C. Mole fraction

40. Complete the following table for ammonia (NH₃) solutions in water:

<table>
<thead>
<tr>
<th>Density</th>
<th>Molality</th>
<th>Molarity</th>
<th>Mass %</th>
<th>Mole fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 0.973</td>
<td></td>
<td></td>
<td>6.00</td>
<td></td>
</tr>
<tr>
<td>B. 0.939</td>
<td></td>
<td></td>
<td>8.80</td>
<td></td>
</tr>
<tr>
<td>C. 0.950</td>
<td></td>
<td></td>
<td>8.02</td>
<td>0.0738</td>
</tr>
<tr>
<td>D. 0.969</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Answers:

1.   
   A.  Barium nitrate (I)  
   B.  Sodium hydride  
   C.  Phosphorous pentachloride  
   D.  Carbon monoxide  
   E.  Ammonium hydroxide (I)  
   F.  Calcium permanganate (I)  
   G.  Dinitrogen tetraoxide  
   H.  Sodium hydrogen sulfate (I)  
   I.  Copper (II) sulfate pentahydrate  
   J.  Tin(IV) chloride  
   K.  Potassium acetate (I)  
   L.  Calcium sulfide (I)  
   M.  Aluminum bromide (I)  
   N.  Propane  
   O.  Copper(II) oxide (I)  
   P.  Lead sulfide (I)  

2.   
   A.  Au(NO3)3  
   B.  Ba(CH3CO2)2  
   C.  KH2PO4  
   D.  CaC2O4  
   E.  P5S7  
   F.  SnCl4  
   G.  LiH  
   H.  CH3CH2OH  
   I.  Al(NO3)3·9H2O  
   J.  NH4Br  
   K.  Fe2(Cr2O7)3  
   L.  C2H4  
   M.  H2SO3  

3.  
   \(+1\)  

4.  
   \(-2\)  

5.  
   \(+1\)  

6.  80.05 g/mol  

7.  \(1.81 \times 10^{21}\) atoms  

8.  57.7%  

9.  \(N_2H_4\)  

10.  \(C_{10}H_{14}O_3\)  

11.  \(1.81 \times 10^{24}\) atoms  

12.  B  

13.  40. g  

14.  13 g CaCl2  

15.  0.86 M \(Al^{3+}\)  

16.  0.13 M HNO3  

17.  0.23 M NaCl  

18.  1.3 M  

19.  3 g K2SO4  

20.  0.15 M  

21.  0.03 M  

22.  20 ml sodium acetate / 30 ml water  

23.  C  

24.  0.0130  

25.  0.270  

26.  0.60 m  

27.  6.17 m  

28.  39 m  

29.  10.7 m  

30.  5.09 m  

31.  A. 1.04% ;  

B. \(0.00115\);  

C. \(0.0637\) m  

32.  0.022 mol  

33.  \(0.0059\) m  

34.  0.801  

35.  \(3.6 \times 10^4\)  

36.  0.013  

37.  A. \(0.324\) m;  

B. \(0.303\) M;  

C. \(5.81 \times 10^{-3}\)  

38.  A. \(0.87\) m  

B. \(0.83\) M;  

C. \(0.015\)  

39.  A. 5.99%;  

B. \(0.0116\);  

C. \(0.651\)  

40.  a. 3.44 M, \(3.76\) m, mole fraction is \(0.0635\)  

b. 11.2 m, 16%, mole fraction is 0.168  

c. 6.68 M, 12%, mole fraction is 0.126  

d. 4.42 m, 3.97 M, 7.00%