Further examples:

1. You dissolve 8,00 g of solid sodium hydroxide NaOH in 0,500 kg of water. The density of the resulting solution is $\rho = 1,05$ g mL^{-1}.

Calculate
a) The molar concentration c of NaOH in the solution.
b) The molality b of NaOH in the solution.
c) The mass fraction w of H_2O in the solution.
d) The molar fraction x of Na^+ in the solution

2. You dissolve 10,00 g of solid calcium chloride in 0,600 kg of water. The density of the resulting solution is $\rho = 1,03$ g mL^{-1}.

Calculate
a) The molar concentration c of $CaCl_2$ in the solution.
b) The molarity b of $CaCl_2$ in the solution.
c) The mass fraction w of $CaCl_2$ in the solution.
d) The molar fraction x of Cl^- in the solution

3. A NaCl solution contains NaCl with a mass fraction w = 0,060.
The density of the solution is 1,0389 g/mL.
a) What is the molar concentration of NaCl in the solution?
b) How much water do you have to add to 100 mL of the solution to get a solution with a mass fraction of w = 1%.

4. A solution contains 12,0 g nitric acid and 36,0 g water.
The density of the solution is 1,100 g/mL.
   a) What is the molar concentration of HNO_3 in the solution?
   b) What is the mass fraction of HNO_3 in the solution?

5. How many grams of NaCl do you need to dissolve in 100 mL of water in order
   to obtain a NaCl solution with $w = 0,150$. Water has a density of 1,000 kg/L.
   Note the significant digits in the result!

6. 0,500 L of an aqueous soulution with a density of 1,05 g/mL contain 11,1 g calcium chloride.

   a) what is the molar concentration of $CaCl_2$?
   b) what is the molar concentration of chloride ions?
   c) what ist he mass fraction w of $CaCl_2$ in the solution?
   d) How much water hast o be added to dilute the solution to a mass fraction of 1% ?

7. To prepare a saturated KCl solution at 20°C, 34,35 g KCl must be dissolved in 100,0 g water. The density of this solution $\rho_{20} = 1,174$ g/mL. Calculate the molar concentration and the molality of this solution.

8. 10,0 g $CoCl_2.2H_2O$ dissolved in alcohol and made up to $5,00.10^2$ mL.
   a) What is the concentration of Co^{2+} in the solution?
   b) What is the concentration of Cl^- in the solution?

9. Calculate the molar concentration of the following solutions:
   a) a) 29,22 g NaCl in 250 mL aqueous solution
   b) 0,600 mol H_2SO_4 in 1,50 kg H_2O total solultion
      $\rho = 1,025$kg/L, $M_{H2SO4} = 98,079$g/mol
   c) 25 % alcohol solution (mass fraction in w%)
      $\rho = 0,96339$ g/mL; $M_{C2H5OH} = 46,07$

10. Calculate the molality b of the following solutions:
    a) 29,22g NaCl in 250 mL aqueous solution
       $M_{NaCl} = 58,44$g/mol ; $\rho = 1,10$ g/mL

    b) 0,600 mol H_2SO_4 in 1,50 kg H_2O aqueous solution
       $\rho = 1,025$kg/L, $M_{H2SO4} = 98,079$g/mol

    c) 25,0 % alcohol solution (mass fraction in w%)
       $\rho = 0,96339$ g/mL; $M_{C2H5OH} = 46,07$

11. Calculate the molar fraction x of the following solutions:

    a) 29,22g NaCl in 250 mL aqueous solution
       $M_{NaCl} = 58,44$g/mol ; $\rho = 1,10$ g/mL; $M_{H2O} = 18,015$

    b) 0,600 mol H_2SO_4 in 1,50 kg H_2O aqueous solution
       $\rho = 1,025$kg/L, $M_{H2SO4} = 98,079$g/mol; $M_{H2O} = 18,015$

    c) 25,0 % alcohol solution (mass fraction in w%)
       $\rho = 0,96339$ g/mL; $M_{C2H5OH} = 46,07$; $M_{H2O} = 18,015$

12. 97,1 g Potassium chromate are dissolved in 900,8 g water.
The density of the solution is 1,05 kg/L. Calculate the concentration of K_2CrO_4 as

    a) molar concentration c
    b) molality b
    c) mass fraction w
    d) molar fraction x

13. Concentrated (fuming) hydrochloric acid has a composition of w = 37% and a density at 20°C of 1.19 g/mL. Prepare 2 L of diluted hydrochloric acid with the molar concentration c = 2.00 mol/L. M_{HCl} = 36.461 g/mol.
    a) How much hydrochloric acid do you need to use (in g) ?
    b) To what volume of HCl would this correspond?
    c) How much water would you need to use? The density of hydrochloric acid @ 2mol/L is 1,03 g/mL

14. At 20°C, a saturated sodium chloride solution has a molar concentration of c=6.00 mol/L and a density of 1.18 g/mL

    a) How much water in g must be added to 500,0 g NaCl in order to produce a saturated solution?

    b) Calculate the mass fraction and the molar fraction of NaCl in this solution

    c) How much water do you have to add to 1,00 L of this solution in order to produce a NaCl solution @ 0,100 mol/L?

15. 200,0 mL of a $CaCl_2$ solution with c= 1,50 mol/L and 300,0 mL of a NaCl solution with c= 3,00 mol/L are mixed. Calculate the following concentrations of the mixture in respect to:

    a) Cl^-- ions

    b) Ca^{2+} - ions

    c) Na^+ - ions

16. A solution of hydrochloric acid with the mass fraction of w=10,0% has a density of 1,0474 g/mL at 20°C.

    a) what ist he molar concentration c .

    b) 0,500 L oft he solution above is diluted to 10,0 L total volume. What ist the new concentration? .

17. A maximum of 58 g HCl gas can be dissolved in 100,0 g water. The density of the resulting solution is 1,19 g/mL.

    a) What is the molar concentration c of the resulting hydrochloric acid?

    b) Using the solution above 50,0 L diluted hydrochloric acid should be produced with a molar concentration of c_2 = 0,250 mol/L. How much wáter and how much concentrated solution are needed?