Exercise:

1. calculate and convert concentrations

Example III. 1. demonstrate

Calculate the mass of :

a) 2,000 mol sodium nitrate

b) 1,50 mol calcium chloride

c) 0,1500 mol sucrose ($C_{12}H_{22}O_{11}$)

Example III. 1. solve

Calculate the mass:

a) 3,0 mol sodium hydroxide

b) 1,700 mol Calcium bromide

c) 0,120 mol Glucose ($C_6H_{12}O_6$)

Example III. 2. demonstrate

How many moles are there:

a) 1 L sodium nitrate solution with the molar concentration c = 2 mol/L

b) 0,50 L calcium chloride solution with c = 1,5 mol/L

c) 0,20 L Saccharose ($C_{12}H_{22}O_{11}$) solution with c = 0,12 mol/L

Example III. 2. solve

How many mole are there:

a) 1 L sodium hydroxide solution with the molar concentration with c = 3 mol/L

b) 0,8 L calcium bromide solution with c = 2,5 mol/L

c) 0,5 L glucose solution with c = 0,2 mol/L

Example III. 3. demonstrate

How many grams of the substance do you need to produce the following solutions?

a) 1,000 L sodium nitrate solution with a molar concentration c = 2,000 mol/L

b) 0,50 L calcium chloride solution with a molar concentration c = 1,5 mol/L

c) 0,2000 L sucrose ($C_{12}H_{22}O_{11}$) solution with c = 0,120 mol/L

Example III. 3. solve

How many grams of the substance do you need to produce the following solutions?

a) 1,000 L sodium hydroxide solution with the molar concentration c = 3,00 mol/L

b) 0,8 L calcium bromide solution with c = 2,5 mol/L

c) 0,500 L glucose ($C_6H_{12}O_6$) solution with c = 0,200 mol/L

Example III. 4. demonstrate

What is the molar concentration of the following solutions:

a) 48,345 g sodium sulfate in 5,000 L water

b) 31 g ammonium chloride in 680 mL water

c) 2700 kg potassium chloride in 3800 m^3 water

Example III. 4. solve

What is the molar concentration of the following solutions:

a) 36,12 g sodium fluoride in 8,000 L water

b) 206 mg strontium chloride in 300,0 µL water

c) 200 kg magnesium hydroxide in 50 m^3 water

Example III. 5. demonstrate

Determine the mass of the substance contained in the following volume:

a) 230 mL magnesium sulfate solution with a molar concentration of c = 3,0 mol/L

b) 2147 L sodium chloride solution with c = 0,52 mol(L?

c) 3,00 mL potassium cyanide solution with c = 0,800 mol/L

Example III. 5. solve

Determine the mass of the substance contained in the following volume:

a) 638 mL sodium sulfate solution with the molar concentration c = 1,78 mol/L?

b) 21 L aluminium chloride solution with c = 0,033 mol(L?

c) 32,00 mL potassium hydroxide solution with c = 0,524 mol/L

Example III. 6. demonstrate

0,500 L NaCl solution with the molar concentration c= 2,03 mol/L and density ρ = 1,078 g/mL is given.

a) What is the weight of this solution

b) How many moles NaCl are there in the solution

c) what is the mass of the solved substance in the given volume?

d) what ist he mass fraction of the substance in %.

e) Calculate the molality of NaCl in this solution.

Example III. 6. solve

0,700 L KCl solution with the molar concentration c = 3,03 mol/L and density ρ = 1,132 g/mL is given.

a) What is the weight of this solution

b) How many moles KCl are there in the solution

c) what is the mass of the solved substance in the given volume?

d) what is the mass fraction of the substance in %.

e) Calculate the molality of KCl in this solution.

Example III. 7. demonstrate

An aqueous magnesium sulfate solution has a molar concentration of 0,7191 mol/L and a density of ρ = 1,082 g/mL. Calculate the molality b of magnesium sulfate and the mass fraction w.

Example III. 7. solve

An aqueous magnesium chloride solution has a molar concentration of c = 2,0462 mol/L and a density of ρ = 1,146 g/mL. Calculate the molality b of magnesium chloride and the mass fraction w.

Example III. 8. demonstrate

Ethanol (C_2H_6O) and water are mixed in equal parts by mass. Calculate the molar fraction *x* of ethanol.

Example III. 8 solve

Ethanol (C_2H_6O) and water are mixed in equal parts by volume. Calculate the mole fraction *x* of ethanol. The density of ethanol is 789 kg/m^3.

Example III. 9. demonstrate

A solution contains 200,0 g sodium sulfate in 1,25 L water.
The solution has a density of 1,137 kg/L

a) What is the concentration of sodium ions?

b) What is the concentration of sulfate ions?

c) Calculate the molality *b* of the respective ions in the solution:

d) Calculate the weight fraction *w* of sodium sulfate in the solution.

e) Calculate the weight fraction *w* of sodium in the solution

f) Calculate the molar fractions for sodium sulfate and water .

Example III. 9. solve

A solution contains 200,0 g of potassium carbonate in 1,50 L of water.
The solution has a density of 1,109 kg/L

a) What is the molar concentration c of potassium ions?

b) What is the molar concentration of carbonate ions

c) Calculate the molality of the respective ions in solution

d) Calculate the mass fraction *w* of potassium carbonate in the solution

e) Calculate the mass fraction *w* of potassium in the solution

f) Calculate the molar fraction *x* of potassium carbonate and water

2. calculate dilutions

Example III. 10. demonstrate

acid dilution

a) How many liters of diluted battery acid with c_2= 5.0 mol/L can be produced from V_1 = 10.0 L of concentrated H_2SO_4 with c_1= 18 mol/L by dilution with water?

b) How much water does one have to add to V_1 = 10 L of concentrated sulfuric acid (c = 18 mol/L) to produce battery acid with a concentration of 5,0 mol/L?

c) 10.0 L of concentrated sulfuric acid (c = 18 mol/L) are diluted with 90,0 L of water. What is the concentration of the resulting sulfuric acid?

d) 3.0 L concentrated sulfuric acid with c = 18 mol/L are diluted with 8,0 L battery acid (c = 5,0 mol/L). What is the concentration of the resulting acid?

Example III. 10. solve

dilute base

a) How many liters of diluted caustic potash with c_2 = 1,20 mol/L can be prepared from V_1 = 4,0 L of concentrated KOH with c_1= 6,0 mol/L by dilution with water?

b) How much water does one have to add to 4,00 L of concentrated potassium hydroxide solution (c_1= 6,0 mol/L) in order to produce a base with a concentration of 1,2 mol/L?

c) 5,0 L of concentrated potassium hydroxide solution (c = 6.0 mol/L) are diluted with 25.0 L of water. What is the concentration of the resulting dilute base?

d) 4,0 L of concentrated potassium hydroxide with c = 6,0 mol/L are diluted with 30,0 L of diluted potassium hydroxide (c = 1.2 mol/L). What is the concentration of the resulting base?