

Tutorial Series N°1

Exercise 1

1- Specify whether the following products are an element, compound, heterogenous or homogenous mixture.

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|---|------------------------|
| 1- Air, | 6- Parfum, |
| 2- Salt water | 7-Fruit Yogurt, |
| 3- Nitrogen gas (N ₂), | 8- Gasoline / Car Oil, |
| 4- Sulfuric Acid (H ₂ SO ₄), | 9- Concrete, |
| 5- Tap Water, | 10- White Sugar, |

2- For each of the following statements, indicate whether it is a physical or chemical transformation:

- | | |
|---------------------------------------|--|
| 1- The melting of ice | 6-The bleaching of a pair of jeans by bleach |
| 2- Dissolution of table salt in water | 7- Sugar caramelization |
| 3-Toast a slice of bread | |
| 4-Cutting a sheet of cardboard. | |
| 5- Melt chocolate | |

Exercise 2

Calculate the number of sulfur S, hydrogen H and oxygen O atoms obtained in 49g of sulfuric acid (H₂SO₄).

Exercise 3

A copper oxide CuO sample has a mass of $m = 1.59\text{g}$.

How many moles and molecules of CuO and atoms of Cu and O are there in this sample?

Exercise 4

We are given the following atomic masses in amu: N = 14, O = 16, La(NO₃)₃ = 324.9.

- 1-What is the atomic mass of Lanthanum (La) in amu?
- 2-Given that the molar mass of Lanthanum is $M=138.9\text{ g/mol}$, what is the mass in grams of Lanthanum in a mixture of 0.1 mol of La(NO₃)₃ and 1 mol of La₂O₃?
- 3-Calculate the number of Lanthanum atoms in this mixture.

Exercise 5

1-How many moles are there in: 4 g of NaOH ; 30 mL H₂SO₄ ($d= 1.83$); 100 μg of KMnO₄; 2.75×10^{32} atoms of iron (Fe).

2-Which sample is the most iron-rich: 2 g of Fe₂(SO₄)₃ and 5.30×10^{21} atoms of iron.

3-Which sample contains the least moles of atoms : [25 g of carbone or 2.49×10^{22} atoms of Au (or)]

4-Calculate in g and in Kg the corresponding mass at 1 amu.

Data : molar mass (g/mol): C (12) ; Na (23) ; O (16) ; S (32) ; K (39) ; Mn(55) ; Fe(56) ; Cl (35,5)

Exercise 6

For 1mL of water calculate:

- | | |
|------------------------------------|-----------------------------------|
| a-The corresponding mass of water | e- The number of moles of oxygène |
| b-The number of moles of hydrogene | |
| c-The number of water molecules | f- The number of hydrogen atoms |
| d- The number of oxygen atoms | |

Data : ρ (H₂O) = 1 g/cm^3 ; M (H₂O) = 18 g/mol .

Exercise 7

Dissolve a 5g sugar lump (sucrose) in a 50 mL cup. Calculate its mass concentration and molarity.
 $M(C_{12}H_{22}O_{11}) = 342 \text{ g/mol}$.

Exercise 8

The solubility of aluminum sulfate is 100 g in 900 g of water. The density of the saturated solution at 15°C is 1.106, $M(Al_2(SO_4)_3) = 342 \text{ g/mole}$. Calculate:

- The molarity;
- The molality;
- The mole fraction;

Exercise 9

On a commercial solution flask of nitric acid HNO_3 , we find: mass percentage : 68.0 % ; Density : $d = 1.41$; Molar mass : $M = 63.0 \text{ g}\cdot\text{mol}^{-1}$.

- 1- demonstrate that the molar concentration of nitric acid in this commercial solution is $15 \text{ mol}\cdot\text{L}^{-1}$.
- 2- determine the volume V_0 (mL) of commercial solution that needs to be taken to prepare $V = 500 \text{ mL}$ of nitric acid solution of concentration $C = 1.0 \text{ mol}\cdot\text{L}^{-1}$.
- 3- Name this process

Exercise 10

Calculate the molarity of one liter of a phosphoric acid solution with a density of 1.08 and 65% by weight of H_3PO_4 . What is its normality?

Exercise 11

Bleach is an aqueous solution containing Na^+ and hypochlorite ClO^- ions. The molar mass of ClO^- ions is $M = 51.5 \text{ g/mol}$. The molar concentration of hypochlorite ion in bleach = 0.75 mol/L

- 1- what chemical species makes up the solvent ?
 - 2- what chemical species makes up the solute ?
 - 3- Calculate the mass of ClO^- ions in one liter of bleach
 - 4- Deduce the massic concentration of ClO^- ions in bleach.
- From this bleach we want to prepare 100mL of subsolution S' twice less concentrated.
- a- what will be the concentration of S' ?
 - b- Calculate the volume of solution S that needs to be taken to prepare solution S'