University of Tlemcen
Faculty of technology
Science and technology Department

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ST Engineer

Tutorial Series N°1

Exercise 1

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

1- Air,
2- Salt water
3- Nitrogen gas (N_2),
4- Sulfuric Acid (H_2SO_4),
5- Tap Water,
6- Parfum,
7-Fruit Yogurt,
8- Gasoline / Car Oil,
9- Concrete,
10- White Sugar,

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

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

Exercise 2

Calculate the number of sulfur S, hydrogen H and oxygen O atoms obtained in 49g of sulfuric acid (H_2SO_4).

Exercise 3

A copper oxide CuO sample has a mass of m = 1.59g.
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, $La(NO_3)_3$ = 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 g/mol, what is the mass in grams of Lanthanum in a mixture of 0.1 mol of $La(NO_3)_3$ and 1 mol of La_2O_3?
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 H_2SO_4 (d= 1.83); 100 µg of $KMnO_4$; 2.75 10^{32} atoms of iron (Fe).
2-Which sample is the most iron-rich: 2 g of $Fe_2(SO_4)_3$ and 5.30 x 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 : molair 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
b-The number of moles of hydrogene
c-The number of water molecules
d- The number of oxygen atoms
e- The number of moles of oxygène
f- The number of hydrogen atoms

Data : ρ (H_2O) = 1 g/cm^3 ; M (H_2O) =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 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 (Al2(SO4)3) = 342 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 $g.mol^{-1}$.
1-demonstrate that the molar concentration of nitric acid in this commercial solution is 15 $mol.L^{-1}$.
2- determine the volume V_0 (mL) of commercial solution that needs to be taken to prepare V = 500 mL of nitric acid solution of concentration C = 1.0 $mol.L^{-1}$.
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 $C\ell O^-$ ions. The molar masse of $C\ell O^-$ ions is M = 51.5 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 $C\ell O^-$ ions in one liter of bleach
4- Deduce the massic concentration of $C\ell O^-$ 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 soluion S that needs to be taken to prepare solution S'