**Mohamed Khidir University of Biskra - Faculty of Exact Sciences, Nature and Life**

**Department of Material Sciences**

**First hexagram/scale Chemistry**

**The third applied work & determining the quantity of the substance**

**Determination of the quantity of material**

***1) The theoretical part:***

Mole: A quantity that contains the same number of particles (atoms, molecules, ions) as amass (the most abundant element in nature). C 12 of carbon 12g this number NA is called Avogadro’s number (hombre d’Avogadro), where: NA = 6.023.10 23

So 1 mole of atoms = 6.023 1023 atoms

1Moles of molecules = 6.023 1023 molecules

1 mole of ions =. 6.023 1023 ions

The number of particles for a sample of a pure chemical can be calculated by the following relationship

Nx = n. NA

Where Nx: the number of particles (atoms, molecules, ions) and n: the amount of substance expressed in the number of moles.

**Note**: The very large number of particles (of the order of 1023) is difficult to deal with in calculations for the quantization of matter. Therefore, the amount of substance is expressed in the number of moles n.

$ n =\frac{N ( \* 10^{23} )}{6.02 . 10^{23}}$ (mole)

So the mole is the unit of quantity of a substance the number of moles n of a sample of a chemical can be calculated according to the following relationship:

$$n =\frac{m \left(g\right)}{M\left(\frac{g}{mol}\right)} \left( mol\right)$$

Where: m is the mass of the substance, M: the molar mass of the substance

✓ Mass is defined as the amount of matter a body contains

✓ The atomic molar mass of a chemical body is defined as the mass of one mole of that body's atoms.

✓ The partial molar mass of a chemical body is defined as the mass of one mole of that body's molecules

***Practical part :***

(The principle of the experiment: This experiment depends on the microscopic concept (atoms, molecules) and the macroscopic concept (experimentally) to quantify matter according to its physical state (solid, liquid, or gas).

***Objectives of the experiment:***

⮚Determine the amount of substance for different samples of pure chemical bodies.

⮚Verifying the law of conservation of matter or the law of conservation of mass (Lavoisier’s law).

**Note**: The law of conservation of mass states the following: When any chemical reaction occurs, the masses of the reacting substances are equal to the masses of the substances resulting from the reaction, and any mass in a closed system will remain constant no matter what happens inside the system.

3) Experiment tools and materials:

Electronic balance - crucible - graduated tester (ml - 50 ml10) – Beaker (100 ml)

A piece of iron (nail) (Fe), a piece of chalk (CaCO3) - a piece of sugar (C12H22O11) - distilled water (H2O) - a solution of copper sulphate (CuSO4).

***The method of work***:

 Determine the quantity of the substance:

🡺Solid sample:

✓Weigh each sample using an electronic scale according to the given table and then record the results.

|  |  |  |  |
| --- | --- | --- | --- |
| 3 | 2 | 1 | Sample number |
| sucrose (sugar) | Calcium carbonate (chalk) | Nail iron | the sample |
| ……………………… | ……………………………… | ……………….. | mass |

***Échantillon liquide :***

Weigh a 50 ml graduated tester (empty) on an electronic scale.

Using this tester, measure a volume of 40 ml of distilled water, then weigh the mass (tester + distilled water) and record the results in a table.

|  |  |  |
| --- | --- | --- |
| The mass of 40 ml distilled water | Bulk mass (tester + 40 ml distilled water) | Inserted tester mass (empty) |
| …………………………………… | ………………………………………….. | …………………………….. |

Note: The volumetric mass of distilled water under regular conditions (eau) ρ = 1g/Cm3

Verification of the law of conservation of mass

⮚Weigh a weigher containing about 10 ml of copper sulphate solution (Cu2+SO42-) and a piece of iron (nail).

Next to each other on an electronic scale

⮚Dip the nail into the Becher solution

⮚After a period of time (after the reaction occurs). Record your observations of the changes in the piece of

 iron and the copper sulphate solution

⮚Reweight the sentence.

⮚Record your observation regarding the weight of the sentence before and after the interaction.