

Tutorial N°01

Activity 1:

- A/ How many molecules are there in 18 g of water (H_2O)?
- B/ A sample contains 1.204×10^{24} molecules of oxygen gas (O_2). How many moles of O_2 is this?
- C/ Find the molar mass of each of the following compounds: Aspartame ($C_{14}H_{18}N_2O_5$), calcium phosphate $Ca_3(PO_4)_2$.
- D/ 'Borax' is the common name of sodium tetraborate, $Na_2B_4O_7$. How many moles, and how many grams of boron are present in 20.0g of Borax?
- E/ The plant photosynthetic pigment chlorophyll contains 2.68 percent magnesium by weight. How many atoms of Mg will there be in 1.00g of chlorophyll?
- F/ Methanol, CH_3OH , is a liquid having a density of 0.79g per millilitre. Calculate the molar volume of methanol.
- G/ How many liters of oxygen gas are in 3 moles of air at STP?
- H/ Determine the mass of a sodium atom (Na) knowing that its atomic molar mass is 23 g/mol.

Activity 2:

We weigh 10g of NaCl using a balance.

- 1/ How many moles of NaCl are contained in the weighed mass?
- 2/ The 10 g of NaCl are placed in a 250 mL flask. What is the molar concentration of the solution? We give $M_{Na} = 23$ g/mol, $M_{Cl} = 35,5$ g/mol.

Activity 3:

A gas mixture consists of 0.2 g of H_2 ; 0.21 g of N_2 and 0.51 g of NH_3 under the pressure of one atmosphere and at a temperature of 27 °C. Calculate the mole fractions.

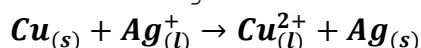
Activity 4:

Artificial sweeteners like aspartame are used to replace sugar in many diet drinks. The molecular formula of aspartame is $C_{14}H_{18}N_2O_5$. A factory uses 2.5×10^2 □ molecules of aspartame to produce 50,000 cans of diet soda.

- 1/ Calculate the molar mass of aspartame.
- 2/ Determine the mass of aspartame used for 50,000 cans.
- 3/ How much aspartame (in mg) is contained in one can?

Activity 5:

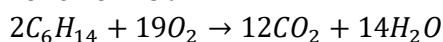
In 50 mL of silver nitrate solution with a concentration of 1.0 mol/L, 0.43 g of copper turnings is introduced according to the following equation:



- 1/ Balance the equation
- 2/ Determine the limiting reactant and the excess reactant.
- 3/ After 10 minutes, the concentration of copper ions is found to be 0.13 mol/L. Calculate the extent of reaction and the conversion rate.
- 4/ Provide the material balance, knowing that the copper has completely disappeared after an hour.

Activity 6:

The combustion reaction of hexane is:



- 1/ What mass of CO_2 is produced when 150.0 g of hexane is burned?

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2/ What mass of $O_2(g)$ is needed to produce 80.0 g of $H_2O(l)$?

3/ What mass of $C_6H_{14}(l)$ is required to produce 67.2 L of $CO_2(g)$ at standard temperature and pressure (STP; 1 mol of gas ≈ 22.414 L)?

Data: C=12,011g/mol, H=1,008 g/mol, O=15,999 g/mol and $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$