

Faculty of Medicine
Pharmacy Department
Analytical Chemistry Module
2nd Year Pharmacy

October 2024

Tutorial N°1": Solutions/Solvents

EXERCISE 1:

Given the following solvents and their dielectric constant: Water ($\epsilon = 81$), acetone ($\epsilon = 21$), benzene ($\epsilon = 6$), ethanol ($\epsilon = 24$), carbon tetrachloride ($\epsilon = 2.2$), methanol ($\epsilon = 32.6$), butanoic acid ($\epsilon = 3$), cyclohexanol ($\epsilon = 15$), propanal ($\epsilon = 18.5$).

- Rank these solvents in increasing order of dissociating power.
- Predict the appropriate solvent for the following solute: KCl.

EXERCISE 2:

A solution contains 75% of ethanol (C_2H_6O) by mass and the rest is water. a. What is the density of the solution if there is 15 mol of ethanol per liter of solution? b. To prepare a 3.5L of 2M ethanol, how many milliliters of the solution is needed?

EXERCISE 3:

Destop is an aqueous solution of sodium hydroxide (NaOH). Its label indicates it contains 20% soda, and its density is $d = 1.23$.

Given: $M(\text{NaOH}) = 40.0 \text{ g/mol}$

Deduce the molar concentration of soda in this household product.

EXERCISE 4:

Hydrogen peroxide bottles found in pharmacies contain 3% by mass, used as a disinfectant. Pure hydrogen peroxide is a liquid containing only hydrogen peroxide molecules (H_2O_2).

a. Is the aqueous solution of hydrogen peroxide ionic or molecular?

You want to prepare a 3% hydrogen peroxide solution using 200 ml of water.

b. What mass of water does this represent?

c. What mass of pure hydrogen peroxide should be taken?

Given: $\rho(\text{water}) = 1.0 \text{ g/ml}$

EXERCISE 5:

1. Calculate the ionic strength (I) of the solution obtained by mixing equal volumes of a 0.250 M sodium chloride solution and a 0.300 M barium chloride solution.

2. Calculate the activity coefficient of the chloride ion in $MgCl_2$ (10^{-3} mol/L) and in $LaCl_3$ at the same concentration. What can you conclude from this?

EXERCISE 6:

Calculate ionic strength of a solution containing 0.0750 M K_2SO_4 , 0.0085 M Na_3PO_4 , and 0.0150 M $MgCl_2$ is 0.3975 M.