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

### **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(NaOH) = 40.0 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:  $\rho$  (water) = 1.0 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<sup>-3</sup> mol/L) and in LaCl<sub>3</sub> 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<sub>2</sub>.