

THE USE OF MICROSOFT ACCESS TO EXPRESS SOLUTIONS CONCENTRATION

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ABSTRACT

The aim of the paper is to present a different system to express solutions concentration, a system meant to help students more and to measure the concentration more easily and efficiently. Initially, the technical support used for measuring the concentration is being presented, and to express the concentrations, a computer simulation was run by through a Microsoft Access database.

KEYWORDS

solutions concentration, students, computer simulation, Microsoft Access database

1. INTRODUCTION

A solution is a homogeneous mixture of two substances. One of the compounds is the solvent which exceeds in amount the solute. If, prior to obtaining a solution, one of the compounds is liquid, than this compound is the solvent, regardless the amount.

Solution concentration, for a specific compound is expressed in terms of the amount of compound in a specific amount of solution or solvent.

Common units used to express concentration are: percentage of composition of solution, molarity, normality, molality, titration, mole fraction.

Percentage of composition of solution is based on the mass or volume of the components of solutions. Percent composition by mass means grams of substance dissolved in 100 grams of solution. For example, 20% solution means 20 grams of solute in 100 grams of solution. Percent composition by volume means volume of solution dissolved in 100 ml solution. For example, 15% volume solution means a solution that contains 15 volume of solute in 100 cm³ of solution.

Solution concentration is industrially expressed in degrees Baume (Bé). 0°Bé marks the water density and 10°Bé marks the concentration of a 10% NaCl solution. The space between the two points is divided into 10 units, units that can extend beyond the selected space. For liquids lighter than water the following formula is used to measure the density:

d=144,30/(144,30+n), where "n" stands for degrees Baume; for liquids heavier than water, the formula used is:

d=144,30/(144,30-n)

A 1 molar (1m) solution is a solution in which 1 mole of a compound is dissolved in a total volume of 1 litre. Molarity has multiples and submultiples, that means the solutions are: dmol(m/10), cmol(m/100), mmol(m/1000), 2molar(2m), 3molar(3m), etc. Solution concentration is measured in moles of substance dissolved in 1000g of solvent. This concentration is molality(m). Solution concentration is measured in gram equivalent weight of a solute per liter of solution. This concentration is called normality (N).

Concentration is measured in mole fractions. Mole fraction is marked X and it is defined as the number of moles of a compound divided by the total number of moles of all components in the solution. Titration is quantity of substance in grams contained in m³ of solution and it is marked T.

2. THE PRESENTATION OF APPLICATION

🖽 Concentrații ă: m_å m_d $m_{d} = \frac{m_{d}}{2} \times 100 \quad (\%)$ (mol/l) (echiv/l) $M_d \times V_S$ $E_d \times V_s$ m. Problemă verificare MODURI DE EXPRIMARE A Iesire CONCENTRATIILOR SOLUTIILOR Concentrație procentuală $m_d \times 1000$ n_1 n_2 - și $x_2 = T = \frac{m_d}{V_s} \quad (\text{g/ml} \)$ $\overline{M_d(m_s - m_d)}$ *x*1 $n_1 + n_2$ $n_1 + n_2$ (mol/1000g_solvent) unde $x_1 + x_2 = 1$

A simple interface is being used to run the program (Fig.1).

Figure 1. Simple interface

🖼 Problema Verificare			
S-au dizolvat md = si s-a adus la Vs =	mililitrii solutie de 📃 🚬		
Densitatea acestei solutii este g/cm3	Md =		
Sa se exprime concentratia procentuala: C% = md \times 100/ms	% Ed =		
Sa se exprime concentratia molara: $m = md / Md \times Vs$	mol/l		
Sa se exprime concentratia normala: $n = md / Ed \times Vs$	echiv/l		
Sa se exprime concentratia molala: a = md × 1000 /Md (ms - md)	mol/1000 g solvent		
Sa se exprime fractia molara pentru substanta dizolvata:			
Sa se exprime fractia molara pentru solvent:			
Sa se exprime titrul solutiei: T = md / Vs	g/ml		
ms = densitate × Vs	g		
Comenzi Calculeaza Golire Imprimare	Iesire		

Figure 2. Verification problem

The form *Concentrations* includes 6 images captured together with formulas for concentrations calculation, a button to close the form and 2 buttons to open windows that verify the concentration problems. As it follows, the form *Verification problem* is being presented; this form illustrates all the units used to express concentration (Fig. 2).

On the first line of the form, within the 2 text boxes, values are given by the students and the solution to calculate different concentrations for is chosen from combo box; the combo box relates to Substances table. Md and Ed values are taken from the table and are filled in automatically, the rest of the text boxes are automatically calculated by pressing the button *Calculate*.

	III Substante : Table				
	ID	Substanta	Simbol	Masa moleculara	Echivalentul chimic
	2	Acid sulfuric	H2SO4	98	49
	3	Hidroxid de potasiu	KOH	56	56
	4	Hidroxid de sodiu	NaOH	40	40
	5	Sulfat de magneziu	MgSO4	120	60
	6	Acid azotic	HNO3	63	63
	7	Acid clorhidric	HCI	36,5	36,5
	8	Acid fosforic	H3PO4	98	32,6
	9	Sulfat de cupru	CuSO4	160	80
*	(AutoNumber)			0	0

🗉 Problema Verificare		_	
S-au dizolvat md = 20 si s-a adus la Vs = 3000	mililitrii solut	ie de Sulfa	at de magneziu 💌
Densitatea acestei solutii este 1,14 g/cm3			Md = 120
Sa se exprime concentratia procentuala: $C\% = md \times 100/ms$	0,584795	%	Ed = 60
Sa se exprime concentratia molara: m = md / Md \times Vs	0,5	mol/l	L
Sa se exprime concentratia normala: n = md / Ed × Vs	1	echiv/l	
Sa se exprime concentratia molala: a = md x 1000 /Md (ms - md)	0,04902	mol/1000 g	solvent
5a se exprime fractia molara pentru substanta dizolvata:	0,000882		
5a se exprime fractia molara pentru solvent:	0,999118		
Sa se exprime titrul solutiei: T = md / Vs	0,006667	g/ml	
ms = densitate × Vs	3420	g	
Comenzi			
[Calculeaza] Golire Imprimare			
		Iesire	

Figure 3. Example

To express the percentage of composition, or to calculate one of the masses (mass of solution or mass of solute) the form *Percentage of composition* is being used.

🖴 c% : Form			
	$c\% = \frac{m_s}{m_d} \times 100$	Iesire	
c%=	ms= 12	md= 24	
	Comenzi		
	Calculeaza		
Figure 4. The pe	ercentage of composition (mass of solution	י ר

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🖴 c% : Form		-	
	$c\% = \frac{m_s}{m_d} \times 100$	Iesire	
c%= 50	ms=]12	md= 24	
	Comenzi		
	Golire		
	1. See Sel 19. Selder Andre Sel . 1		

Figure 5. The percentage of composition (mass of solute)

3. CONCLUSIONS

The use of educational soft will increase the ability and the creativity of the students, will improve their knowledge at a medium and high level and consequently informatics will be used more and more in many other fields of activity.

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