UNIVERSITY CEU SAN PABLO
SCHOOL OF PHARMACY
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

ISSUES OF PHYSICAL CHEMISTRY

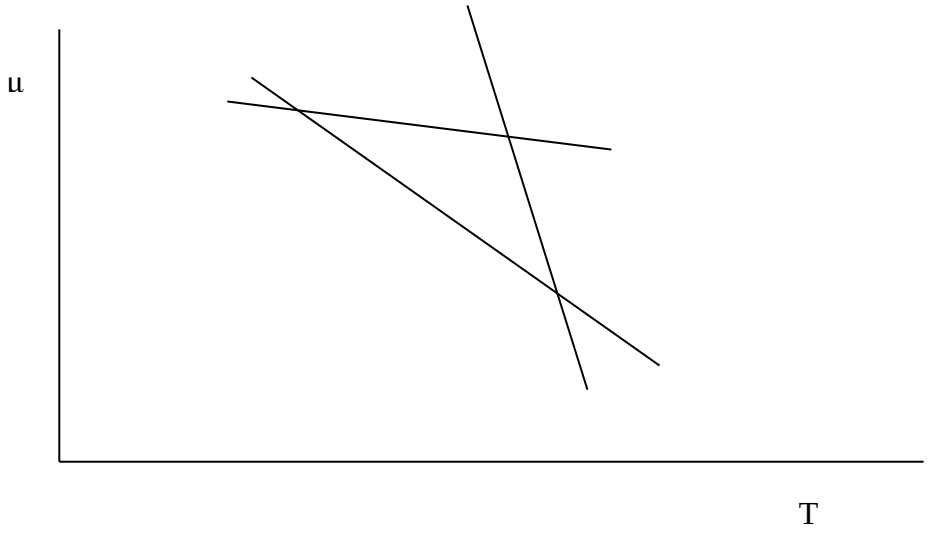
2018-2019

LESSON 6

41. The figure below shows how the chemical potential of a pure substance is modified with temperature in solid, liquid and vapour states.

a) Identify the chemical potential of each state

b) Indicate how the chemical potentials will be modified by adding a non-volatile solute



42. A non-volatile solute is added to a solvent with vapour pressure P_A^*, resulting in a solution with a vapour pressure P. Plot P/P_A^* versus small molalities of the solute B. What do the slope and intercept of this graph mean?. Will be these values modified by changing the solute? Explain your answer using the appropriate equations

43. List all data that would be needed to determine the molecular weight of a non-volatile solute from a colligative property. Would be needed more data if the solute were an electrolyte?

44. Two solutions have 1% (w/w) of benzene in ethyl bromide and 1% (w/w) of ethyl bromide in benzene which one the two solutions will freeze first? Indicate the necessary steps to get the result, assuming that the solution has ideal behaviour.

Component	**Molecular weight / $g \cdot mol^{-1}$**	**Kf /$K \cdot kg \cdot mol^{-1}$**	**T_m / ºC**
Ethyl bromide	109	12.12	7
Benzene	78	5.0	7

45. The osmotic pressure of an aqueous solution 0.0200 $g \cdot cm^{-3}$ of ovine albumin is 6.1 torr at 0 ºC. Estimate the molecular weight of this protein. Indicate whether this method is the best one to determine this magnitude, justifying the answer.

Data: $R = 0.082\ l \cdot atm \cdot K^{-1} \cdot mol^{-1} = 1.987\ cal \cdot K^{-1} \cdot mol^{-1} = 8.314\ J \cdot K^{-1} \cdot mol^{-1}$

1 atm = 760 torr

46. Derive the equation to obtain the natural logarithm of the activity of the solvent of a real solution with the decrease of the melting temperature. Explain all the approximations made.

47. Order the following electrolytes aqueous solutions from the highest to the lowest value of osmotic pressure at 20 ° C. Consider full dissociation.

solute	NaCl	$MgCl_2$	$MgSO_4$	$CaSO_4$	sucrose	glucose
$mol \cdot l^{-1}$	0.046	0.034	0.019	0.009	0.480	0.240