

Name:

Date:

Period:

Seat #:

Show all work and/or explain using chemistry principles

[1] A solution of salt (molar mass 90 g mol^{-1}) in water has a density of 1.29 g/mL . The concentration of the salt is 35% by mass. Assume a 100 mL sample.

- Calculate the molarity of the solution. **5.0 M**
- Calculate the total number of moles in the solution. **4.0 mol**
- Calculate the mole fraction of the salt in the solution. **0.10**

[2] Ethylene glycol ($\text{C}_2\text{H}_4(\text{OH})_2$; 150 grams) is added to ethanol ($\text{C}_2\text{H}_5\text{OH}$; 250 grams).

- Calculate the mass % of ethylene glycol in the solution. **37.5 %**
- Calculate the mole fraction of ethylene glycol in the solution. **0.31**

[3] Concentrated sulfuric acid contains very little water, only 5.0% by mass. It has a density of 1.84 g/mL . What is the molarity of this acid? **17.8 M**

[4] The lattice energy of a salt is 350 kJ/mol and the solvation energies of its ions add up to 320 kJ/mol for the preparation of a 0.50 M solution. In the preparation of this solution would the solution get colder or warmer? What is the driving force for this solution process?

[5] Addition of excess sodium nitrate to water to form a saturated solution results in the following equilibrium. The solution process is endothermic. $\text{NaNO}_3 (\text{s}) \leftrightarrow \text{Na}^+ (\text{aq}) + \text{NO}_3^- (\text{aq})$

How could the concentration of sodium nitrate in the solution be increased? Explain why & why not for each. Choose the answer

- add more $\text{NaNO}_3 (\text{s})$
- increase the pressure on the solution
- increase the temperature
- stir the solution more vigorously

[6] Ethanol and methanol form an almost ideal solution. If 64 g of methanol is mixed with 69 g of ethanol, what is the total vapor pressure above the solution? **70.7 torr** [$P_{\text{methanol}}^\circ = 90 \text{ torr}$; $P_{\text{ethanol}}^\circ = 45 \text{ torr}$]