

## Recitation 4 Worksheet (Solutions)

Name:

UGA ID:

### Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is sre13137). **Do not use your 81x number.**
- If you have a printer, print the worksheet, write your answers on the template showing your work where appropriate, convert it to a PDF and Upload this worksheet to Gradescope by 11:59 p.m. on Tuesday, September 29. You do not need to upload anything to eLC.
- If you do not have a printer, type your answers in the boxes and write your work on separate sheets of paper and convert your work to a PDF. Upload the PDF of your work to eLC in the Dropbox. Then upload the worksheet template to Gradescope by 11:59 p.m. on Tuesday, September 29.

1. Which of these statements is **true**?

- A. In a saturated solution at equilibrium, the rate at which solid material is dissolving differs from the rate at which solid material is reforming.
- B. For solids that dissolve in water, the primary reason is because dissolving results in increasing disorder.
- C. Any solid that dissolves in water does so in an exothermic way.
- D. The solubility of a solid always decreases at higher temperature

2. Which relationship is false for solubility in water?

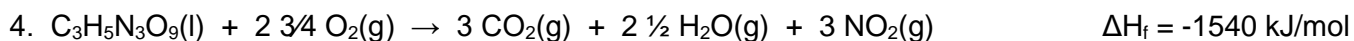
- A.  $C_5H_{11}OH > C_{11}H_{23}OH$
- B.  $C_5H_{11}OH > C_5H_{12}$
- C.  $CCl_4 > CaCl_2$
- D.  $CH_3OCH_3 > CH_3CCl_3$

3. Which of the following statements is false?

- A.  $C_6H_{14}$  has very low solubility in water because it can't hydrogen bond to itself or to water
- B. NaCl has poor solubility in  $CCl_4$  because strong solute-solute interactions are replaced by weak solute-solvent interactions, making the process strongly endothermic
- C.  $C_6H_{14}$  has good solubility in  $CCl_4$ . Neither the original nor final intermolecular interactions are very strong.
- D.  $CH_3OCH_3$  has very low solubility in water because it can't hydrogen bond to itself or to water

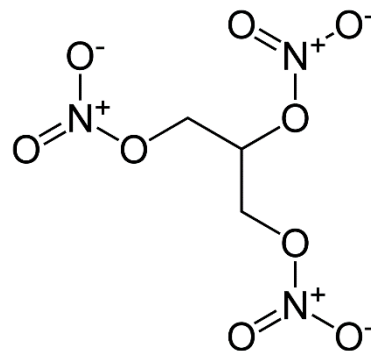
4. Calculate the **molality** of a solution that contains 51.2 g of naphthalene,  $C_{10}H_8$ , in 500 mL of carbon tetrachloride. The density of  $CCl_4$  is 1.60 g/mL.

5. Calculate the standard enthalpy of formation of one mole of nitroglycerine from carbon, hydrogen, oxygen and nitrogen using the given four equations. (Hint: First write and balance the equation for the formation of nitroglycerine from C,  $H_2$ ,  $O_2$  and  $N_2$ .)



What is the sum of the coefficients in the balanced equation to form nitroglycerine?

$\Delta H_f$  nitroglycerine =  kJ/mol



6. What is the **molality** of an 8.6% aqueous glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) solution by weight?

7. Calculate the mole fraction of ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ) in a solution that contains 46 grams of  $\text{C}_2\text{H}_5\text{OH}$ , and 64 grams of methanol ( $\text{CH}_3\text{OH}$ ).

$$X_{\text{ethanol}} = \text{[ ]}$$

8. Commercial cold packs often contain solid  $\text{NH}_4\text{NO}_3$  and a pouch of water. The temperature of the pack drops as the  $\text{NH}_4\text{NO}_3$  dissolves in water. Therefore, for the dissolving of  $\text{NH}_4\text{NO}_3$  in water,

$\Delta H_{\text{soln}}$  is (+ or -)

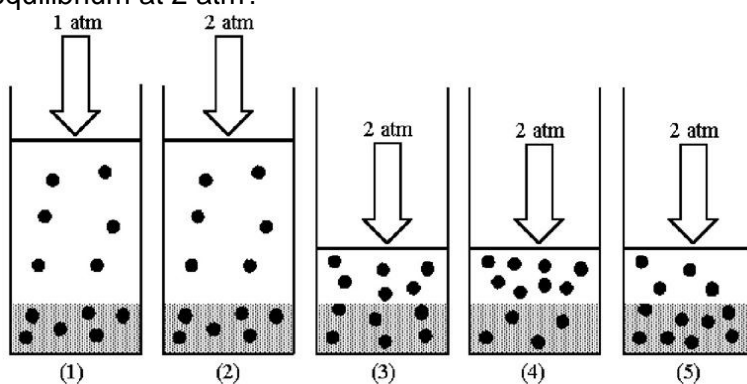
$\Delta S_{\text{soln}}$  is (+ or -)

9. Which of the following aqueous salt (NaCl) solutions has the greater concentration?

- A. 0.5 M
- B. 2.3 m
- C. 3.0% by mass
- D. 11.1 g/L

10. Drawing (1) shows a system in which an equilibrium exists between dissolved and undissolved gas particles at  $P = 1$  atm. According to Henry's law, if the pressure is increased to 2 atm and equilibrium is restored, which drawing (2)-(5) best represents the equilibrium at 2 atm?

- A. drawing (2)
- B. drawing (3)
- C. drawing (4)
- D. drawing (5)



11. An aqueous solution is 0.467 M in HCl. What is the molality of the solution if the density is 1.23 g/mL?

12. A sealed container contains 0.352 L of water with an atmosphere of oxygen gas. What is the concentration of O<sub>2</sub> in the water if the external pressure is 4.24 atm given that kH for O<sub>2</sub> is  $1.66 \times 10^{-6}$  M/mm Hg at this temperature?