General Chemistry Review: Exam 1

Presented by the Academic Skills Center Spring 2019



**Topics**:
Chapter 13: Colligative Properties

Chapter 14: Entropy

1. What are the three intermolecular forces which hold molecules together in liquids and solids?
2. What is the process by which each solute molecule is separated from one another and surrounded by the solvent?
3. Label the types of intermolecular interaction occurring on the three images below:



1. What is the difference in molarity and molality?
2. What is the difference in molality and percent by mass (also called percent by weight)?
3. Household rubbing alcohol is a combination of isopropyl alcohol (C3H7OH) and water that is 70 Percent isopropyl alcohol by mass (density = 0.79 g/mL at 20°C). Express the concentration of Isopropyl alcohol in rubbing alcohol in (a) molarity and (b) molality.
4. b)
5. What factors affect solubility?
6. Ethylene glycol [CH2(OH)CH2(OH)] is a common automobile antifreeze. It is water soluble and fairly nonvolatile (b.p. 197°C). Calculate (a) the freezing point and (b) the boiling point of a solution containing 685 g of ethylene glycol in 2075 g of water.
7. The osmotic pressure if a 0.0100 M potassium iodide (KI) solution at 25°C is 0.465 atm. Determine the experimental van’t Hoff factor for KI at this concentration. (R=0.08206 L•atm/K•mol)
8. A solution made by dissolving 14.2 g of sucrose in 100 g of water exhibits a freezing-point depression of 0.77°C. Calculate the molar mass of sucrose.
9. Describe a colloid.
10. What is the difference in a hydrophobic substance vs. a hydrophilic substance?

1. Predict the spontaneity of the following reactions:
	1. H₂O (l) → H₂O (g)
	2. 6CO₂ (g) + 6 H₂O (l) → C₆O₁₂H₆ (s) + 6O₂ (g)
	3. 2Ni₂O₃ (s) → 4Ni(s) +3 O₂ (g)
	4. 2MgO(s) → 2Mg(s) + O₂ (g)
2. A certain reaction is spontaneous at 25°C. If the enthalpy change for the reaction is 20 Kj/mol, what is the minimum value of ΔS for the reaction?
3. Given the following information, predict whether the following reactions are spontaneous at 23.7°C.
	1. ΔS = -124 J/k\*mol, ΔH = 140 kJ/mol
	2. ΔS= 146 J/k\*mol, ΔH = 1 kJ/mol
	3. ΔS = 50 J/k\*mol, ΔH = -25 Kj/mol
4. What is the temperature required to make each of the following spontaneous?
	1. ΔS = -324 J/k\*mol, ΔH = 40 kJ/mol
	2. ΔS= 26 J/k\*mol, ΔH = 12 kJ/mol
	3. ΔS = 50 J/k\*mol, ΔH = -25 Kj/mol
5. The enthalpy change in the denaturation of a certain protein is 125 Kj/mol. If the entropy change is 397 J/K\*mol, what is the minimum temperature at which the protein would denature spontaneously?