

CEM 142 Spring 2015 Mock Exam 1 Short Answer Section

1. If you place a container of a mixture of liquid water and water vapor (the system) on a hotplate:
  - a. When the hotplate temperature is **above** 100 °C what change will occur in the system?
  
  
  
  
  
  
  
  
  
  
  - b. Draw a molecular level representation of the change as the temperature increases. (show the species that are present before and after the change)

- c. What is the sign of these thermodynamic functions for this change:

	Sign
$\Delta H$ system:	
$\Delta H$ surroundings:	
$\Delta S$ system	
$\Delta S$ surroundings	
$\Delta G$	

- d. At T= 100 °C (373K) what is  $\Delta G$ ?

CEM 142 Spring 2015 Mock Exam 1 Short Answer Section

2 When a hot block is placed next to a cold block the two blocks eventually end up at the same temperature. Explain both **how** this happens (what processes allow this to occur) and **why** this happens (and why it will not reverse).

3. Describe how you would make 250 mL of a 1.25 M solution of sodium chloride, given a 250 mL volumetric flask, water, sodium chloride and a balance.

CEM 142 Spring 2015 Mock Exam 1 Short Answer Section

4. Draw molecular level representations that clearly show interactions between the solute and solvent for:
  - a. A solution of ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ ) in water

- b. Calcium chloride ( $\text{CaCl}_2$ ) in water

- c. Methane ( $\text{CH}_4$ ) in water

CEM 142 Spring 2015 Mock Exam 1 Short Answer Section

5. When magnesium chloride is added to water, the white solid seems to disappear and the temperature increases.

What information can you deduce from these observations? (for example about the thermodynamic functions  $\Delta H$ ,  $\Delta S$  and  $\Delta G$ , and the relative strengths of interactions)