Group Members Names \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Phases and Phase Diagrams**

 **Activity I: Phases and Solid Solution Binary Alloys**

1. A glass of water has sugar slowly added to it until it saturates and a small amount of sugar is left at the bottom. A small amount of extra sugar is then added to the system and students are asked to predict what will happen to the sugar. Student A says, “A little bit more of the sugar can now dissolve in the water, but the majority of the sugar will settle to the bottom.” Students B says, “No more sugar can dissolve in the water unless you stir it.” Student C says, “The solution is super-saturated. No more sugar can dissolve even if you stir.” Which student’s statement is the most correct? Explain.
2. a) For each point draw the microstructure.

**A** **B**

**C** **D**

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 b) Is the % wt composition of Ni in the alpha phase the same for pt B and C? Explain

**Activity II: Binary Eutectic Alloys**

1. Some binary alloys (alloys with two constituents) have only one solid phase such, as the Copper-Nickel system. Others have two solid phases, such as the Lead-Tin system.
2. Why is this?

1. Under what conditions will a Lead Tin alloy have only one phase?



1. Draw pictures of the microstructure of this Copper-Silver alloy as you slowly cool the solution.

 **At 97% Ag**

 **a3: b3: c3:**

 **At 72% Ag**

 **a2: b2: c2:**

**At 24% Ag**

 **a1: b1: c1:**

**Activity III: Using the Phase Diagram to Determine Phase Composition and Amounts.**

1. At point b1 in the above diagram, estimate the composition of the α?
2. At point b1 in the above diagram, estimate the composition of the Liquid?
3. At point b1 in the above diagram, use your estimates above to calculate the fraction of the microstructure that is α?
4. At point b1 in the above diagram, use your estimates above to calculate the fraction of the microstructure that is Liquid?

**Activity IV: Looking Backward**

1. When water is at a certain temperature, a small change to the temperature is all that is needed to go from all solid to all liquid. Does the same thing happen to binary alloys? Explain.
2. In the Cu-Ag eutectic phase diagram on page 2, what is alpha? Draw a picture of alpha at the atomic level.
3. What is the difference between phase **composition** and phase **fraction**?