**Short answer.**

ALL calculations with proper units are required for full credit

The solubility of sodium carbonate in water is 7.00 g/100 mL at 0 °C and 45.5 g/100 mL at 100 °C. If you were given a 40 g mixture of sodium carbonate and sand, and it took 75 mL of boiling water to dissolve the sodium carbonate, how much sodium carbonate would you theoretically be able to recover from recrystallization?

The solubility of caffeine in water is 0.6 g/100 mL at 0 °C, 33 g/100mL at 55 °C and 67 g/100 mL at 100 °C. Calculate the percent loss is you recrystallized 67 g of caffeine by first dissolving it in water at 55 °C instead of 100 °C.

The solubility of benzoic acid in water is 1.70 g/100 mL at 0 °C and 53.6 g/100 mL at 100 °C. If you recrystallized a 1.78 g sample of contaminated benzoic acid with 20.0 mL of water and recovered 1.00 g of pure benzoic acid, what percentage of the original sample were impurities?

**True/False.**

1. \_\_\_\_\_\_ During recrystallization, the cooled solution becomes supersaturated with the solute.
2. \_\_\_\_\_\_ Melting points are always reported as a single number
3. \_\_\_\_\_\_ When recrystallizing in a hexane/acetone solvent pair, the compound will have higher solubility in acetone.
4. \_\_\_\_\_\_ The two solvents in a solvent pair for recrystallization must be immiscible.
5. \_\_\_\_\_\_ Toluene would be an appropriate solvent to recrystallize sodium chloride.
6. \_\_\_\_\_\_ Recrystallization is used to purify both products and starting materials of reactions.
7. \_\_\_\_\_\_ Recrystallization ideally utilizes a solvent with high solubility at high temperature and high solubility at low temperature
8. \_\_\_\_\_\_ After recrystallization, impurities are located in solution.
9. \_\_\_\_\_\_ When filtering a product in water, always wash it with room-temperature water.
10. \_\_\_\_\_\_ In a water/ethanol solvent pair, the product should be washed with ethanol.

**Multiple Choice**

1. Which of the following is the proper procedure for recrystallization?

1. Heat solvent, add hot solvent to solute to dissolve, recrystallize in ice bath, filter to recover
2. Add solute to solvent, heat solvent to dissolve, recrystallize in ice bath, filter to recover
3. Heat solvent, add solute to hot solvent to dissolve, recrystallize in ice bath, filter to recover
4. Add solute to solvent to dissolve, recrystallize in ice bath, filter to recover

2. During recrystallization, the solvent should always be

1. Kept at 100 °C until all solute has dissolved
2. Added to the solute at room temperature then heated
3. Kept at boiling until all solute has dissolved
4. Added at a ratio of 10 mL of solvent per gram of solute

3. Which of the following will ensure production of the purest crystals?

1. Scratching the sides of the flask to induce recrystallization
2. Cooling the solution slowly
3. Using a solvent pair for recrystallization
4. Decolorizing the solution

4. If no crystals have formed in an ice bath after 10 min, which of the following should be done?

1. Add more cold solvent
2. Scratch the sides of the flask
3. Heat the solution to dryness
4. Heat the solution to boiling and ice bath it again

5. Improper drying of crystals will usually result in

1. An increased melting point and greater than 100% yield
2. An decreased melting point and greater than 100% yield
3. An increased melting point and less than 100% yield
4. An decreased melting point and less than 100% yield

6. Which of the following solvents would be best for recrystallizing naphthalene?

1. Water
2. Ethanol
3. Toluene
4. Methanol

7. The purpose of a boiling chip is to:

1. Prevent superheating or flash boiling
2. Bring a liquid to a boil
3. Induce recrystallization
4. Help two solvents dissolve

8. An impure compound will have a melting point that is

1. Sharp and high
2. Sharp and low
3. Broad and high
4. Broad and low

9. Which of the following will always be 0 °C?

1. Boiling water
2. Liquid water
3. A mixture of ice and water
4. Ice

10. Which of the following is a hazard for water?

1. Corrosive
2. Mutagenic
3. Irritant
4. None of the above