**Quiz 9**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Water in a glass tube that contains grease or oil residue displays a flat meniscus, whereas water in a clean glass tube displays a concave meniscus. Explain this observation (3 points).

In a clean glass tube, the water can generate strong adhesive interactions with the glass (due to the dipoles at the surface of the glass). Water experiences adhesive forces with glass that are stronger than its cohesive forces, causing it to climb the surface of the glass tube. When grease or oil coats the glass, this interferes with the formation of these adhesive interactions with the glass because oils are nonpolar and cannot interact strongly with the dipoles in the water. Without experiencing these strong intermolecular forces with oil, the water’s cohesive forces will be greater and water will be drawn away from the surface of the tube.

1. In each pair of compounds, pick the one with the higher boiling point. Explain your reasoning (6 points).
   1. NH3 or CH4

NH­3 has the higher boiling point because it exhibits hydrogen bonding.

* 1. CS2 or CO2

CS2 has the higher boiling point because it has the larger molar mass.

* 1. CO2 or NO2

NO2 has the higher boiling point because it exhibits dipole-dipole forces.

1. Which evaporates more quickly: 55 mL of water in a beaker or 55 mL of acetone, (CH3)2CO, in an identical beaker under identical conditions? Is the vapor pressure of the two substances different? Explain (3 points).

The acetone will evaporate more quickly because it is not capable of forming hydrogen bonds, so the intermolecular forces are much weaker. This will result in a larger vapor pressure at the same temperature as the water.

1. Define a colligative property (3 points).

A colligative property is a property that depends solely on the number of solute particles (ions or molecules) and is not dependent on the properties of those particles.