Chemistry I
Colligative Properties Practice

1. What is the freezing point of a solution made with 5.00g of magnesium nitrate and 100g of water?

2. What is the boiling point of a solution made with 20.0g of sodium hydroxide and 500g of water?

3. The solution in an automobile's radiator is found to have a boiling point of 115°C. What is the mole fraction of the solute, ethylene glycol ($C_2H_6O_2$), if 3.50kg of water are used in the cooling system?

4. A Coke label tells me that it has 65.0g of sugar in 591mL. If I assume that means the mass of the water that basically makes up the Coke is 526g, and the sugar is actually sucrose ($C_{12}H_{22}O_{11}$), then what will the freezing point of this Coke be?

5. What are the freezing and boiling points of naphthalene (moth balls) when 10.0g of nicotine, $C_{10}H_{14}N_2$, are dissolved in 50.0g of naphthalene? Refer to the chart below.

6. When 10.0g of elemental sulfur are dissolved in 100.0g of cycohexane, the freezing point of this solution is found to be −1.40°C. What are the molar mass and molecular formula of this allotrope of sulfur? Refer to the chart below.

solvent	freezing point (°C)	k_f (°C-kg/mol)	boiling point (°C)	k_b (°C-kg/mol)
naphthalene	80.29	6.94	217.96	6.20
cyclohexane	6.50	20.2	80.72	2.75

Answers
1. -1.88°C

2. 101.02°C

3. 0.346

4. -0.671°C

5. $T_{fsolution}$ = 71.7°C

   $T_{bsolution}$ = 225.6°C

6. 255.70g/mol; S_8