

Chemistry 146 – Van Bramer
Spring Problem Set – Week 2

Compound	Formula	Density (20 °C g cm ⁻³)	FP (°C)	BP (°C)	K _f (°C m ⁻¹)	K _b (°C m ⁻¹)	Vap P (25 °C, Pa)
Acetic Acid	CH ₃ COOH	1.0492	16.6	117.9	3.90	3.07	2.11*10 ³
Benzene	C ₆ H ₆	0.8765	5.5	80.1	4.90	2.53	1.261*10 ⁴
Carbon Tetrachloride	CCl ₄	1.5940	-22.99	76.54	2.98	5.03	1.541*10 ⁴
Nitrobenzene	C ₆ H ₅ NO ₂	1.2037	5.7	210.8	7.00	5.24	55.1
Water	H ₂ O	0.998203	0.000	100.0	1.86	0.512	3.467*10 ³
Ethanol	C ₂ H ₆ O	0.7893	-117.3	78.5		1.22	7900

- For a mixture prepared by combining 200.0 mL of nitrobenzene and 1.00 L of water.
 - Calculate the mole fraction of each compound in the mixture
 - Calculate the vapor pressure of each compound in the mixture
 - Calculate the total vapor pressure of the mixture
- For a mixture prepared by mixing 5.00 g of caffeine (C₈H₁₀N₄O₂) with 250.0 mL of water. The final density of this mixture is 1.05 g mL⁻¹.
 - Calculate the boiling point of this mixture
 - Calculate the vapor pressure of this mixture
 - Calculate the freezing point of this mixture
 - Calculate the osmotic pressure of this mixture at 25 °C.
- For a mixture prepared by mixing 10.0 g of sodium sulfate in 250 mL of water. The final density of this mixture is 1.10 g mL⁻¹.
 - Calculate the boiling point of this mixture
 - Calculate the vapor pressure of this mixture
 - Calculate the freezing point of this mixture
 - Calculate the osmotic pressure of this mixture
- You are examining forensics data for a court case and need to identify an analgesic (pain killer). It could be either acetylsalicylic acid (aspirin), ibuprofen (Advil) or acetaminophen (Tylenol). A mixture of the unknown is prepared by mixing 10.0 grams of unknown and diluting to 250 mL with ethanol. The density of this solution is 0.80 g mL⁻¹.
 - Identify the unknown based upon the following:
 - The boiling point of this mixture is 78.8 °C.
 - The osmotic pressure of this mixture is 480400 Pa at 25 °C.