<u>**CONCEPT:**</u> BOILING POINT ELEVATION

● The phenomenon when adding a solute to a pure solvent results in _____ of the boiling point of the solvent.

    □ **Normal Boiling Point** (_____): The boiling point of the pure solvent _____ the addition of the solute.

    □ **Boiling Point of Solution** (_____): The boiling point of the solvent _____ the addition of the solute.

Boiling Point Elevation		
Ⓐ Boiling Point Elevation Formula	**Ⓒ** Variables	**Ⓓ** Constants

Ⓐ Boiling Point Elevation Formula

$$\Delta T_b = \underline{\quad} \cdot \underline{\quad} \cdot \underline{\quad}$$

Ⓑ Boiling Point of Solution

$$BP\underline{\quad} = BP\underline{\quad} + \underline{\quad}$$

Ⓒ Variables

□ ΔT_b = Change in Boiling Point

□ _____ = van't Hoff Factor

□ _____ = Boiling Point Constant of Solvent in _____.

□ _____ = molality of solution in _____.

Ⓓ Constants

Solvent	Normal BP (ºC)	k_b (ºC/m)
Water	100.0	0.51
Benzene, C_6H_6	80.1	2.53
Chloroform, $CHCl_3$	61.2	3.60
Ethanol, C_2H_5OH	78.4	1.20

    □ Recall, if a compound is covalent, nonvolatile or non-ionic then its van't Hoff factor is equal to _____.

EXAMPLE: Calculate the boiling point of a 3.71 m aqueous $CaBr_2$ solution.

PRACTICE: An ethylene glycol solution contains 25.2 g of ethylene glycol ($C_2H_6O_2$) in 99.5 mL of water. Determine the change in boiling point. Assume a density of 1.00 g/mL for water.

a) 18.4 ºC   b) 9.22 ºC   c) 2.08 ºC   d) 0.572 ºC

<u>**CONCEPT:**</u> BOILING POINT ELEVATION

PRACTICE: Pure water boils at 100°C. What is the new boiling point of water after the addition of 13.12 g aluminum chloride, $AlCl_3$, to 615 g water?

a) 100.25 °C   b) 100.08 °C   c) 100.33 °C   d) 100.16 °C

PRACTICE: What is the molality of glucose in an aqueous solution if the boiling point of the solution is 103.15°C?

a) 0.15 m   b) 0.29 m   c) 6.18 m   d) 1.6 m

PRACTICE: Carbon dioxide is dissolved in 722 mL of benzene with a density of 1.59 g/mL. What mass of carbon dioxide would you add to make the boiling point of the solution 104.7°C?

a) 11 g   b) 500 g   c) 22.9 g   d) 491 g