Question:

The boiling point elevation constant, kb, for CS2 is 2.3 o^C (degrees celsuis) and its boiling point is 46.3 o^C (degrees Celsius). What would be the boiling point of a one tenth saturated solution of S8 in CS2?

Thanks!

Solution:

$\Delta T_b = K_b \cdot b_B$

- ΔTb, increase in the boiling point, is defined as Tb (solution)-Tb (pure solvent).
- K_b, the ebullioscopic constant, which depends on the properties of the solvent. It can be calculated as Kb = RTb2M / ΔHv, where R is the gas constant, and Tb is the boiling point of the pure solvent [in K], M is the molar mass of the solvent, and ΔHv is the evaporation heat per mole of the solvent.
- b_B is the molarity of the solution, calculated taking into account dissociation, since an increase in the boiling point is a colligative property, depending on the amount of particles in the solution.

Tb (solution) = Tb (pure solvent) + $K_b \cdot b_B$ = 46.3 + 2.3*1/10 = 46.3+0.23 = 46.53 o^C (degrees celsuis).