

### Problem 13-04 Freezing point depression – non-electrolyte solutions

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Compare the results of four cryoscopic experiments in which 0.01 mol

(a) of bromoform ( $K_K = 14.4 \text{ K kg mol}^{-1}$ ),

(b) of dioxane ( $K_K = 4.63 \text{ K kg mol}^{-1}$ ),

(c) of cyclohexane ( $K_K = 20.0 \text{ K kg mol}^{-1}$ ),

(d) of camphor ( $K_K = 37.7 \text{ K kg mol}^{-1}$ )

was dissolved always in 400 g of benzene ( $K_K = 5.12 \text{ K kg mol}^{-1}$ ). In which of these experiments the greatest melting point depression was achieved?

[ $\Delta T_f$  is the same in all experiments]

Solution:

$$-\Delta T_f = \underline{m}_2 \cdot K_{K, \text{ solvent}}$$

In all experiments the solvent is the same  $\Rightarrow K_K$  is always the same

$$\underline{m}_2 = \frac{n_2}{m_1}$$

$n_2$  as well as  $m_1$  are the same in all experiments

$\Delta T_f$  is the same in all experiments