

# 1. Determination of molar mass

## 1.a. Cryoscopic determination of molar mass of naphthalene

---



**TASK:** Determine the molar mass of naphthalene. Measure the freezing-point temperature of naphthalene solution in benzene solvent for three different solute concentration.



**LABORATORY AIDS AND CHEMICALS:** Apparatus for cryoscopy (see **xxxxx Fig. 2**), digital thermometer, burette for measuring volumes of volatile liquids ( $25\text{ cm}^3$ ), analytical balance, weighting bottle ( $25\text{ cm}^3$ ), spoon, benzene, naphthalene, ice, stopwatch.



**INSTRUCTIONS:** Determine the benzene cooling curve (**xxxxFig.3**) as instructed in the introductory chapter. Apply  $20\text{ cm}^3$  of pure benzene. Weight benzene liquid in weighting bottle (need for 4 significant digits). Repeat the curve measurement twice.

Weigh about  $0.2\text{ g}$  (need for 4 significant digits) of naphthalene into small weighting bottle and put it in a cryoscopic tube. Dissolve the naphthalene and determine the freezing-point of the solution twice.

In the same way, measure the freezing-point temperature of other solutions at solute concentrations corresponding to the total addition of  $0.4$  and  $0.6\text{ g}$  of naphthalene (i.e., to the previous amount of naphthalene add  $0.2\text{ g}$ ). It all in original  $20\text{ cm}^3$  of benzene.



**REPORT:** Systematic deviation of the digital thermometer. **Table 1:** for each experiment: benzene weight, naphthalene weight, experimental benzene/solution freezing point temperature, mean benzene freezing-point temperature and the calculated molar mass of naphthalene. **Common graph 1:** cooling curves of pure benzene and naphthalene solutions.