

There are 9 unknowns. Their names and molar masses are:

Naphthalene (128.2)	Anthracene (178.2)	Cholanthrene (254.3)
Dichlorobenzene (147.0)	Anthrone (194.2)	Cholane (330.6)
Naphthoquinone (158.2)	Benzil (210.2)	Cholestane (372.7)

Introduction: When one mole of a solute is contained in 1 kg of solvent, the melting point of that mixture is lowered by a characteristic amount. That amount is called the molal freezing point depression constant, K_f .

This can be written as a formula:

$$M = \frac{K_f \times w \times 1000}{\Delta T \times W}$$

K_f = Molecular depression constant for camphor (39.7)
 w = Weight (mass) of unknown compound (solute)
 W = Weight (mass) of camphor (solvent)
 ΔT = Depression of melting point
 M = gram molecular weight of solute

In this simulation you will be asked to find the molecular weight of an unknown solid by measuring the depression of the melting point of camphor when the solid is mixed with it. This method of determining molecular weight is called Rast's method.

Procedure:

Put a little pure camphor onto a clean watch glass. Now take a melting point tube sealed at one end, and tamp it into the solid – open end down. Now invert the tube and tap it lightly on the bench to get the solid to the end of the tube. While this method works with most dry solids, camphor has a peculiar tenacity and it may have to be poked to the bottom of the tube with a wire.

The tube is now attached to a thermometer with a rubber band. The assembly is put into a thiele tube full of oil. The tube is designed so that the hot oil will circulate evenly.

At the melting point the solid will become clear liquid. Record the melting point of the pure solvent (camphor). You must record the temperature when the last crystal melts.

You are now ready to measure the melting point of a mixture of camphor and your unknown sample. You need a homogeneous solution of the unknown and camphor in known concentration. You must weigh some camphor and some unknown, melt them together and find the melting point of the mixture.

Measure the mass of an empty test tube. Add about 1 gram of camphor and record its mass. Add about 0.1 gram of the unknown solute and record its mass. The contents of the test tube are melted by placing it

in an oil bath preciously heated to 180-185 degrees. The liquid must not be heated more than one minute or the camphor will sublime from the solution.

The tube is taken from the bath, propped up in another beaker and allowed to cool. Some of the solid is scraped from the tube and powdered on a watch glass. It is convenient to use the bottom of a test tube as a pestle.

A little of the solid is put into a melting point tube as before. The tube is attached to the thermometer and the melting point is obtained. Record the melting point of the mixture.

Data: Unknown # _____

Melting Point of pure camphor: _____

Melting Point of mixture: _____

Mass of empty test tube: _____

Mass of t.t. + camphor: _____

Mass of t.t. + camphor + unknown: _____

Calculations:

Weight of camphor, W , = _____

Weight of unknown, w , = _____

M = _____

Unknown is: _____