Answer on Question #59221, Chemistry / General Chemistry

1. A special degreaser contains 350mL of benzene (C6H6) and 1.40L of carbon tetra chloride. The density of benzene is 0.876 g/mL. The density of carbon tetra chloride is 1.59g/mL. The density of the degreaser is 1.47g/mL. What is the molarity? Mass percent? Molality?

Solution:

Total volume of the solution:

$V(C_6H_6) + V(CCl_4) = 350ml + 1400ml = 1750ml.$ – solution.

350ml C_6H_6 – solute.

1.4L = 1400ml CCl_4 – solvent.

$m = \rho \times V$

mass = density × volume

$m\ (C_6H_6) = 350ml \times 0.876\ g/ml = 306.6\ g.$

$m\ (CCl_4) = 1400ml \times 1.59\ g/ml = 2226\ g.$

$m\ (solution) = 1750ml \times 1.47\ g/ml = 2572.5g.$

Molarity:

$C_M = \frac{n}{V}$ $\quad$ $n = \frac{m}{M}$

V – Volume of solution, L.

$M\ (C_6H_6) = 72\ g/mol$

$n = \frac{306,6\ g}{72\ g/mol} = 4.03\ mol$

$C_M = \frac{4,03\ mol}{1,750\ L} = 2.3\ mol/L$

Molality:

$C_m = \frac{n}{m}$

m – mass of solvent, kg.

$C_m = \frac{4,03\ mol}{2,226\ kg} = 1.81\ mol/kg$

Mass percent:

$\omega = \frac{mass\ of\ solute}{mass\ of\ solution} \times 100\%$

$\omega = \frac{306,6\ g}{2572,5\ g} \times 100\% = 11.92\%.$

Answer: molarity = 2.3 mol/L; molality = 1.81 mol/kg; mass percent = 11.92%.