Concentration

ppm

Concentration

arts per million

parts per million (ppm):

Used when the amount of solute is extremely small

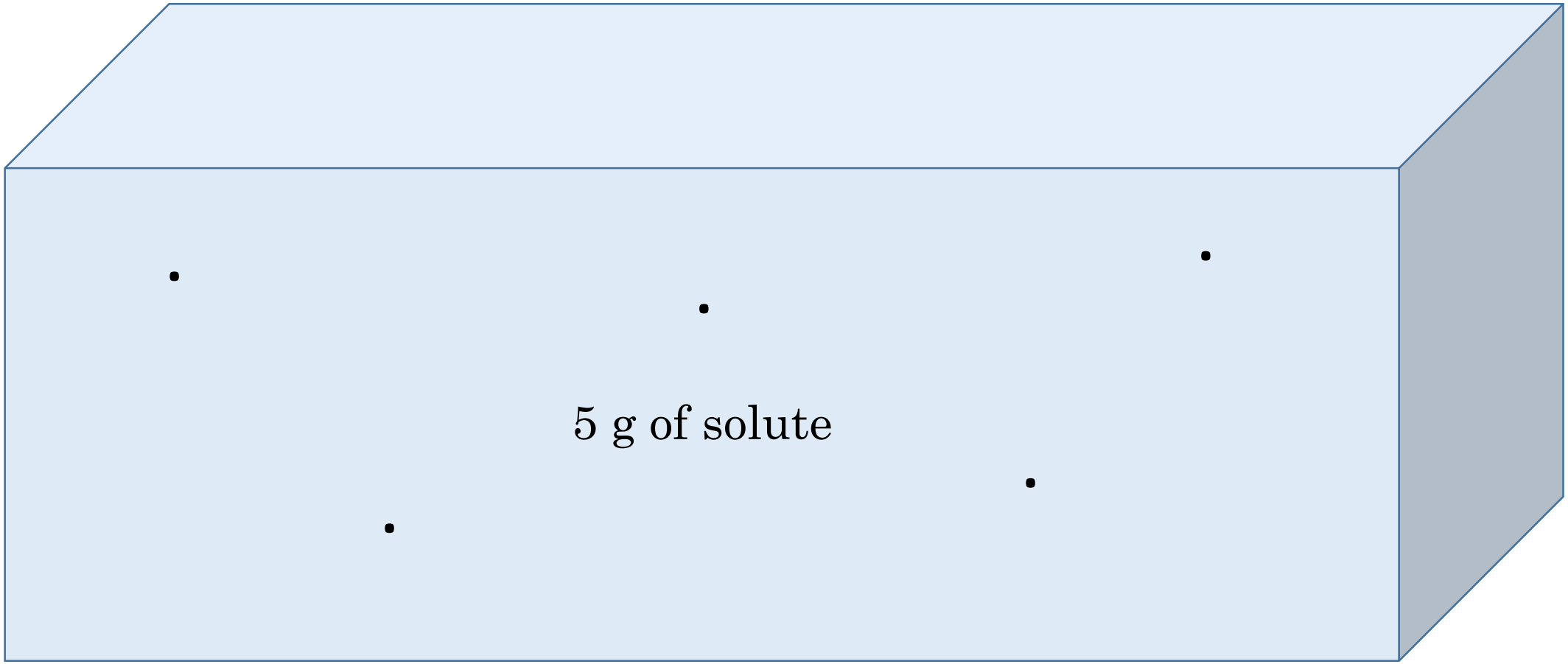
(compared to the amount of solution)

$$\left(\frac{solute}{solution}\right) \qquad \frac{g}{1\,000\,000\ g} \qquad \textit{or} \qquad \frac{mg}{kg} \qquad \textit{or} \qquad \frac{mg}{L}$$

parts per million (ppm):

$$C = \frac{\text{amount of solute}}{amount\ of\ solution}$$

$$C = 5\ ppm\ = \frac{5\ g}{1000000\ g}$$



parts per million (ppm):

$$C = \frac{\text{amount of solute}}{amount\ of\ solution}$$

$$\underset{?}{\_\_\_\_\_} mg = 1\ kg$$

$$1000\ mg = 1\ g \quad \& \quad 1000\ g = 1\ kg$$

parts per million (ppm):

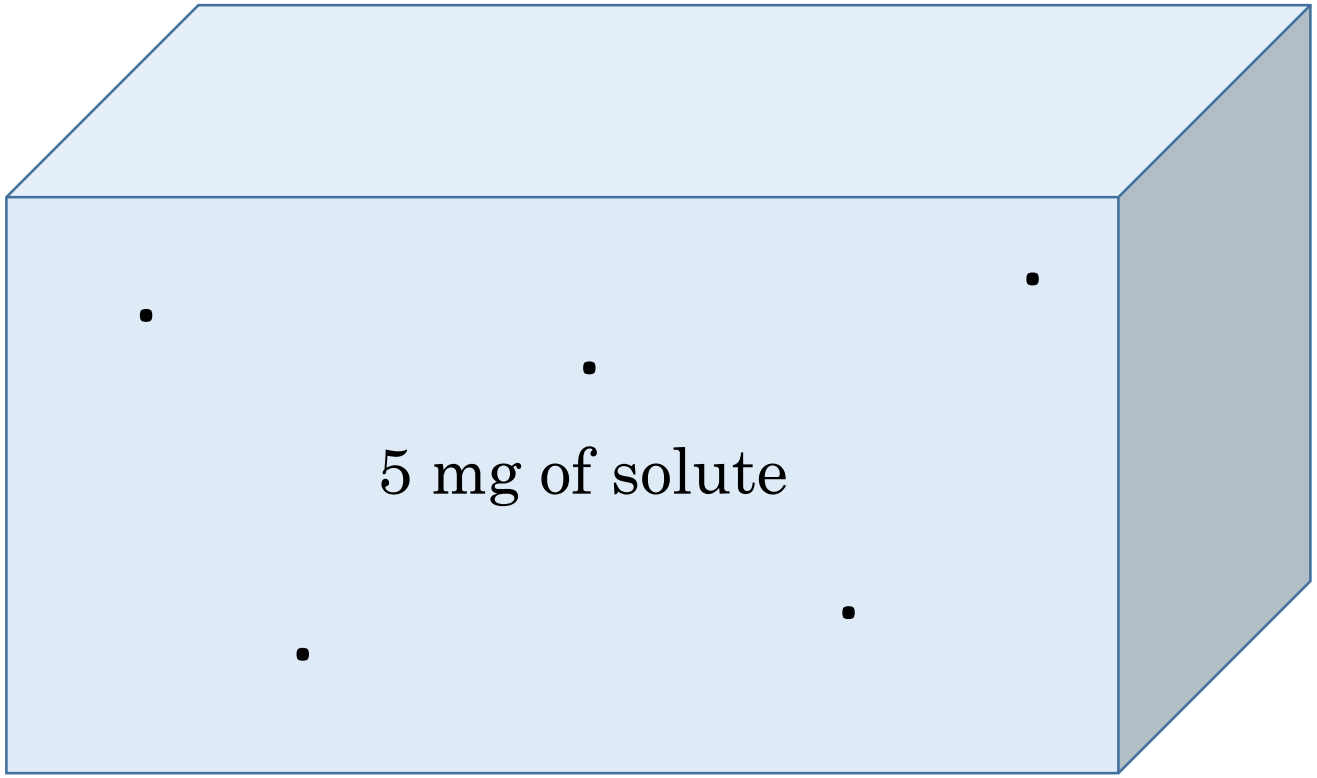
$$\underbrace{1\ 000\ 000}_{\text{(1 million)}}\ mg = 1\ kg$$

$$1000\ mg = 1\ g \quad \& \quad 1000\ g = 1\ kg$$

parts per million (ppm):

$$1000000\ mg = 1\ kg$$

$$C = 5\ ppm \quad = \frac{5\ mg}{1\ kg}$$



parts per million (ppm):

$$1000000\ mg = 1\ kg$$

What if the solution is a liquid and measured by volume?

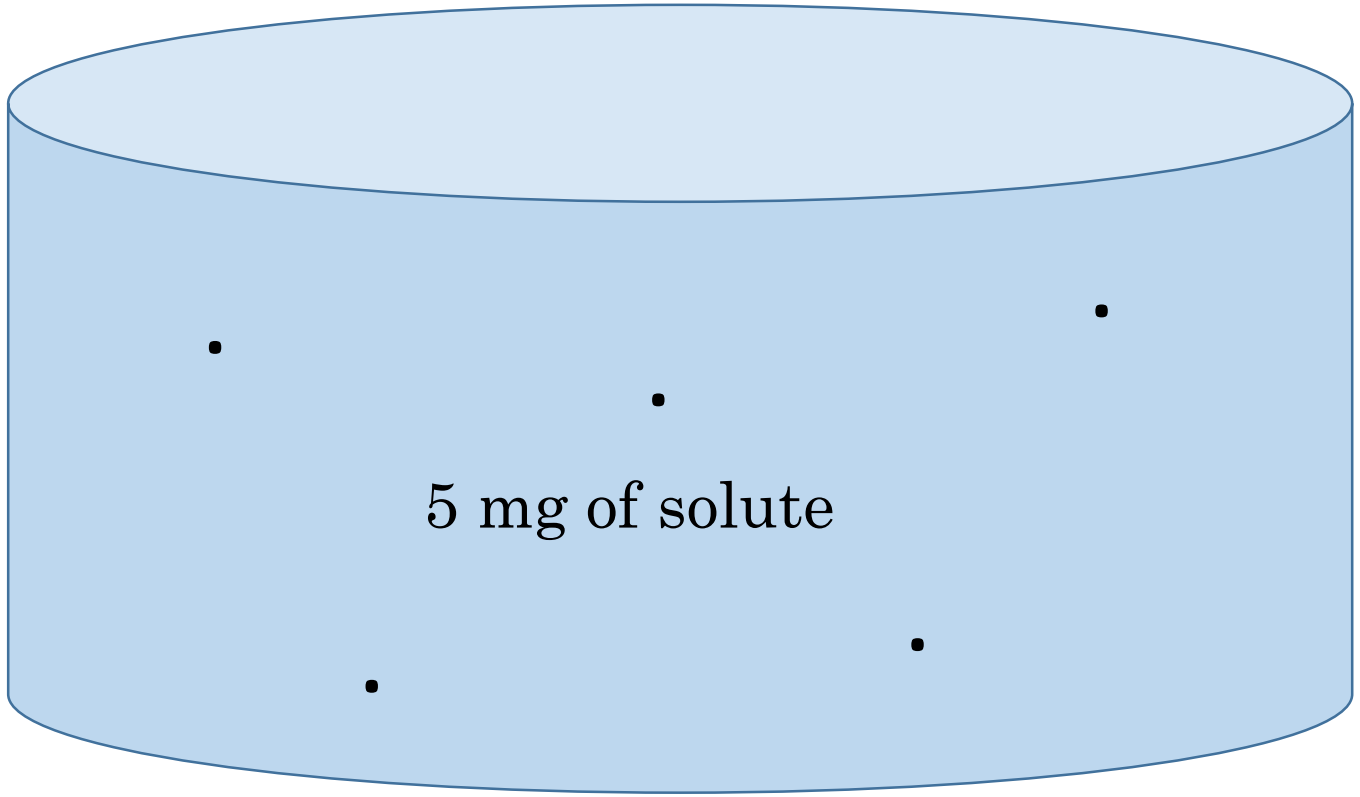
Since water has a density of 1.0 kg/L:

$$1\ kg \text{ of water } = 1\ L \text{ of water}$$

$$1000000\ mg \text{ of water } = 1\ L \text{ of water}$$

parts per million (ppm): $1000000\ mg$ of water $=$ $1\ L$ of water

$$C = 5\ ppm \quad = \frac{5\ mg}{1\ L}$$



parts per million (ppm): $\frac{g}{1\,000\,000\ g}$ *or* $\frac{mg}{kg}$ *or* $\frac{mg}{L}$

Example I: 12 mg of solute in 3 kg of solution; $C = ?$

$$C = \frac{12\ \text{mg}}{3\ \text{kg}}$$

$$C = 4\ \text{ppm}$$

$$C = \frac{\text{solute}}{\text{solution}}$$

parts per million (ppm): $\frac{g}{1\,000\,000\ g}$ *or* $\frac{mg}{kg}$ *or* $\frac{mg}{L}$

Example II: 60 L of solution contains 42 mg of solute ; $C = ?$

$$C = \frac{42\ \text{mg}}{60\ \text{L}}$$

$$C = 0.7\ \text{ppm}$$

$$C = \frac{\text{solute}}{\text{solution}}$$

parts per million (ppm): $\frac{g}{1\,000\,000\ g}$ *or* $\frac{mg}{kg}$ *or* $\frac{mg}{L}$

Example III: 1.8 g of solute dissolved in 400 L of solution; $C = ?$

1.8 g = 1800 mg

$$C = \frac{\text{solute}}{\text{solution}}$$

$$C = \frac{1800\ \text{mg}}{400\ \text{L}}$$

$$C = 4.5\ \text{ppm}$$

parts per million (ppm): $\frac{g}{1\,000\,000\ g}$ *or* $\frac{mg}{kg}$ *or* $\frac{mg}{L}$

Example IV: Determine the quantity of solute found in 2.4 kg of solution that has a concentration of 3 ppm

$$C = \frac{\text{solute}}{\text{solution}}$$

$$\frac{3\ \text{mg}}{1\ \text{kg}} = \frac{x}{2.4\ \text{kg}}$$

$$(1)(x) = (3)(2.4)$$

$$x = 7.2\ \text{mg}$$

parts per million (ppm): $\frac{g}{1\,000\,000\ g}$ *or* $\frac{mg}{kg}$ *or* $\frac{mg}{L}$

Example V: Determine the quantity of solute found in 750 g of solution that has a concentration of 8 ppm

$$C = \frac{\text{solute}}{\text{solution}}$$

$$\frac{8\ \text{g}}{1000000\ \text{g}} = \frac{x}{750\ \text{g}}$$

or

$$(1000000)(x) = (8)(750)$$

$$1000000\ x = 6000$$

$$x = 0.006\ \text{g}$$

parts per million (ppm): $\frac{g}{1\,000\,000\ g}$ *or* $\frac{mg}{kg}$ *or* $\frac{mg}{L}$

Example V: Determine the quantity of solute found in 750 g of solution that has a concentration of 8 ppm

0.75 kg of solution

$$\frac{8\ \text{g}}{1000000\ \text{g}} = \frac{x}{750\ \text{g}}$$

$$(1000000)(x) = (8)(750)$$

$$1000000\ x = 6000$$

$$x = 0.006\ \text{g}$$

or

$$\frac{8\ \text{mg}}{1\ \text{kg}} = \frac{x}{0.75\ \text{kg}}$$

$$(1)(x) = (8)(0.75)$$

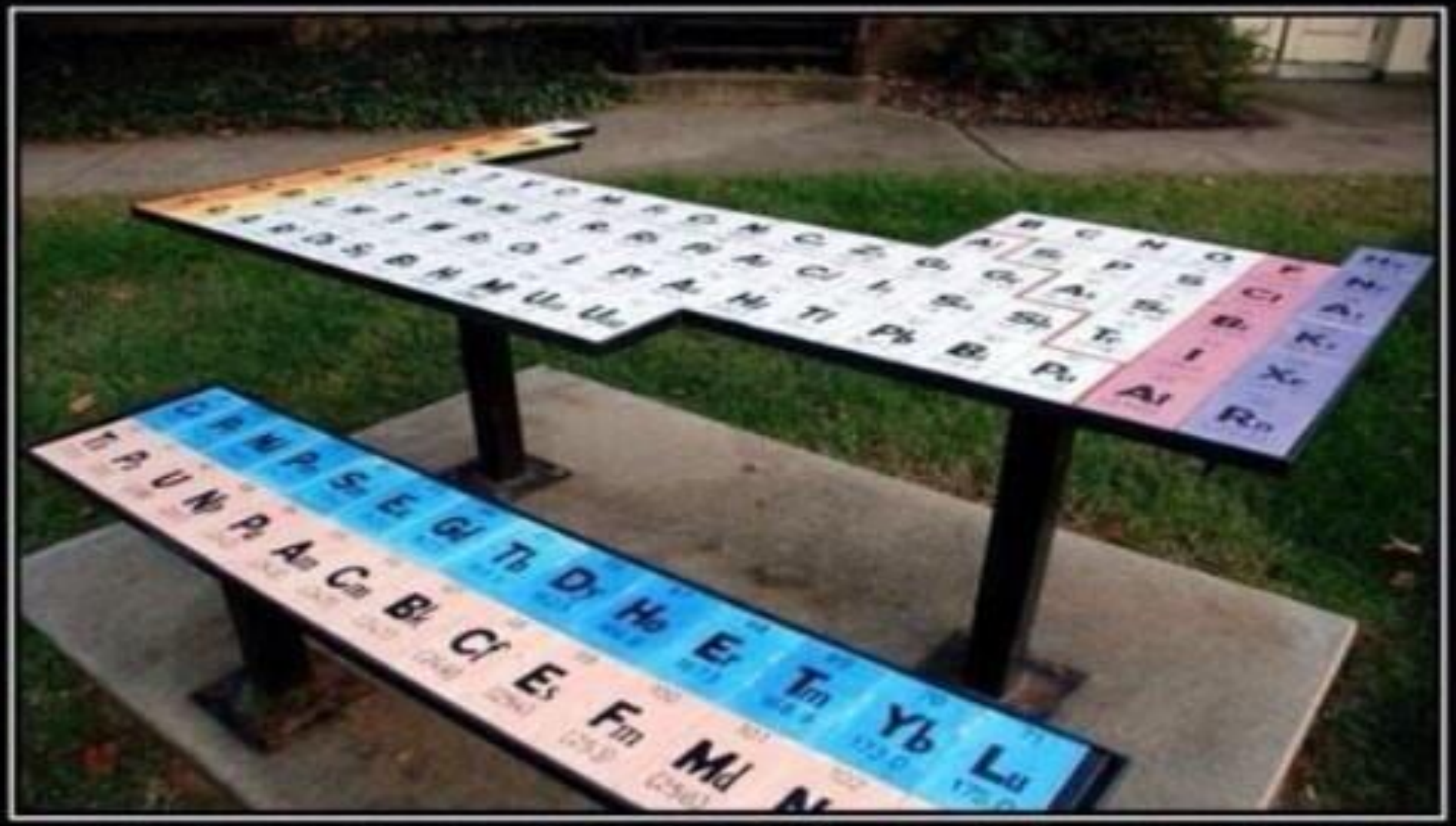
$$x = 6\ \text{mg}$$

parts per million (ppm): $\frac{g}{1\,000\,000\ g}$ *or* $\frac{mg}{kg}$ *or* $\frac{mg}{L}$

Example VI: A concentration of 35 ppm is equivalent to what concentration in g/L ?

35 mg = 0.035 g

$$C = 35\ \text{ppm} = \frac{35\ \text{mg}}{1\ \text{L}} = \frac{0.035\ \text{g}}{1\ \text{L}} = 0.035\ \text{g/L}$$



That bench doesn’t look very stable