University of Kent | Student Learning Advisory Service

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AT A GLANCE/ PHARMACY CALCULATIONS UNITS & STRENGTHS

Student Learning Advisory Service

Contact us

Please come and see us if you need any academic advice or guidance.

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Our offices are next to Santander Bank

Open

Monday to Friday, 09.00 – 17.00
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Medway

We are based in room G0-09, in the Gillingham Building and in room DB034, in the Drill Hall Library.

Open

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This leaflet has been produced in conjunction with **sigma** Network for Excellence in Mathematics and Statistics Support

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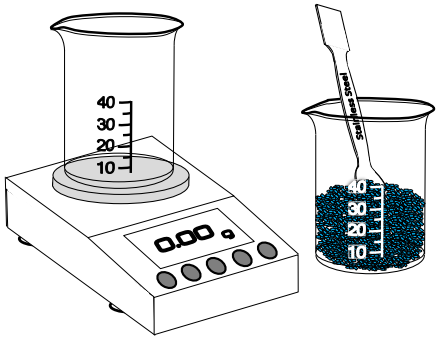
Units of measure, prefixes and strengths



Units of measure (SI)

Length/distance

micrometre (µm)	0.001mm
millimetre (mm)	0.001m
centimetre (cm)	10mm
metre (m)	1000mm
kilometre (km)	1000m

Volume

picolitre (pL)	0.001nL
nanolitre (nL)	0.001mcL
microlitre (mcL)	0.001mL
millilitre (mL)	0.001L
centilitre (cL)	10mL
litre (L , l)	1000mL
kilolitre (kL)	1000L

Mass

nanogram (ng)	0.001mcg
microgram (mcg)	0.001mg
milligram (mg)	0.001g
gram (g)	0.001kg
kilogram (kg)	1000g
tonne (t)	1000kg

Corresponding units – volume/mass*

1 ng (nanogram)	↔	1 pL (picolitre)
1 mcg (microgram)	↔	1 nL (nanolitre)
1 mg (milligram)	↔	1 mcL (microlitre)
1 g (gram)	↔	1 mL (millilitre)
1 kg (kilogram)	↔	1 L (litre)*
1 t (tonne)	↔	1 m^3 (cubic metre)

* Density of water (at 4°C) is ≈1kg/L (1g/mL)

SI prefixes

tera (T)	1,000,000,000,000	10^{12}
giga (G)	1,000,000,000	10^{9}
mega (M)	1,000,000	10^{6}
kilo (k)	1,000	10^{3}
hecto (h)	100	10^{2}
deca (da)	10	10^{1}
base unit	1	10^{0}
deci (d)	0.1	10^{-1}
centi (c)	0.01	10^{-2}
milli (m)	0.001	10^{-3}
micro (mc, μ)	0.000,001	10^{-6}
nano (n)	0.000,000,001	10^{-9}
pico(p)	0.000,000,000,001	10^{-12}

Strengths of solutions

In pharmaceutical science, the strength of a solution or mixture is usually expressed as a ratio of the ingredients:

1. Percentage Strengths

Percentage (%) strengths are fractions derived from the ratio of parts of ingredient per one hundred total parts:

$$e.g., 5\% = \frac{5}{100} \quad or \quad 0.02\% = \frac{0.02}{100}$$

2. *Ratio Strengths*

Ratio strengths are fractions derived from the ratio of the parts of ingredient to the total parts of solution/mixture:

$$e.g., 1 \text{ part in } 50 = \frac{1}{50} \quad or \quad 5 \text{ parts in } 1{,}000 = \frac{5}{1000}$$

Since percentage and ratio strengths can be used with regard to liquids, solids, and combinations of both, the nature of the ingredients (i.e., solid or liquid), and hence the units for calculating quantities, must be specified :

v/v – volume of a liquid ingredient in a liquid,
…hence, *ml/ml, l/l,* etc.

w/v – weight of a solid ingredient in a liquid,
…hence, *g/ml, mg/mcl*, etc.

w/w – weight of a solid ingredient in a solid,
…hence, *g/g, mg/mg*, etc.

v/w – volume of a liquid ingredient in a solid,
…hence, *ml/g, l/kg*, etc.

NB: As above, percentage and ratio strengths **must** always be expressed in equal/corresponding units of measure.

Remember, *milli*litres and *milli*grams **do not** correspond: they are different by a factor of 1000.

3. *Amount Strengths*

Amount strengths are fractions derived from the ratio of the amount of ingredient in an amount of base:

$$e.g., 5\text{mg/mL} = \frac{5\text{mg}}{1\text{mL}} \quad or \quad 200mg/5mL = \frac{200mg}{5mL}$$

NB: Amount strengths do not have to be expressed in equal/corresponding units.

Example 1: What quantity of ingredient A is needed to make up 150mL of a 15% v/v solution?

$$150 \times \frac{15ml}{100} = \mathbf{22.5mL}$$ ✓

Example 2: How much of ingredient B is contained in 1200mL of a 1 part in 500 w/v solution?

$$1200 \times \frac{1g}{500} = \mathbf{2.4g}$$ ✓

Example 3: If a product contains 400mg per 15mL of ingredient C, how much is contained in a 75mL bottle?

$$75 \times \frac{400mg}{15} = \mathbf{2000mg}$$ ✓