

# SI Units and Prefixes

Every SI prefix from femto to mega, with the bench-range examples you actually pipette.

## SI prefixes

| Prefix | Symbol | Factor     | Common bench example                                                                                                           |
|--------|--------|------------|--------------------------------------------------------------------------------------------------------------------------------|
| femto  | f      | $10^{-15}$ | fmol: ultra-low-input qPCR/ddPCR targets                                                                                       |
| pico   | p      | $10^{-12}$ | pg: single-cell DNA/RNA mass                                                                                                   |
| nano   | n      | $10^{-9}$  | ng: typical PCR template mass; nM: low-affinity binding assays                                                                 |
| micro  | $\mu$  | $10^{-6}$  | $\mu$ L: typical pipette range, 0.5–1000 $\mu$ L; $\mu$ M: common working concentration                                        |
| milli  | m      | $10^{-3}$  | mL: typical tube or reaction volume; mM: common buffer or salt concentration                                                   |
| (base) | –      | $10^0$     | L: stock solution volume; M: stock concentration                                                                               |
| kilo   | k      | $10^3$     | kDa: protein molecular weight (Da carries SI prefixes by convention, though it isn't itself an SI unit); kg: bulk reagent mass |
| mega   | M      | $10^6$     | Mbp: genome or contig length (bp carries SI prefixes by the same convention)                                                   |

## Derived units you'll meet at the bench

| Unit | Name   | Definition                                                        | Bench context                                                    |
|------|--------|-------------------------------------------------------------------|------------------------------------------------------------------|
| Da   | dalton | 1 Da = 1 g/mol                                                    | Reporting protein or peptide molecular weight (e.g. 66 kDa BSA). |
| mol  | mole   | SI base unit, amount of substance                                 | Stoichiometry: moles of DNA, protein, or reagent in a reaction.  |
| M    | molar  | mol/L (non-SI, accepted for use with SI)                          | Reagent and buffer stock concentrations.                         |
| N    | newton | $\text{kg}\cdot\text{m}/\text{s}^2$ , SI derived unit of force    | The force term underlying RCF (g-force) in centrifugation.       |
| Pa   | pascal | $\text{N}/\text{m}^2$ , SI derived unit of pressure               | Filtration pressure, autoclave chamber pressure.                 |
| J    | joule  | $\text{kg}\cdot\text{m}^2/\text{s}^2$ , SI derived unit of energy | Sonicator and UV crosslinker energy output.                      |

Source: BIPM, *The International System of Units (SI Brochure)*, 9th edition (2019).

Generated 23 Jul 2026

For the theory behind SI units and prefixes, see Vol 1, Ch 1 of the *Biotech Techniques Bible*.

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