SI Units and Metric Conversions

Prefixes for SI Units

Prefix	Symbol	Factor
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deka	D	10^1
Base unit		$10^0=1$
deci	d	10^{-1}
centi	C	10^{-2}
milli	m	10^{-3}
micro	mc or μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Other useful conversion factors

$$1 \text{ cm}^3 = 1 \text{ mL}$$
$$1000 \text{ cm}^3 = 1 \text{ L}$$
$$1 \text{ m}^3 = 1000 \text{ L}$$
$$1 \text{ L} = 1 \text{ kg of water}$$
$$1 \text{ ha} = 10\,000 \text{ m}^2$$
$$1000 \text{ kg} = 1 \text{ tonne}$$

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	Conversion factors			
	Prefix	Symbol	Factor	
	tera	T	10^{12}	
		1000		
	giga	G	10^9	
		1000		
	mega	M	10^6	
		1000		
	kilo	k	10^3	
		10		
	hecto	h	10^2	
		10		
	decka	D	10^1	
÷		10		×
	Base unit	Base unit	10^0	
		10		
	deci	d	10^{-1}	
		10		
	centi	C	10^{-2}	
		10		
	milli	m	10^{-3}	
		1000		
	micro	mc or μ	10^{-6}	
		1000		
	nano	n	10^{-9}	
		1000		
	pico	p	10^{-12}	

Your base units are metres, litres , grams etc.

Use the table above to determine whether to multiply or divide, and what power of ten to use.

Examples

1. Convert 1.2L to mL.
   Your units move down the table so you multiply by the conversion factor, which is 1000. $1.2 \times 1000 = 1200 \text{ mL}$

2. Convert 0.0742g to mg $0.0742 \times 1000 = 74.2 \text{ mg}$

3. Convert 23kg to Mg $23 kg \div 1000 = 0.023 \text{ Mg}$

4. Convert 790000pg to mg $790000 \div 1000000000 = 0.00079 \text{ mg}$

5. Convert 0.0000056kL to mL $0.0000056 \times 1000000 = 5.6 \text{ mL}$

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More complex conversions

6. 400 km/hr is equivalent how many m/s?

To convert you need to multiply by conversion factors where the numerator and denominator have equivalent values.

- 1 km = 1000 m so $\frac{1000 \text{ m}}{1 \text{ km}} = 1$ so multiplying by $\frac{1000 \text{ m}}{1 \text{ km}}$ will change the units but not the size.

- Similarly 1 hr = 3600 seconds, so multiplying by $\frac{1 \text{ hr}}{3600 \text{ s}}$ will change the units.

Putting these together we get

$$\frac{400 \text{ km}}{1 \text{ hr}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ hr}}{3600 \text{ s}}$$

$$= \frac{400 \text{ km}}{1 \text{ hr}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ hr}}{3600 \text{ s}}$$

$$= \frac{400 \times 1000}{3600} \frac{\text{m}}{\text{s}}$$

$$= 111 \text{ m/s}$$

7. Convert 105 ML/day to litres/minute

$$\frac{105 ML}{1 day} = 105 \frac{ML}{day} \times \frac{1000000 L}{1 ML} \times \frac{1 day}{24 hr} \times \frac{1 hr}{60 \min}$$

$$= \frac{105 ML}{1 day} \times \frac{1000000 L}{1 ML} \times \frac{1 day}{24 hr} \times \frac{1 hr}{60 \min}$$

$$= \frac{105 \times 1000000}{24 \times 60} \frac{L}{\min}$$

$$= 72917 L/\min$$

8. Convert 238000 cm³/hour to L/min

$$\frac{238000 \text{ cm}^3}{1 \text{ hr}} = \frac{238000 \text{ cm}^3}{1 \text{ hr}} \times \frac{1 \text{mL}}{1 \text{ cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1 \text{ hr}}{60 \text{ min}}$$

$$= \frac{238000 \text{ cm}^3}{1 \text{ hr}} \times \frac{1 \text{mL}}{1 \text{cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1 \text{ hr}}{60 \text{ min}}$$

$$= \frac{238 \text{L}}{60 \text{min}}$$

$$= 39.7 \text{L/min}$$

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