Units, and Unit Conversion

Contents

I. Lengths 1
a) Metric lengths 1
b) Imperial lengths 3
II. Areas 4
III. Volumes 6
a) Based on cubing units of distance 6
b) Based on litres 8
c) Combination 9
IV. Time 11
V. Speed 12
VI. Concentration 13
VII. Additional prefixes 14

I. Lengths

a) Metric lengths

1) Complete the following set of conversion factors, relative to the metre. Use index form for any factors smaller than 0.01 or greater than 100; otherwise use decimals.

					SI prefix				
1	**pm**	=	**10^{-12}**	**m**	**pico**	_____	**pm**	=	**1 m**
1	Å	=	10^{-10}	m	–	10^{+10}	Å	=	1 m
1	**nm**	=	_____	**m**	**nano**	_____	**nm**	=	**1 m**
1	**µm**	=	_____	**m**	**micro**	_____	**µm**	=	**1 m**
1	**mm**	=	_____	**m**	**milli**	_____	**mm**	=	**1 m**
1	cm	=	_____	m	centi	_____	cm	=	1 m
1	dm	=	0.1	m	deci	10	dm	=	1 m
1	**m**	=	_____	**m**	**–**	_____	**m**	=	**1 m**
1	hm	=	100	m	hecto	0.01	hm	=	1 m
1	**km**	=	_____	**m**	**kilo**	_____	**km**	=	**1 m**

Notice that for the rows in bold the conversion factors can be written as ten raised to a multiple of three.

Ångströms (Å) are occasionally used for measurements of atom, ion and molecule sizes. Decimetres (dm) can be used as the basis for the litre (L). Hectometres (hm) are conveniently referred to as a *memory aid* when working with the hectare (ha).

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2) Complete the following set of conversion factors. Use index form for any factors smaller than 0.01 or greater than 100; otherwise use decimals.

EXAMPLE: 1 Å = ? pm.

From the preceding exercise you can read conversion factors of 10^{-10} m/Å , and 10^{+12} pm/m . Thus, 1 Å = (1×10^{-10}) m = 10^{-10} m = $(10^{-10} \times 10^{+12})$ pm = 100 pm .

1	pm	=	_____	nm	_____	pm	=	1	µm
1	Å	=	100	pm	10	Å	=	1	nm
1	nm	=	_____	µm	_____	nm	=	1	pm
1	µm	=	_____	mm	_____	µm	=	1	cm
1	mm	=	_____	km	_____	mm	=	1	Å
1	cm	=	_____	dm	_____	cm	=	1	km
1	dm	=	10^{+5}	µm	0.01	dm	=	1	mm
1	m	=	_____	nm	_____	m	=	1	µm
1	km	=	_____	cm	_____	km	=	1	nm

3) Find the equivalent length. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

EXAMPLE: 0.8 dm = ? nm.

From the first exercise you can read conversion factors of 10^{-1} m/dm , and 10^{+9} nm/m . Thus, 0.8 dm = (0.8×10^{-1}) m = 8×10^{-2} m = $(8 \times 10^{-2} \times 10^{+9})$ nm = $8 \times 10^{+7}$ nm .

7	pm	=	_____	mm	_____	pm	=	8	Å
8	Å	=	_____	µm	_____	Å	=	4	km
5	nm	=	_____	mm	_____	nm	=	4	mm
3	µm	=	_____	km	_____	µm	=	7	mm
95	mm	=	_____	dm	_____	mm	=	83	nm
28	cm	=	_____	µm	_____	cm	=	55	dm
0.8	dm	=	$8\times10^{+7}$	nm	_____	dm	=	0.39	nm
0.04	m	=	_____	cm	9.1×10^{-11}	m	=	91	pm
0.4	km	=	_____	nm	_____	km	=	22	cm

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b) Imperial lengths

4) Complete the following set of conversion factors. Use decimal form.

1	foot	=	12	inches	24	furlongs	=	1	league
1	yard	=	3	feet	_____	inches	=	1	yard
1	furlong	=	220	yards	_____	inches	=	1	furlong
1	mile	=	8	furlongs	_____	inches	=	1	mile
1	league	=	3	miles	_____	inches	=	1	league
					_____	yards	=	1	mile

5) Complete the following set of conversion factors. Use decimal notation.

1	inch	=	25.4	mm	_____	mm	=	1	foot
					_____	cm	=	1	foot
1	mile	=	_____	mm	_____	m	=	1	foot
1	mile	=	_____	cm	_____	µm	=	1	yard
1	mile	=	_____	m	_____	mm	=	1	yard
1	mile	=	1.609344	km	_____	m	=	1	yard

6) Find the equivalent length. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

3	inches	=	76.2	mm	$2.1336\times10^{+9}$	nm	=	7	feet
4	inches		_____	cm	_____	cm	=	9	feet
51	inches	=	_____	km	_____	µm	=	12	feet
24	inches	=	_____	cm	_____	mm	=	5.5	feet
47	inches	=	_____	m	_____	m	=	101	yards
600	inches	=	_____	km	_____	m	=	0.2	miles

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II. Areas

Areas are obtained by *multiplying two lengths*. Therefore the units of area are commonly the **square** of a unit of length — although some special names are also defined.

7) Complete the following set of conversion factors, relative to the square metre. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

					SI prefix				
1	**pm²**	**=**	**10^{-24}**	**m²**	**–**	_____	**pm²**	**=**	**1 m²**
1	**nm²**	**=**	_____	**m²**	**–**	**10^{+18}**	**nm²**	**=**	**1 m²**
1	**µm²**	**=**	_____	**m²**	**–**	_____	**µm²**	**=**	**1 m²**
1	**mm²**	**=**	_____	**m²**	**–**	_____	**mm²**	**=**	**1 m²**
1	cm²	=	_____	m²	–	_____	cm²	=	1 m²
1	**m²**	**=**	**1**	**m²**	**–**	_____	**m²**	**=**	**1 m²**
1	a	=	100	m²	–	0.01	a	=	1 m²
1	ha	=	10^4	m²	hecto	_____	ha	=	1 m²
1	**km²**	**=**	_____	**m²**	**–**	_____	**km²**	**=**	**1 m²**

For units of area based on squaring a unit of distance, the conversion factors for distance are simply squared.

For example:

10 mm = 1 cm

$(10\text{ mm})^2 = (1\text{ cm})^2$

$10^2\text{ mm}^2 = 1^2\text{ cm}^2$

$100\text{ mm}^2 = 1\text{ cm}^2$

Note that the SI prefix has priority over any mathematical operations. Thus, "cm²" means "the square of a centimetre"; it does not mean "a one-hundredth of a square metre".

Notice that for the rows in bold the conversion factors can be written as ten raised to a multiple of six (2×3).

"a" represents the "are", an uncommon unit of area equal to 100 m² — *e.g.* a square of size 10 m × 10 m.

"ha" represents the "hectare" a common unit of area equal to 10000 m² — *e.g.* a square of size 100 m × 100 m (*coincidentally* equivalent to a square of size 1 hm × 1 hm).

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8) Complete the following set of conversion factors. Use index form for any factors smaller than 0.01 or greater than 100; otherwise use decimals.

EXAMPLE: 1 pm^2 = ? ha.

From the preceding exercise you can read conversion factors of 10^{-24} m^2/pm^2 , and 10^{-4} ha/m^2 . Thus, 1 pm^2 = (1 × 10^{-24}) m^2 = 10^{-24} m^2 = (10^{-24} × 10^{-4}) ha = 10^{-28} ha .

1	pm^2	=	10^{-28}	ha		_____	pm^2	=	1	mm^2
1	nm^2	=	_____	km^2		_____	nm^2	=	1	cm^2
1	μm^2	=	_____	nm^2		_____	μm^2	=	1	ha
1	mm^2	=	_____	μm^2		_____	mm^2	=	1	mm^2
1	cm^2	=	_____	mm^2		_____	cm^2	=	1	ha
1	m^2	=	_____	cm^2		_____	m^2	=	1	mm^2
1	a	=	0.01	ha		10^{+4}	a	=	1	km^2
1	ha	=	_____	mm^2		_____	ha	=	1	nm^2
1	km^2	=	_____	ha		_____	km^2	=	1	μm^2

9) Find the equivalent area. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

5	pm^2	=	_____	ha		_____	pm^2	=	9	nm^2
3	nm^2	=	_____	mm^2		_____	nm^2	=	2	μm^2
9	μm^2	=	_____	ha		_____	μm^2	=	8	mm^2
2	mm^2	=	_____	ha		_____	mm^2	=	0.04	cm^2
7	cm^2	=	_____	km^2		_____	cm^2	=	0.4	ha
15	m^2	=	_____	nm^2		_____	m^2	=	77	mm^2
30	a	=	$3.0\times10^{+15}$	μm^2		_____	a	=	30	ha
0.15	ha	=	_____	mm^2		_____	ha	=	500	cm^2
401	km^2	=	_____	cm^2		_____	km^2	=	58	pm^2

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III. Volumes

Volumes are obtained by *multiplying three lengths*. Therefore the units of volume are commonly the **cube** of a unit of length — although several special names are also defined.

a) Based on cubing units of distance

10) Complete the following set of conversion factors, relative to the cubic metre. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

1	**pm³**	**=**	_____	**m³**		**10^{+36}**	**pm³**	**=**	**1 m³**
1	**nm³**	**=**	_____	**m³**		_____	**nm³**	**=**	**1 m³**
1	**µm³**	**=**	_____	**m³**		_____	**µm³**	**=**	**1 m³**
1	**mm³**	**=**	_____	**m³**		_____	**mm³**	**=**	**1 m³**
1	cm³	=	_____	m³		_____	cm³	=	1 m³
1	dm³	=	_____	m³		_____	dm³	=	1 m³
1	**m³**	**=**	_____	**m³**		_____	**m³**	**=**	**1 m³**
1	hm³	=	10^{+6}	m³		_____	hm³	=	1 m³
1	**km³**	**=**	_____	**m³**		_____	**km³**	**=**	**1 m³**

For units of volume based on cubing a unit of distance, the conversion factors for distance are simply cubed.

For example:

10 mm = 1 cm

$(10\text{ mm})^3 = (1\text{ cm})^3$

$10^3\text{ mm}^3 = 1^3\text{ cm}^3$

$1000\text{ mm}^3 = 1\text{ cm}^3$

Note that the SI prefix has priority over any mathematical operations. Thus, "cm^3" means "the cube of a centimetre"; it does not mean "a one-hundredth of a cubic metre".

Notice that for the rows in bold the conversion factors can be written as ten raised to a multiple of nine (3×3).

"hm" represents the "hectometre" an uncommon unit of length (equal to 100 m) that is seldom used in relation to volumes.

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11) Complete the following set of conversion factors. Use index form for any factors smaller than 0.01 or greater than 100; otherwise use decimals.

1	pm^3	=	_____	dm^3		10^{+27}	pm^3	=	1 mm^3
1	nm^3	=	_____	km^3		_____	nm^3	=	1 cm^3
1	μm^3	=	_____	nm^3		_____	μm^3	=	1 dm^3
1	mm^3	=	_____	μm^3		_____	mm^3	=	1 mm^3
1	cm^3	=	_____	mm^3		_____	cm^3	=	1 dm^3
1	dm^3	=	_____	cm^3		_____	dm^3	=	1 mm^3
1	m^3	=	_____	dm^3		_____	m^3	=	1 km^3
1	hm^3	=	10^{+15}	mm^3		_____	hm^3	=	1 nm^3
1	km^3	=	_____	dm^3		_____	km^3	=	1 μm^3

12) Find the equivalent volume. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

2	pm^3	=	_____	dm^3		_____	pm^3	=	3 nm^3
8	nm^3	=	_____	mm^3		_____	nm^3	=	5 μm^3
9	μm^3	=	_____	dm^3		_____	μm^3	=	10 mm^3
51	mm^3	=	_____	dm^3		_____	mm^3	=	100 cm^3
82	cm^3	=	_____	km^3		_____	cm^3	=	0.2 dm^3
110	dm^3	=	_____	nm^3		_____	dm^3	=	12 mm^3
567	m^3	=	_____	μm^3		_____	m^3	=	60 dm^3
0.66	hm^3	=	_____	mm^3		7.07×10^{-10}	hm^3	=	707 cm^3
66	km^3	=	_____	cm^3		_____	km^3	=	0.01 pm^3

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b) Based on litres

13) Complete the following set of conversion factors, relative to the litre. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

					SI prefix				
1	**pL**	**=**	**10^{-12}**	**L**	**pico**	_____	**pL**	**=**	**1 L**
1	**nL**	**=**	_____	**L**	**nano**	_____	**nL**	**=**	**1 L**
1	**µL**	**=**	_____	**L**	**micro**	_____	**µL**	**=**	**1 L**
1	**mL**	**=**	_____	**L**	**milli**	_____	**mL**	**=**	**1 L**
1	cL	=	0.01	L	centi	_____	cL	=	1 L
1	dL	=	_____	L	deci	10	dL	=	1 L
1	**L**	**=**	_____	**L**	**–**	_____	**L**	**=**	**1 L**
1	hL	=	100	L	hecto	_____	hL	=	1 L
1	**kL**	**=**	_____	**L**	**kilo**	_____	**kL**	**=**	**1 L**
1	**ML**	**=**	_____	**L**	**mega**	_____	**ML**	**=**	**1 L**
1	**GL**	**=**	_____	**L**	**giga**	**10^{-9}**	**GL**	**=**	**1 L**

Notice that for the rows in bold the conversion factors can be written as ten raised to a multiple of three.

The units not listed in bold are less commonly used.

14) Complete the following set of conversion factors. Use index form for any factors smaller than 0.01 or greater than 100; otherwise use decimals.

1	pL	=	10^{-9}	mL	_____	pL	=	1	µL
1	nL	=	_____	kL	_____	nL	=	1	mL
1	µL	=	_____	ML	_____	µL	=	1	pL
1	mL	=	_____	kL	_____	mL	=	1	nL
1	cL	=	_____	pL	10	cL	=	1	dL
1	dL	=	10^{+8}	nL	_____	dL	=	1	cL
1	L	=	_____	µL	_____	L	=	1	ML
1	hL	=	_____	µL	10^{-5}	hL	=	1	mL
1	kL	=	_____	mL	_____	kL	=	1	GL
1	ML	=	_____	GL	_____	ML	=	1	mL
1	GL	=	_____	ML	_____	GL	=	1	kL

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15) Find the equivalent volume. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

7	pL	=	_____	mL		$2\times10^{+18}$	pL	=	2	ML
6	nL	=	_____	kL		_____	nL	=	5	mL
4	µL	=	_____	mL		_____	µL	=	9	kL
12	mL	=	_____	nL		_____	mL	=	0.1	ML
5.5	cL	=	0.55	dL		_____	cL	=	0.5	mL
36	dL	=	_____	mL		_____	dL	=	654	L
70	L	=	_____	µL		_____	L	=	0.03	nL
1.5	kL	=	_____	GL		_____	kL	=	128	µL
80	ML	=	$8.0\times10^{+4}$	kL		_____	ML	=	50	GL
0.01	GL	=	_____	ML		_____	GL	=	5.8	kL

c) Combination

One litre is equal to one cubic decimetre. Thus, a cube of side length 1 dm (*i.e.* 0.1 m) has a volume of one litre.

Hence, one cubic metre is equivalent to one thousand litres.

16) Complete the following set of conversion factors. Use index form for any factors smaller than 0.01 or greater than 100; otherwise use decimals.

1	pm^3	=	_____	L
1	nm^3	=	_____	L
1	μm^3	=	_____	L
1	mm^3	=	_____	L
1	cm^3	=	_____	L

1	dm^3	=	1	L
1	m^3	=	10^{+3}	L
1	hm^3	=	_____	L
1	km^3	=	_____	L

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17) Complete the following set of conversion factors. Use index form for any factors smaller than 0.01 or greater than 100; otherwise use decimals.

EXAMPLE: 1 nm^3 = ? nL.

Conversion factors of 10^{-27} m^3/nm^3 , 10^{+3} L/m^3 , and 10^{+9} nL/L can be applied.

1 nm^3 = (1×10^{-27}) ~~nm^3~~ $\times$ m^3 ~~$/ nm^3$~~ = 10^{-27} m^3
= $(10^{-27} \times 10^{+3})$ ~~m^3~~ $\times$ L ~~$/ m^3$~~ = 10^{-24} L
= $(10^{-24} \times 10^{+9})$ ~~L~~ $\times$ nL ~~$/$ L~~ = 10^{-15} nL .

Notice that when the conversion factors are used in the correct sequence, the units will cancel appropriately in each step.

1	pm^3	=	_____	pL	10^{+42}	pm^3	=	1	GL
1	nm^3	=	10^{-15}	nL	_____	nm^3	=	1	cL
1	μm^3	=	_____	kL	_____	μm^3	=	1	dL
1	mm^3	=	_____	µL	_____	mm^3	=	1	mL
1	cm^3	=	_____	mL	_____	cm^3	=	1	dL
1	dm^3	=	_____	ML	_____	dm^3	=	1	mL
1	hm^3	=	10^{+12}	mL	_____	m^3	=	1	kL
1	km^3	=	_____	dL	_____	hm^3	=	1	nL

18) Find the equivalent volume. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

EXAMPLE: 80 hm^3 = ? ML.

Conversion factors of 10^{+6} m^3/hm^3 , 10^{+3} L/m^3 , and 10^{-6} ML/L apply.

1 nm^3 = $(80 \times 10^{+6})$ ~~hm^3~~ $\times$ m^3 ~~$/ hm^3$~~ = $8 \times 10^{+7}$ m^3
= $(8 \times 10^{+7} \times 10^{+3})$ ~~m^3~~ $\times$ L ~~$/ m^3$~~ = $8 \times 10^{+10}$ L
= $(8 \times 10^{+10} \times 10^{-6})$ ~~L~~ $\times$ ML ~~$/$ L~~ = $8 \times 10^{+4}$ ML .

Notice that when the conversion factors are used in the correct sequence, the units will cancel appropriately in each step.

32	pm^3	=	_____	pL	_____	dm^3	=	33	ML
654	nm^3	=	_____	nL	_____	mm^3	=	10	mL
92	μm^3	=	_____	µL	_____	dm^3	=	8	kL
1.2	mm^3	=	_____	mL	_____	dm^3	=	98	ML
5.51	cm^3	=	0.551	cL	_____	km^3	=	18	mL
3	dm^3	=	_____	dL	_____	nm^3	=	2.2	L
700	m^3	=	_____	L	_____	μm^3	=	0.01	nL
1.05	m^3	=	_____	hL	_____	mm^3	=	0.05	µL
25	m^3	=	_____	kL	_____	nm^3	=	72	µL
80	hm^3	=	$8.0 \times 10^{+4}$	ML	_____	μm^3	=	65	GL
9.01	km^3	=	_____	GL	_____	mm^3	=	11.1	kL

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IV. Time

19) Complete the following set of conversion factors. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

1	microsecond	=	1000	nanoseconds	_____	ns	=	1	s
1	millisecond	=	1000	microseconds	_____	µs	=	1	d
1	second	=	1000	milliseconds	$3.6\times10^{+6}$	ms	=	1	h
1	minute	=	60	seconds	_____	s	=	1	d
1	hour	=	60	minutes	_____	min	=	1	d
1	day	=	24	hours	_____	h	=	1	week
1	week	=	7	days	_____	ns	=	1	ms
1	fortnight	=	14	days	_____	µs	=	1	h
1	month	~	30.4	days	_____	ms	=	1	ns
1	month	~	4	weeks	_____	s	=	1	week
1	“year”	=	12	months	_____	min	=	1	fortnight
1	“year”	~	365	days	_____	h	=	1	week
1	solar year	≈	365.2422	days	_____	µs	=	1	min
1	sidereal year	≈	365.2564	days	1×10^{-3}	ms	=	1	µs

The length of a “month” and a “year” varies. For maximum precision and to avoid ambiguity it is safer to avoid working in such units unless either (i) the situation demands it, (ii) a clear basis is stated, or (iii) only approximate, indicative values are needed.

20) Find the equivalent time. Use scientific notation for any values smaller than 0.01 or greater than 100; otherwise use decimals.

5	ms	=	$5\times10^{+6}$	ns	_____	ns	=	7	h
8	min		_____	µs	_____	µs	=	9	min
58	min	=	_____	ms	_____	ms	=	12	s
0.1	ns	=	_____	s	_____	s	=	52	min
47	weeks	=	_____	min	_____	min	=	101	h
47	weeks	=	_____	h	_____	h	=	0.01	d
600	fortnights	=	_____	d	_____	d	=	0.2	weeks

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V. Speed

Speed characterises distance travelled for a given duration.

21) Complete the following table.
For each pair of adjacent rows, write down the relevant length conversion factor.
For each pair of adjacent columns, write down the relevant time conversion factor.

Length unit	Time unit: ns	µs	ms	s	min	h	d	Factor:
pm		$5.0\times10^{+9}$	$5.0\times10^{+12}$					
nm								
µm		$5.0\times10^{+3}$						
mm	5.0×10^{-3}	5.0	$5.0\times10^{+3}$	$5.0\times10^{+6}$			$4.32\times10^{+11}$	× 0.1
cm		0.5		$5.0\times10^{+5}$				
dm		0.05						
m		5.0×10^{-3}						
hm						$1.8\times10^{+5}$		
km		5.0×10^{-6}						
Factor:		$\times10^{+3}$						

Explanation:

Start with 5.0 mm/µs (highlighted). To find the equivalent speed in cm/s use the relevant length and time conversion factors, namely 0.1 cm/mm and 10^{+6} µs/s .

Writing the units in index form shows which numerical factor to use for consistency:

$5.0\ \text{mm}\ \mu\text{s}^{-1} = 5.0\ \text{mm}\ \mu\text{s}^{-1} \times 0.1\ \text{cm}\ \text{mm}^{-1} \times 10^{+6}\ \mu\text{s}\ \text{s}^{-1}$

$5.0\ \text{mm}\ \mu\text{s}^{-1} = 5.0 \times 0.1\ \text{cm} \times 10^{+6}\ \text{s}^{-1}$

$5.0\ \text{mm}\ \mu\text{s}^{-1} = 5.0 \times 0.1 \times 10^{+6}\ \text{cm}\ \text{s}^{-1}$

$5.0\ \text{mm}\ \mu\text{s}^{-1} = 5.0 \times 10^{+5}\ \text{cm}\ \text{s}^{-1}$

Notice that mm cancels with mm^{-1}, while μs^{-1} cancels with µs .

The conversion would be inconsistent (and hence unsuccessful) if multiplication by 10 mm/cm or 10^{-6} s/µs were attempted here.

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VI. Concentration

Concentration can be expressed in various ways, including the mass of solute (*e.g.* salt) per volume of solution (*e.g.* seawater).

22) Complete the following table.
For each pair of adjacent rows, write down the relevant mass conversion factor.
For each pair of adjacent columns, write down the relevant volume conversion factor.

Mass unit \ Volume unit	µm³	mm³	µL	mL	L	m³	GL	Factor:
pg								
ng								
µg								
mg	8.7×10^{-10}	0.87		870				× 0.1
cg		0.087		87				
g								
kg		8.7×10^{-7}						
Mg								
Gg								
Factor:	$\times10^{+9}$							

For large masses the tonne (t), kilotonne (kt) and megatonne (Mt) are more commonly employed than the megagram (Mg), gigagram (Gg) and teragram (Tg).

Explanation:
Start with 0.87 mg/mm³ (highlighted). To find the equivalent concentration in cg/mL use the relevant mass and volume conversion factors, namely 0.1 cg/mg and 10^{+3} mm³/mL.
Writing the units in index form shows which numerical factor to use for consistency:

$0.87\ \text{mg mm}^{-3} = 0.87\ \text{mg mm}^{-3} \times 0.1\ \text{cg mg}^{-1} \times 10^{+3}\ \text{mm}^{3}\ \text{mL}^{-1}$
$0.87\ \text{mg mm}^{-3} = 0.87 \times 0.1\ \text{cg} \times 10^{+3}\ \text{mL}^{-1}$
$0.87\ \text{mg mm}^{-3} = 0.87 \times 0.1 \times 10^{+3}\ \text{cg mL}^{-1}$
$0.87\ \text{mg mm}^{-3} = 87\ \text{cg mL}^{-1}$

Notice that mg cancels with mg^{-1}, while mm^{-3} cancels with mm^{3}.

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VII. Additional prefixes

The following SI prefixes are also defined.

Prefix	Symbol	Factor	Example:		
yocto	y	10^{-24}	10^{-24} g	=	1 yg
zepto	z	10^{-21}	10^{-21} g	=	1 zg
atto	a	10^{-18}	10^{-18} g	=	1 ag
femto	f	10^{-15}	10^{-15} g	=	1 fg
…				=	
deca	da	10^{+1}	10^{+1} m	=	1 dam
…				=	
tera	T	10^{+12}	10^{+12} J	=	1 TJ
peta	P	10^{+15}	10^{+15} J	=	1 PJ
exa	E	10^{+18}	10^{+18} J	=	1 GJ
zetta	Z	10^{+21}	10^{+21} g	=	1 Zg
yotta	Y	10^{+24}	10^{+24} g	=	1 Yg

Notice that most factors have an index that is a multiple of three.

Take care to distinguish “deca” (da) from “deci” (d).

Notice the distinction here between uppercase prefix symbols for the largest quantities and lowercase prefix symbols for the smallest quantities.

“J” represents joules (a unit of energy).

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