CHEM001 NOTESHEET : CHAPTERS 2 & 3

by Remi Leano | Fall 2019
ocf.berkeley.edu/~rleano

UNIT CONVERSION

VOLUME (m^3) = LENGTH × WIDTH × HEIGHT
SURFACE AREA (m^2) = LENGTH × WIDTH

DENSITY = MASS / VOLUME

$$5.83\ \text{CM} \times \frac{1\ \text{METER}}{100\ \text{CM}} = 0.583 \times 10^{-1}\ \text{METER}$$

(1 METER: UNITS YOU WANT IN NUMERATOR; 100 CM: UNITS YOU HAVE IN DENOMINATOR)

SIG FIGS, PRECISION, & EXPONENTTAL NOTATION

101.0156 — 100s, 10s, UNITY, 10THS, 100THS, 1000THS, 10,000THS

VALUE	# OF SF'S	PRECISION	EXP. NOTATION
1.	1	UNITY	1×10^0
0.001	1	THOUSANDTHS	1×10^{-3}
1000	1	THOUSANDS	1×10^3
1000.	4	UNITY	1.000×10^3
1.00	3	HUNDREDTHS	1.00×10^0
1000.0	5	TENTHS	1.0000×10^3
100001.	6	UNITY	1.00001×10^5

$0.001 \longrightarrow 1 \times 10^{-3}$ RIGHT → NEGATIVE

$1000. \longrightarrow 1 \times 10^{+3}$ LEFT → POSITIVE

ONLY MEASUREMENTS HAVE SIG FIGS! CONVERSION FACTORS ARE EXACT NUMBERS

TIP: IT IS EASIER TO GET SIG FIGS RIGHT WHEN EXPONENTIAL NOTATION IS USED.

BONDING

CATION = POSITIVELY CHARGED (+)
ANION = NEGATIVELY CHARGED (−)

COVALENT BOND = NONMETAL + NONMETAL
IONIC BOND = NONMETAL + METAL

TABLE 3.5 | The Periodic Table

1 1A	2 2A	3	4	5	6	7	8	9	10	11	12	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac†	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo

Metals, Metalloids, Nonmetals

*	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
†	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

ADDITION & SUBTRACTION (PRECISION)

GIVE YOUR ANSWER TO THE DECIMAL PLACE OF THE LEAST PRECISE #.

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 125.17  (HUNDREDTHS)
+ 129    (UNITY)
   52.2  (TENTHS)
  306.37 → 306
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  12 5.17  (HUNDREDTHS)
+ 12 0     (TENS)
   5 2.2   (TENTHS)
  29 7.37 → 3.0 × 10^2
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MULTIPLICATION & DIVISION (SIGNIFICANT FIGURES)

GIVE YOUR ANSWER TO THE SAME # OF SIG FIGS AS THE MEASUREMENT WITH THE LEAST.

TEMPERATURE PRECISION EXAMPLES:

273.15 + ___ °C = ___ KELVIN

°C = (°F − 32) / 1.8

°F = (1.8 × °C) + 32

25°C + 273.15 = **298 K**

100°C + 273.15 = 373.15 K → **400 K**

100.1116°C + 273.15 = **373.2616 K**

100.°C + 273.15 = 373.15 K → **373 K**

Common mass relationships:
1 g = 1000 mg
1 kg = 1000 g
1 kg = 2.205 lb
1 lb = 453.6 g

Common length relationships:
1 m = 10^6 µm = 10^{10} Å
= 100 cm = 1000 mm
1 cm = 10 mm = 0.01 m
1 in. = 2.54 cm
1 mile = 1.609 km

TABLE 2.5 | Metric Units of Mass

Unit	Abbreviation	Gram equivalent	Exponential equivalent
kilogram	kg	1000 g	10^3 g
gram	g	1 g	10^0 g
decigram	dg	0.1 g	10^{-1} g
centigram	cg	0.01 g	10^{-2} g
milligram	mg	0.001 g	10^{-3} g
microgram	µg	0.000001 g	10^{-6} g

TABLE 2.3 | Metric Units of Length

Unit	Abbreviation	Meter equivalent	Exponential equivalent
kilometer	km	1000 m	10^3 m
meter	m	1 m	10^0 m
decimeter	dm	0.1 m	10^{-1} m
centimeter	cm	0.01 m	10^{-2} m
millimeter	mm	0.001 m	10^{-3} m
micrometer	µm	0.000001 m	10^{-6} m
nanometer	nm	0.000000001 m	10^{-9} m
angstrom	Å	0.0000000001 m	10^{-10} m

TABLE 2.1 | Common Prefixes and Numerical Values for SI Units

Prefix	Symbol	Numerical value	Power of 10 equivalent
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
deka	da	10	10^1
—	—	1	10^0
deci	d	0.1	10^{-1}
centi	c	0.01	10^{-2}
milli	m	0.001	10^{-3}
micro	µ	0.000001	10^{-6}
nano	n	0.000000001	10^{-9}
pico	p	0.000000000001	10^{-12}
femto	f	0.000000000000001	10^{-15}

COMMON QUIZ MISTAKES:

-1 WRONG SIG FIGS OR PRECISION
-1 WRONG OR MISSING UNITS