

Cheat Sheet CHE 101/111

Conversions

Length	Mass	Volume	Temperature
1 link = 0.66 ft 1 chain = 100 links = 4 rods 1 ft = 12 inch 1 yd = 3 ft 1 rod = 16.5 ft 1 furlong = 660 ft 1 mile = 5280. Feet = 80 chains 1 meter = 1.0936 yards 1 inch = 2.54 cm (exactly) 1 kilometer = 0.62137 mile 1 mile = 1.609 kilometers 1 angstrom = 10 ⁻¹⁰ meter	1 oz = 16 drams 256 drams = 16 oz 16 oz = 7000 grains 1 pound = 16 oz. 1 ton = 2000 pounds 1 kilogram = 2.205 pounds 1 pound = 453.59 grams 1 amu = 1.6606x10 ⁻²⁷ kg	1 cup = 8 fl oz 1 pint = 2 cup 1 quart = 2 pint 1 gallon = 4 quart 1 gallon = 3.785 liters 1 quart = 0.946 liters 1 Liter = 1.0567 quarts 1 milliliter = 1 cm³	$^{\circ}\text{C} = \frac{(^{\circ}\text{F} - 32)}{1.8}$ $^{\circ}\text{F} = 1.8(^{\circ}\text{C}) + 32$ $\text{K} = ^{\circ}\text{C} + 273.15$
	Pressure 1 Atm = 760 mm Hg = 760 torr = 101,305 Pa = 14.7 PSI or lb/in ² $R = \frac{0.0821 \text{ L} \cdot \text{Atm}}{\text{mol} \cdot \text{K}} = \frac{8.314 \text{ J}}{\text{mol} \cdot \text{K}}$	Pressure Eqn. PV=nRT $\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 V_2}{n_2 T_2}$	Energy 1 cal = 4.184 J 1 eV = 1.602x10 ⁻¹⁹ J $1 \text{ J} = \frac{\text{kg} \cdot \text{m}^2}{\text{s}^2} = \frac{\text{N}}{\text{m}}$ 101 J = 1 L · Atm Energy Equations q=msΔT q=mΔH

Polyatomic Ions		Metric System (meter, Liter, grams)			
Name	Formula	Prefix	Symbol	Numerical Value	10 ^X
Acetate	C ₂ H ₃ O ₂ ⁻	exa	E	1000000000000000000	10 ¹⁸
Ammonium	NH ₄ ⁺	peta	P	1000000000000000	10 ¹⁵
Arsenate	AsO ₄ ³⁻	tera	T	10000000000000	10 ¹²
Bromate	BrO ₃ ⁻	giga	G	1000000000	10 ⁹
Carbonate	CO ₃ ⁻²	mega	M	1000000	10 ⁶
Chlorate	ClO ₃ ⁻	kilo	k	1000	10 ³
Chlorite	ClO ₂ ⁻	hecto	h	100	10 ²
Chromate	CrO ₄ ²⁻	deka	da	10	10 ¹
Cynide	CN ⁻	-	-	1	10 ⁰
Dichromate	Cr ₂ O ₇ ²⁻	deci	d	0.1	10 ⁻¹
Dihydrogen phosphate	H ₂ PO ₄ ⁻	centi	c	0.01	10 ⁻²
Hydrogen carbonate (or bicarbonate)	HCO ₃ ⁻	milli	m	0.001	10 ⁻³
Hydrogen phosphate	HPO ₄ ⁻²	micro	μ	0.000001	10 ⁻⁶
Hydrogen sulfate (or bisulfate)	HSO ₄ ⁻	nano	n	0.000000001	10 ⁻⁹
Hydrogen sulfide	HS ⁻	pico	p	0.000000000001	10 ⁻¹²
Hydrogen sulfite (bisulfite)	HSO ₃ ⁻	femto	f	0.000000000000001	10 ⁻¹⁵
Hydroxide	OH ⁻	atto	a	0.00000000000000001	10 ⁻¹⁸
Hypochlorite	ClO ⁻				
Hypoiodite	IO ⁻				
Iodate	IO ₃ ⁻				
Iodite	IO ₂ ⁻				
Nitrate	NO ₃ ⁻				
Nitrite	NO ₂ ⁻				
Oxalate	C ₂ O ₄ ²⁻				
Perchlorate	ClO ₄ ⁻				
Permanganate	MnO ₄ ⁻				
Phosphate	PO ₄ ⁻³				
Phosphite	PO ₃ ⁻³				
Sulfate	SO ₄ ⁻²				
Sulfite	SO ₃ ⁻²				
Thiocyanate	SCN ⁻				
Thiosulfate	S ₂ O ₃ ²⁻				

Metric System (meter, Liter, grams)			
Prefix	Symbol	Numerical Value	10 ^X
exa	E	1000000000000000000	10 ¹⁸
peta	P	1000000000000000	10 ¹⁵
tera	T	10000000000000	10 ¹²
giga	G	1000000000	10 ⁹
mega	M	1000000	10 ⁶
kilo	k	1000	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
atto	a	0.00000000000000001	10 ⁻¹⁸

<u>Fixed Charge</u>	
Group 1A Cations (+1): H, Li, Na, K, Rb, Cs	
Group 2A Cations (+2): Be, Mg, Ca, Sr, Ba	
Group 7A Anions (-1): F, Cl, Br, I	
Group 6A Anions (-2): O, S, Se	
Group 5A Anions (-3): N, P	
Misc: Ag ⁺ , Al ⁺³ , Cd ⁺² , Ni ⁺² , Sc ⁺³ , Zn ⁺²	

<u>Variable Charge</u>	
As, Au, Co, Cr, Cu, Fe, Hg, Mn, Pb, Sb, Sn, Ti, V	

<u>Activity Series: (highest > lowest)</u>	
K, Ca, Na, Mg, Al, Zn, Fe, Ni, Sn, Pb, H, Cu, Ag, Hg, Au	
F ₂ , Cl ₂ , Br ₂ , I ₂	

Density			
Liquids and Solids		Gasses	
Substance	Density (g/mL)	Substance	Density (g/L)
Wood (Douglas Fir)	0.512	Helium	0.178
Ethyl Alcohol (Ethanol)	0.789	Methane	0.714
Vegetable Oil	0.91	Ammonia	0.771
Water (4 °C)	1.000	Neon	0.90
Sugar	1.59	Carbon Monoxide	1.25
Glycerin	1.26	Nitrogen	1.251
Karo Syrup	1.37	Air	1.293
Sulfuric Acid	1.84	Oxygen	1.429
Sulfur	2.07	Hydrogen Chloride	1.63
Salt	2.16	Argon	1.78
Aluminum	2.70	Carbon Dioxide	1.963
Silver	10.5	Chlorine	3.17
Lead	11.34		
Mercury	13.55		
Gold	19.3		

Specific Heat	
Substance	Sp. Heat (J/g·°C)
Water (l)	4.184
Ethyl Ether	2.22
Ethyl Alcohol (Ethanol)	2.138
Water (s)	2.059
Ethyl Chloride	1.687
Magnesium	1.020
Aluminum	0.900
Iron	0.473
Zinc	0.390
Copper	0.385
Brass	0.380
Silver	0.237
Tin	0.222
Gold	0.131
Lead	0.128

Colligative Properties				
Substance	Freezing Point (°C)	K_f (°C · kg solvent / mol solute)	Boiling Point (°C)	K_b (°C · kg solvent / mol solute)
Water	0.00	1.86	100.0	0.512
Acetic Acid	16.6	3.90	118.5	3.07
Benzene	5.5	5.1	80.1	2.53
Camphor	178	40.	208.2	5.95

pH Scale	
$\text{pH} = -\log[\text{H}^+]$	$[\text{H}^+] = 10^{-\text{pH}}$
$\text{pOH} = -\log[\text{OH}^-]$	$[\text{OH}^-] = 10^{-\text{pOH}}$
$\text{pH} + \text{pOH} = 14$	$[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$
Colligative Properties	
$\Delta T_f = mK_f$	
$\Delta T_b = mK_b$	

Physical Properties				
Substance	Boiling Point (°C)	Heat of Vaporization ΔH_{vap} - (J/g)	Melting Point (°C)	Heat of Fusion ΔH_{fus} - (J/g)
Ethyl Chloride	12.3	387	-139	69.0
Ethyl Ether	34.6	351	-116	97.0
Ethanol	78.4	885	-112	104
Water (H ₂ O)	100.0	2259	0	335
H ₂ S	-60.3	548	-85.5	69.9
H ₂ Se	-41.3	238	-65.7	31
H ₂ Te	-2	179	-49	-

Solubility of Salts (g Salt/100 g H ₂ O)				
Temp (°C)	KCl	NaCl	KBr	BaCl ₂
0.0	27.6	35.7	53.5	31.6
10.0	31.0	35.8	59.5	33.3
20.0	34.0	36.0	65.2	35.7
30.0	37.0	36.3	70.6	38.2
40.0	40.0	36.6	75.5	40.7
50.0	42.6	37.0	80.2	43.6
60.0	45.5	37.3	85.5	46.6
70.0	48.3	37.8	90.0	49.4
80.0	51.1	38.4	95.0	52.6
90.0	54.0	39.0	99.2	55.7
100.	55.6	39.8	104.0	58.8

