

Cheat Sheet CHE 101/111

Conversions

<p style="text-align: center;">Length</p> <p>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</p> <p>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</p>	<p style="text-align: center;">Mass</p> <p>1 oz = 16 drams 256 drams = 16 oz 16 oz = 7000 grains 1 pound = 16 oz. 1 ton = 2000 pounds</p> <p>1 kilogram = 2.205 pounds 1 pound = 453.59 grams</p> <p>1 amu = 1.6606×10^{-27} kg</p>	<p style="text-align: center;">Volume</p> <p>1 cup = 8 fl oz 1 pint = 2 cup 1 quart = 2 pint 1 gallon = 4 quart</p> <p>1 gallon = 3.785 liters 1 quart = 0.946 liters 1 Liter = 1.0567 quarts</p> <p>1 milliliter = 1 cm^3</p>	<p style="text-align: center;">Temperature</p> $^{\circ}\text{C} = \frac{(^{\circ}\text{F} - 32)}{1.8}$ $^{\circ}\text{F} = 1.8(^{\circ}\text{C}) + 32$ $\text{K} = ^{\circ}\text{C} + 273.15$
<p style="text-align: center;">Pressure</p> $1 \text{ Atm} = 760 \text{ mm Hg} = 760 \text{ torr} = 101,305 \text{ Pa} = 14.7 \text{ lb/in}^2$ $R = \frac{0.0821 \text{ L} \cdot \text{Atm}}{\text{mol} \cdot \text{K}} = \frac{8.314 \text{ J}}{\text{mol} \cdot \text{K}}$			<p style="text-align: center;">Energy</p> <p>1 cal = 4.184 J 1 eV = 1.602×10^{-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</p>

Polyatomic Ions		Metric System (meter, Liter, grams)			
Name	Formula	Prefix	Symbol	Numerical Value	10^x
Acetate	$\text{C}_2\text{H}_3\text{O}_2^-$	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	$\text{Cr}_2\text{O}_7^{2-}$	deci	d	0.1	10^{-1}
Dihydrogen phosphate	H_2PO_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	0.000000000000000001	10^{-18}
Hypochlorite	ClO^-				
Hypoiodite	IO^-				
Iodate	IO_3^-				
Iodite	IO_2^-				
Nitrate	NO_3^-				
Nitrite	NO_2^-				
Oxalate	$\text{C}_2\text{O}_4^{2-}$				
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	$\text{S}_2\text{O}_3^{2-}$				

Fixed Charge	
Group 1A Cations (+1): 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}	

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

Activity Series: (highest > lowest)	
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		Gases	
Substance	Density (g/mL)	Substance	Density (g/L)
Wood (Douglas Fir)	0.512	Hydrogen	0.090
Ethyl Alcohol (Ethanol)	0.789	Helium	0.178
Vegetable Oil	0.91	Methane	0.714
Water (4 °C)	1.000	Ammonia	0.771
Sugar	1.59	Neon	0.90
Glycerin	1.26	Carbon Monoxide	1.25
Karo Syrup	1.37	Nitrogen	1.251
Sulfuric Acid	1.84	Air	1.293
Sulfur	2.07	Oxygen	1.429
Salt	2.16	Hydrogen Chloride	1.63
Aluminum	2.70	Argon	1.78
Silver	10.5	Carbon Dioxide	1.963
Lead	11.34	Chlorine	3.17
Mercury	13.55		
Gold	19.3		

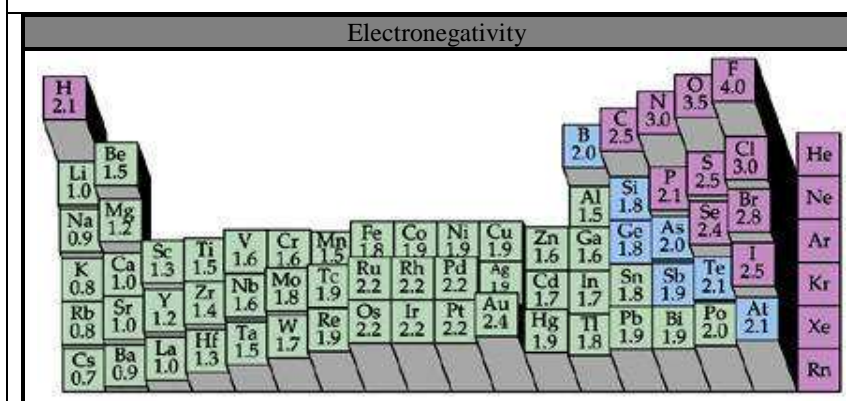
Specific Heat	
Substance	Sp. Heat (J/g·°C)
Water (l)	4.184
Ethyl Ether	2.22
Ethyl Alcohol (Ethanol)	2.138
Water (s)	2.059
Ethyl Chloride	1.687
Magnesium	1.020
Aluminum	0.900
Iron	0.473
Zinc	0.390
Copper	0.385
Brass	0.380
Silver	0.237
Tin	0.222
Gold	0.131
Lead	0.128

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	
pH = -log[H ⁺]	[H ⁺] = 10 ^{-pH}
pOH = -log[OH ⁻]	[OH ⁻] = 10 ^{-pOH}
pH + pOH = 14	[H ⁺][OH ⁻] = 1 × 10 ⁻¹⁴

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	37.6	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



$$pH = -\log[H^+]$$

$$pOH = -\log[OH^-]$$

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$$pOH = -\log[OH^-]$$

$$pH + pOH = 14$$

$$[H^+][OH^-] = 1 \times 10^{-14} M$$

