

Physical Science Reference Tables

STANDARD UNITS

Symbol	Name	Quantity
m	meter	length
kg	kilogram	mass
Pa	pascal	pressure
K	Kelvin	temperature
mol	mole	amount of a substance
J	joule	energy, work, quantity of heat
s	second	time
C	coulomb	electric charge
V	volt	electric potential
A	ampere	current
Ω	ohm	resistance

WAVELENGTHS OF LIGHT IN A VACUUM

Violet	$4.0 - 4.2 \times 10^{-7} \text{ m}$
Blue	$4.2 - 4.9 \times 10^{-7} \text{ m}$
Green	$4.9 - 5.7 \times 10^{-7} \text{ m}$
Yellow	$5.7 - 5.9 \times 10^{-7} \text{ m}$
Orange	$5.9 - 6.5 \times 10^{-7} \text{ m}$
Red	$6.5 - 7.0 \times 10^{-7} \text{ m}$

THE INDEX OF REFRACTION FOR COMMON SUBSTANCES

($\lambda = 5.9 \times 10^{-7} \text{ m}$)

Air	1.00
Alcohol	1.36
Canada Balsam	1.53
Corn Oil	1.47
Diamond	2.42
Glass, Crown	1.52
Glass, Flint	1.61
Glycerol	1.47
Lucite	1.50
Quartz, Fused	1.46
Water	1.33

PHYSICAL CONSTANTS AND CONVERSION FACTORS

Acceleration due to gravity g	9.8 m/s/s or m/s^2
Avogadro's Number N_A	6.02×10^{23} particles per mole
Electron charge e	$1.6 \times 10^{-19} \text{ C}$
Electron rest mass m_e	$9.11 \times 10^{-31} \text{ kg}$
Gravitation constant G	$6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$
Mass-energy relationship	$1 \text{ u (amu)} = 9.3 \times 10^2 \text{ MeV}$
Speed of light in a vacuum c	$3.00 \times 10^8 \text{ m/s}$
Speed of sound at STP	331 m/s
Standard Pressure	1 atmosphere 101.3 kPa 760 Torr or mmHg 14.7 lb/in.^2

HEAT CONSTANTS

	Specific Heat (average) ($\text{kJ/kg}\cdot^\circ\text{C}$) ($\text{J/g}\cdot^\circ\text{C}$)	Melting Point ($^\circ\text{C}$)	Boiling Point ($^\circ\text{C}$)	Heat of Fusion (kJ/kg) (J/g)	Heat of Vaporization (kJ/kg) (J/g)
Alcohol (ethyl)	2.43 (liq.)	-117	79	109	855
Aluminum	0.90 (sol.)	660	2467	396	10500
Ammonia	4.71 (liq.)	-78	-33	332	1370
Copper	0.39 (sol.)	1083	2567	205	4790
Iron	0.45 (sol.)	1535	2750	267	6290
Lead	0.13 (sol.)	328	1740	25	866
Mercury	0.14 (liq.)	-39	357	11	295
Platinum	0.13 (sol.)	1772	3827	101	229
Silver	0.24 (sol.)	962	2212	105	2370
Tungsten	0.13 (sol.)	3410	5660	192	4350
Water (solid)	2.05 (sol.)	0	—	334	—
Water (liquid)	4.18 (liq.)	—	100	—	—
Water (vapor)	2.01 (gas)	—	—	—	2260
Zinc	0.39 (sol.)	420	907	113	1770

FORMULAS

MECHANICS

$$\Delta d = v_i \Delta t + \frac{1}{2} a (\Delta t)^2$$

$$\bar{v} = \frac{\Delta d}{\Delta t} = \frac{v_f + v_i}{2}$$

$$\bar{a} = \frac{v_f - v_i}{\Delta t} = \frac{\Delta v}{\Delta t}$$

$$F = ma$$

$$F_w = mg$$

Δd = displacement
 v = velocity
 t = time
 a = acceleration
 g = acceleration due to gravity
 m = mass
 F = force
 F_w = weight

WORK, POWER, AND ENERGY

$$W = F \Delta d$$

$$PE_g = mgh = F_w h$$

$$KE = \frac{1}{2} mv^2$$

$$P = \frac{W}{t} = \frac{F \Delta d}{t}$$

W = work
 PE_g = gravitational potential energy
 KE = kinetic energy
 h = height
 A = area
 P = power

WAVE MOTION AND LIGHT

$$v_w = f \lambda$$

$$n = \frac{c}{v}$$

v_w = wave velocity
 f = frequency
 n = index of refraction
 c = speed of light in a vacuum
 v = speed of light in a substance
 λ = wavelength

DENSITY

$$D = \frac{m}{V}$$

D = density
 m = mass
 V = volume

ELECTRICITY

$$V = IR$$

$$P = VI$$

V = electrical potential difference
 I = current
 P = power
 R = resistance

Series Circuits

$$I_t = I_1 = I_2 = I_3 = \dots$$

$$V_t = V_1 + V_2 + V_3 + \dots$$

$$R_t = R_1 + R_2 + R_3 + \dots$$

Parallel Circuits

$$I_t = I_1 + I_2 + I_3 + \dots$$

$$V_t = V_1 = V_2 = V_3 = \dots$$

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

INTERNAL ENERGY

$$Q = m C_p \Delta T$$

$$Q = m H_f$$

$$Q = m H_v$$

Q = quantity of heat
 C_p = specific heat
 H_f = heat of fusion
 H_v = heat of vaporization
 T = temperature

GAS LAWS

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$P_1 V_1 = P_2 V_2$$

$$P = \frac{F}{A}$$

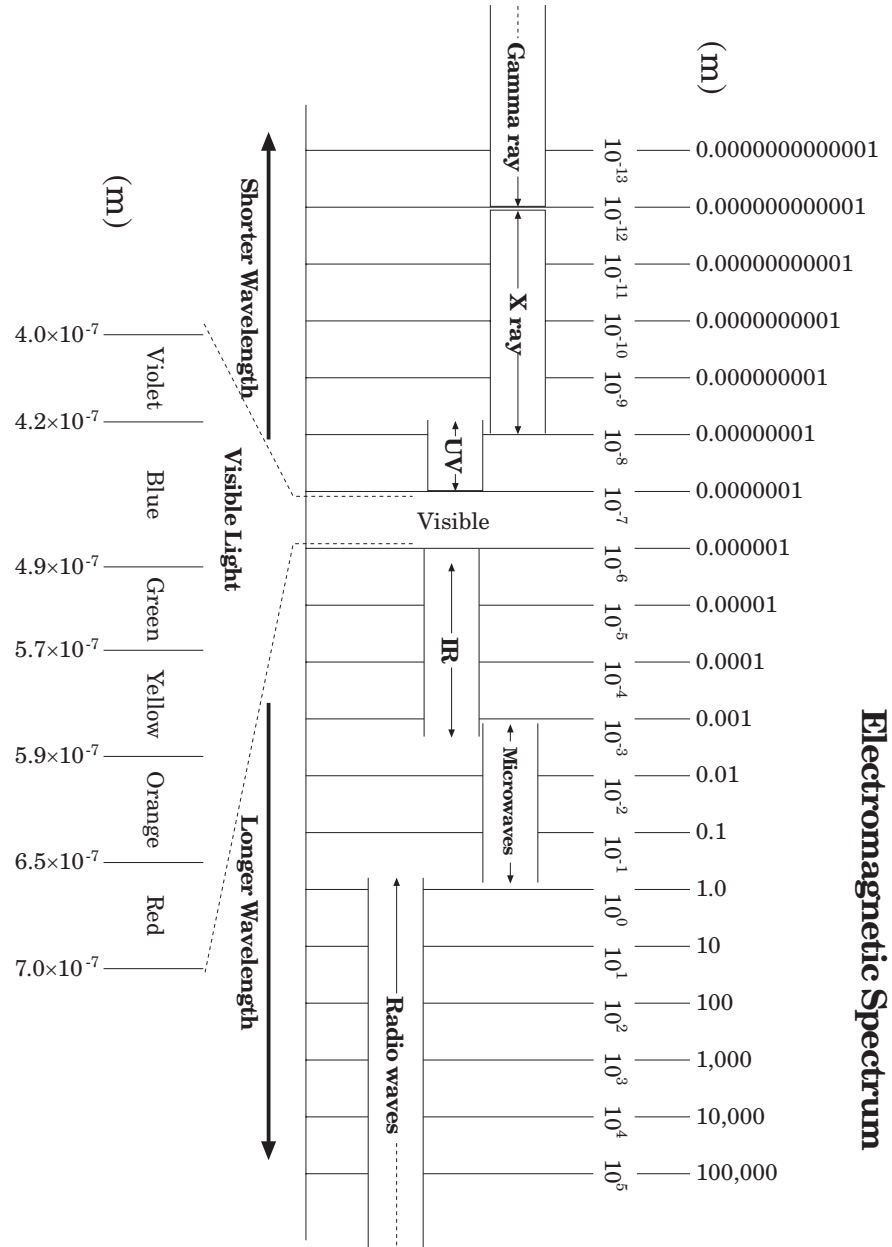
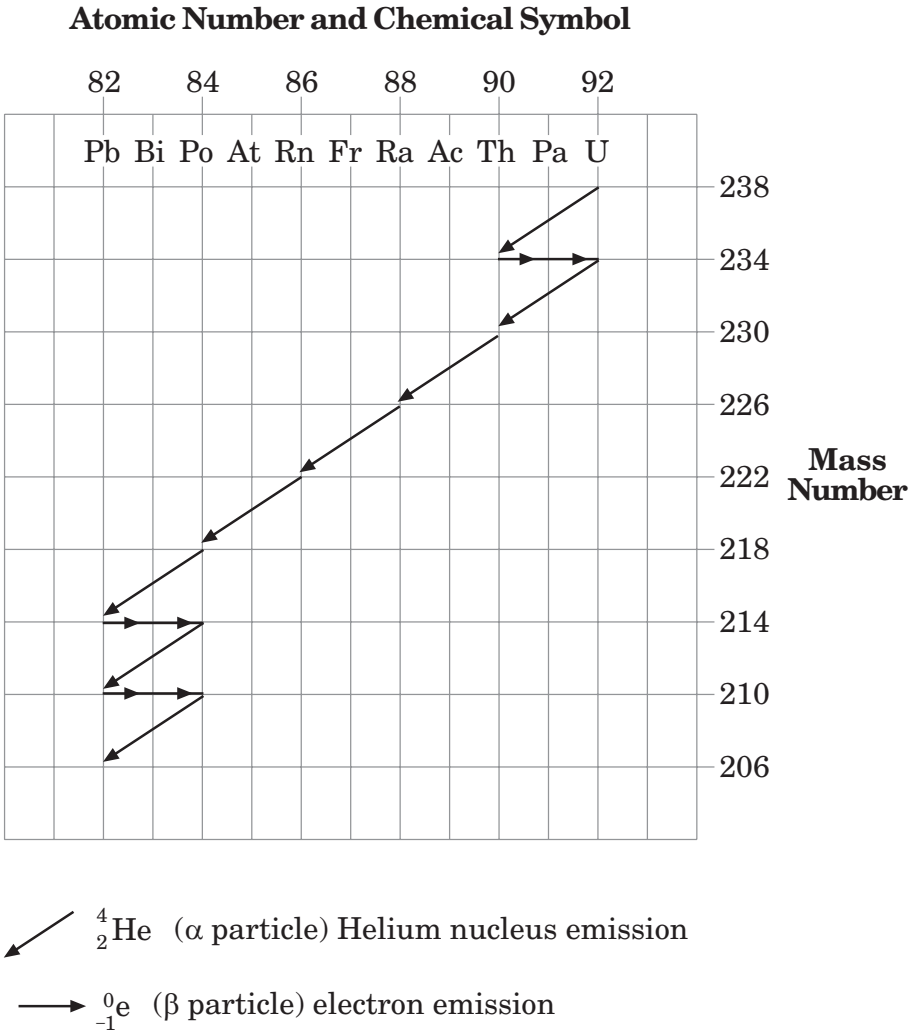
$$K = ^\circ C + 273$$

V = volume
 T = temperature
 K = Kelvin
 P = Pressure
 $^\circ C$ = degrees Celsius

INVESTIGATIONS

$$\% \text{ Error} = \frac{\text{Accepted value} - \text{Experimental value}}{\text{Accepted value}} \times 100$$

URANIUM DISINTEGRATION SERIES



PERIODIC TABLE OF THE ELEMENTS

1 1A																	18 8A
1 H Hydrogen 1.008	2 2A											13 3A	14 4A	15 5A	16 6A	17 7A	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
11 Na Sodium 22.99	12 Mg Magnesium 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.88	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.61	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.1	45 Rh Rhodium 102.9	46 Pd Palladium 106.4	47 Ag Silver 107.9	48 Cd Cadmium 112.4	49 In Indium 114.8	50 Sn Tin 118.7	51 Sb Antimony 121.8	52 Te Tellurium 127.6	53 I Iodine 126.9	54 Xe Xenon 131.3
55 Cs Cesium 132.	56 Ba Barium 137.	57 La Lanthanum 138.	72 Hf Hafnium 178.	73 Ta Tantalum 181.0	74 W Tungsten 183.8	75 Re Rhenium 186.	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.96	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium 226.0	89 Ac Actinium 227.0	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 Uun Ununnilium (269)	111 Uuu Unununium (272)	112 Uub Ununbium (277)						
Stock No. 7951		58 Ce Cerium 140.1	59 Pr Praseodymium 140.9	60 Nd Neodymium 144.2	61 Pm Promethium (145)	62 Sm Samarium 150.4	63 Eu Europium 152.0	64 Gd Gadolinium 157.3	65 Tb Terbium 158.9	66 Dy Dysprosium 162.5	67 Ho Holmium 164.9	68 Er Erbium 167.3	69 Tm Thulium 168.9	70 Yb Ytterbium 173.0	71 Lu Lutetium 175.0		
		90 Th Thorium 232.0	91 Pa Protactinium 231.0	92 U Uranium 238.0	93 Np Neptunium 237.0	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)		