Reference Tables for Physical Science:
Physics
2025 Edition
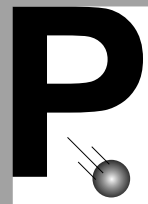
List of Physical Constants

Name	Symbol	Magnitude
Acceleration due to gravity near Earth's surface	g	9.8 m/s^2
Gravitational field strength near Earth's surface	g	9.8 N/kg
Universal gravitational constant	G	$6.67 \times 10^{-11} \text{ N}\bullet\text{m}^2/\text{kg}^2$
Speed of light in a vacuum	c	$3.00 \times 10^8 \text{ m/s}$
Speed of sound in air at STP		$3.31 \times 10^2 \text{ m/s}$
1 electronvolt (eV)		$1.60 \times 10^{-19} \text{ J}$
Electrostatic constant	k	$9.0 \times 10^9 \text{ N}\bullet\text{m}^2/\text{C}^2$
1 elementary charge	e	$1.60 \times 10^{-19} \text{ C}$
Planck's constant	h	$6.63 \times 10^{-34} \text{ J}\bullet\text{s}$

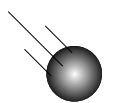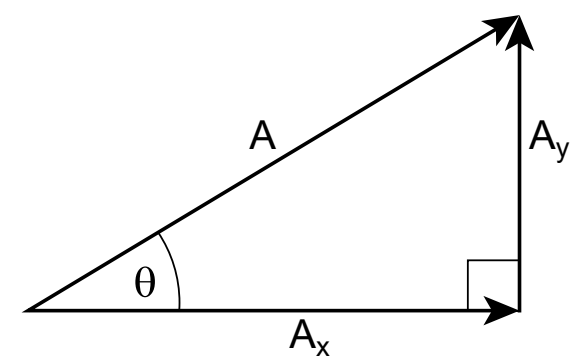| Prefixes for Powers of 10		
Prefix	**Symbol**	**Notation**
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Vectors

$$A^2 = A_x{}^2 + A_y{}^2$$

$$\cos \theta = \frac{A_x}{A}$$

$$\sin \theta = \frac{A_y}{A}$$

$$\tan \theta = \frac{A_y}{A_x}$$

Motion and Forces

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

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

$$v_f = v_i + at$$

$$d = v_i t + \frac{1}{2} at^2$$

$$v_f^2 = v_i^2 + 2ad$$

$$F_{net} = ma$$

$$F_g = mg$$

$$F_{net} t = m\Delta v$$

$$p = mv$$

$$F_g = \frac{Gm_1 m_2}{r^2}$$

$$a_c = \frac{v^2}{r}$$

$$C = 2\pi r$$

a = acceleration

a_c = radial acceleration during circular motion

C = circumference

d = displacement *or* distance

F_g = weight *or* gravitational force

F_{net} = net force

g = acceleration due to gravity *or* gravitational field strength

G = universal gravitational constant

m = mass

p = momentum

r = radius *or* distance between centers

t = time interval

v = velocity *or* speed

$\bar{v}$ = average velocity *or* average speed

v_i = initial velocity *or* initial speed

v_f = final velocity *or* final speed

Δ = change

Energy

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

$$\Delta PE_g = mg\Delta h$$

$$PE_s = \tfrac{1}{2} kx^2$$

$$W = Fd$$

$$W_{net} = \Delta E_T$$

$$E_T = PE + KE + E_{other}$$

$$P = \frac{W}{t} = \frac{Fd}{t} = F\overline{v}$$

$$Q = mc\Delta T$$

$$\% \text{ efficiency} = \frac{\text{output}}{\text{input}} \times 100$$

c = specific heat capacity

d = displacement *or* distance

E_{other} = non-mechanical energy

E_T = total energy

F = force

g = acceleration due to gravity *or* gravitational field strength

h = height

k = spring constant

KE = kinetic energy

m = mass

P = power

PE = potential energy

PE_g = gravitational potential energy

PE_s = spring potential energy

Q = change in thermal energy

T = temperature

t = time interval

v = velocity *or* speed

$\overline{v}$ = average velocity *or* average speed

W = work

W_{net} = net work

x = change in spring length from equilibrum position

Δ = change

Waves and Electromagnetic Radiation

$$v = f\lambda$$

$$T = \frac{1}{f}$$

$$E_{photon} = hf$$

$$\theta_i = \theta_r$$

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

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\frac{n_2}{n_1} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

$$\frac{1}{F} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{h_i}{h_o} = -\frac{d_i}{d_o}$$

c = speed of light in a vacuum

d_i = distance to image

d_o = distance to object

E_{photon} = energy of photon

F = focal length

f = frequency

h = Planck's constant

h_i = image height

h_o = object height

n = absolute index of refraction
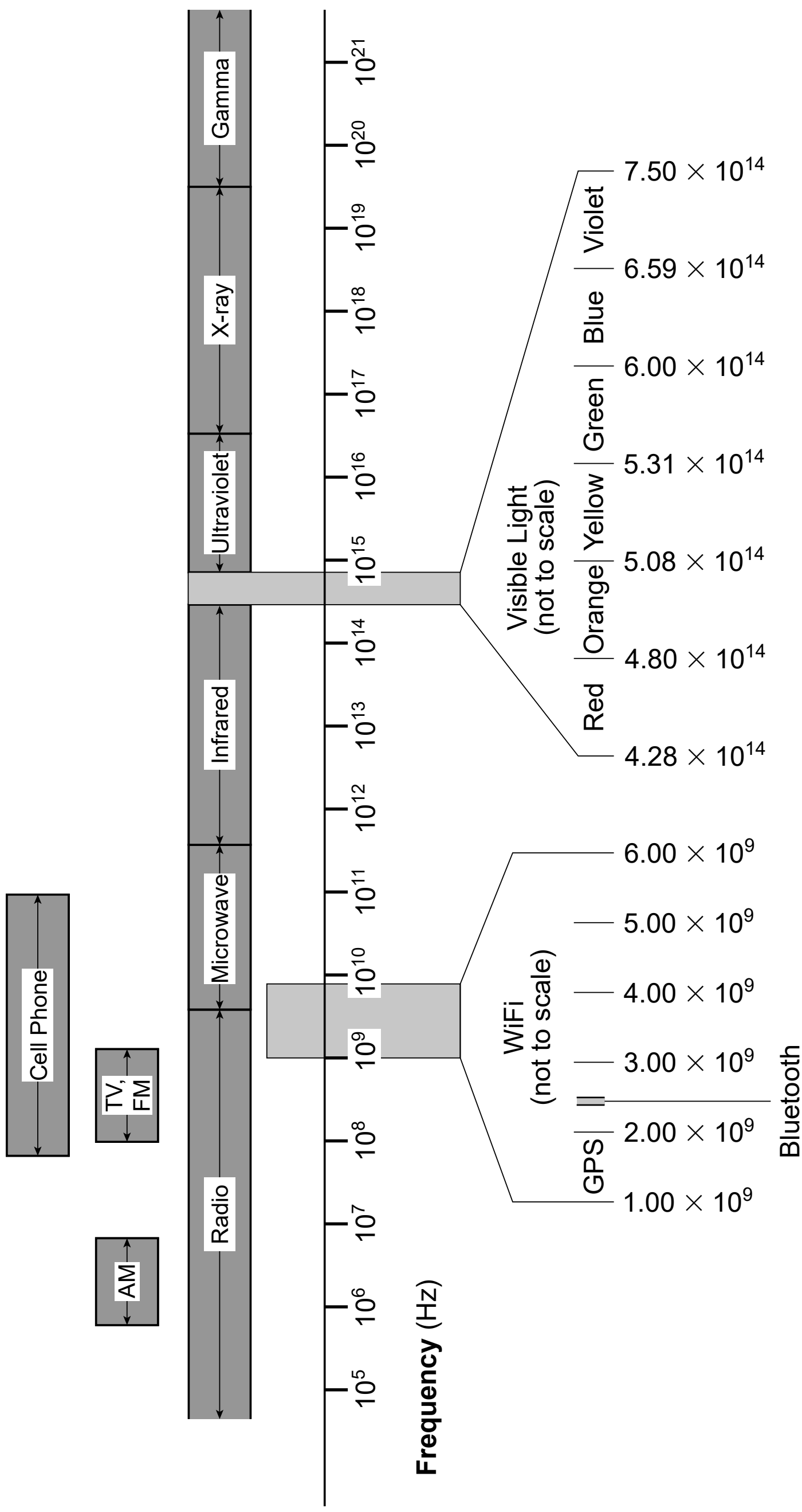
T = period

v = velocity *or* speed

λ = wavelength

θ = angle

θ_i = angle of incidence

θ_r = angle of reflection

The Electromagnetic Spectrum

Spectral boundaries are not discrete, and there is an overlap in the biological effects between adjacent forms of electromagnetic radiation.

Cell Phone

TV, FM

AM

| Gamma | X-ray | Ultraviolet | Infrared | Microwave | Radio |

Frequency (Hz)

10^{21} 10^{20} 10^{19} 10^{18} 10^{17} 10^{16} 10^{15} 10^{14} 10^{13} 10^{12} 10^{11} 10^{10} 10^{9} 10^{8} 10^{7} 10^{6} 10^{5}

Visible Light (not to scale)

| Red | Orange | Yellow | Green | Blue | Violet |

7.50×10^{14}
6.59×10^{14}
6.00×10^{14}
5.31×10^{14}
5.08×10^{14}
4.80×10^{14}
4.28×10^{14}

WiFi (not to scale)

6.00×10^{9}
5.00×10^{9}
4.00×10^{9}
3.00×10^{9}
2.00×10^{9}
1.00×10^{9}

GPS

Bluetooth

Electricity

$$F_e = \frac{kq_1q_2}{r^2}$$

$$F_e = qE$$

$$W = qV$$

$$P = VI = I^2R = \frac{V^2}{R}$$

$$W = Pt = VIt = I^2Rt = \frac{V^2t}{R}$$

$$V = IR$$

$$I = \frac{\Delta q}{t}$$

E = electric field strength

F_e = electrostatic force

I = current

k = electrostatic constant

P = power

q = charge

r = distance between centers

R = resistance

R_{eq} = equivalent resistance

t = time interval

V = potential difference

W = work *or* electrical energy

Δ = change

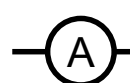| Circuit Symbols	Series Circuits	Parallel Circuits
battery	$I = I_1 = I_2 = I_3 = \ldots$	$I = I_1 + I_2 + I_3 + \ldots$
power supply	$V = V_1 + V_2 + V_3 + \ldots$	$V = V_1 = V_2 = V_3 = \ldots$
switch	$R_{eq} = R_1 + R_2 + R_3 + \ldots$	$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$
voltmeter		
ammeter		
resistor		
variable resistor		
light bulb		