



Physics 30

Learner Assessment Branch

Data Sheets of

Constants

Equations

Periodic Table of the Elements

Alberta
LEARNING

PHYSICS DATA SHEET

CONSTANTS

Gravity, Electricity, and Magnetism

Acceleration Due to Gravity or
Gravitational Field Near Earth..... a_g or $g = 9.81 \text{ m/s}^2$ or 9.81 N/kg

Gravitational Constant..... $G = 6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$

Mass of Earth..... $M_e = 5.98 \times 10^{24} \text{ kg}$

Radius of Earth..... $R_e = 6.37 \times 10^6 \text{ m}$

Coulomb's Law Constant $k = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$

Electron Volt $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$

Elementary Charge $e = 1.60 \times 10^{-19} \text{ C}$

Index of Refraction of Air $n = 1.00$

Speed of Light in Vacuum $c = 3.00 \times 10^8 \text{ m/s}$

Atomic Physics

Energy of an Electron in the 1st
Bohr Orbit of Hydrogen $E_1 = -2.18 \times 10^{-18} \text{ J}$ or -13.6 eV

Planck's Constant $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$ or $4.14 \times 10^{-15} \text{ eV}\cdot\text{s}$

Radius of 1st Bohr Orbit of Hydrogen $r_1 = 5.29 \times 10^{-11} \text{ m}$

Rydberg's Constant for Hydrogen $R_H = 1.10 \times 10^7 \frac{1}{\text{m}}$

Particles

	Rest Mass	Charge
Alpha Particle	$m_\alpha = 6.65 \times 10^{-27} \text{ kg}$	α^{2+}
Electron	$m_e = 9.11 \times 10^{-31} \text{ kg}$	e^-
Neutron.....	$m_n = 1.67 \times 10^{-27} \text{ kg}$	n^0
Proton	$m_p = 1.67 \times 10^{-27} \text{ kg}$	p^+

Trigonometry and Vectors

$$\sin \theta = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

$$\cos \theta = \frac{\textit{adjacent}}{\textit{hypotenuse}}$$

$$\tan \theta = \frac{\textit{opposite}}{\textit{adjacent}}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

For any Vector \vec{R}

$$R = \sqrt{R_x^2 + R_y^2}$$

$$\tan \theta = \frac{R_y}{R_x}$$

$$R_x = R \cos \theta$$

$$R_y = R \sin \theta$$

Graphing Calculator Window Format

$$x: [x_{\min}, x_{\max}, x_{\text{sc}}]$$

$$y: [y_{\min}, y_{\max}, y_{\text{sc}}]$$

Prefixes Used With SI Units

Prefix	Symbol	Exponential Value	Prefix	Symbol	Exponential Value
pico	p	10^{-12}	tera	T	10^{12}
nano	n	10^{-9}	giga	G	10^9
micro	μ	10^{-6}	mega	M	10^6
milli	m	10^{-3}	kilo	k	10^3
centi	c	10^{-2}	hecto	h	10^2
deci	d	10^{-1}	deka	da	10^1

EQUATIONS

Kinematics

$$\vec{v}_{\text{ave}} = \frac{\vec{d}}{t}$$

$$\vec{a} = \frac{\vec{v}_f - \vec{v}_i}{t}$$

$$\vec{d} = \vec{v}_i t + \frac{1}{2} \vec{a} t^2$$

$$v = \frac{2\pi r}{T}$$

$$\vec{d} = \vec{v}_f t - \frac{1}{2} \vec{a} t^2$$

$$\vec{d} = \left(\frac{\vec{v}_f + \vec{v}_i}{2} \right) t$$

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

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

Dynamics

$$\vec{F} = m\vec{a}$$

$$\vec{F}\Delta t = m\Delta\vec{v}$$

$$\vec{F}_g = m\vec{g}$$

$$F_t = \mu F_N$$

$$\vec{F}_s = -k\vec{x}$$

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

$$g = \frac{Gm_1}{r^2}$$

$$F_c = \frac{mv^2}{r}$$

$$F_c = \frac{4\pi^2 mr}{T^2}$$

Momentum and Energy

$$\vec{p} = m\vec{v}$$

$$W = Fd$$

$$W = \Delta E = Fd \cos \theta$$

$$P = \frac{W}{t} = \frac{\Delta E}{t}$$

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

$$E_p = mgh$$

$$E_p = \frac{1}{2} kx^2$$

Waves and Light

$$T = 2\pi \sqrt{\frac{m}{k}}$$

$$T = 2\pi \sqrt{\frac{l}{g}}$$

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

$$v = f\lambda$$

$$\frac{\lambda_1}{2} = l; \frac{\lambda_1}{4} = l$$

$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1}$$

$$\lambda = \frac{xd}{nl}$$

$$\lambda = \frac{d \sin \theta}{n}$$

$$m = \frac{h_i}{h_0} = \frac{-d_i}{d_0}$$

$$\frac{1}{f} = \frac{1}{d_0} + \frac{1}{d_i}$$

Atomic Physics

$$hf = E_{k_{\text{max}}} + W$$

$$W = hf_0$$

$$E_{k_{\text{max}}} = qV_{\text{stop}}$$

$$E = hf = \frac{hc}{\lambda}$$

$$\frac{1}{\lambda} = R_H \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

$$E_n = \frac{1}{n^2} E_1$$

$$r_n = n^2 r_1$$

$$N = N_0 \left(\frac{1}{2} \right)^n$$

Quantum Mechanics and Nuclear Physics

$$E = mc^2$$

$$p = \frac{h}{\lambda}$$

$$p = \frac{hf}{c}; E = pc$$

Electricity and Magnetism

$$F_e = \frac{kq_1 q_2}{r^2}$$

$$V = IR$$

$$P = IV$$

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

$$\vec{E} = \frac{\vec{F}_e}{q}$$

$$F_m = IIB_{\perp}$$

$$F_m = qvB_{\perp}$$

$$|\vec{E}| = \frac{V}{d}$$

$$V = \frac{\Delta E}{q}$$

$$V = l v B_{\perp}$$

$$R = R_1 + R_2 + R_3$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{N_p}{N_s} = \frac{V_p}{V_s} = \frac{I_s}{I_p}$$

$$V_{\text{eff}} = 0.707 V_{\text{max}}$$

$$I_{\text{eff}} = 0.707 I_{\text{max}}$$

Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																																																																																					
IA	IIA	IIIB	IVB	VB	VIB	VIIIB	VIII	VIIIB	VIIIB	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA or O																																																																																					
1 1.01 hydrogen	3 Li 6.94 lithium	4 Be 9.01 beryllium	5 B 10.81 boron	6 C 12.01 carbon	7 N 14.01 nitrogen	8 O 16.00 oxygen	9 F 19.00 fluorine	10 Ne 20.18 neon	11 Na 22.99 sodium	12 Mg 24.31 magnesium	13 Al 26.98 aluminum	14 Si 28.09 silicon	15 P 30.97 phosphorus	16 S 32.07 sulfur	17 Cl 35.45 chlorine	18 Ar 39.95 argon	19 K 39.10 potassium	20 Ca 40.08 calcium	21 Sc 44.96 scandium	22 Ti 47.87 titanium	23 V 50.94 vanadium	24 Cr 52.00 chromium	25 Mn 54.94 manganese	26 Fe 55.85 iron	27 Co 58.93 cobalt	28 Ni 58.69 nickel	29 Cu 63.55 copper	30 Zn 65.39 zinc	31 Ga 69.72 gallium	32 Ge 72.64 germanium	33 As 74.92 arsenic	34 Se 78.96 selenium	35 Br 79.90 bromine	36 Kr 83.80 krypton	37 Rb 85.47 rubidium	38 Sr 87.62 strontium	39 Y 88.91 yttrium	40 Zr 91.22 zirconium	41 Nb 92.91 niobium	42 Mo 95.94 molybdenum	43 Tc (98) technetium	44 Ru 101.07 ruthenium	45 Rh 102.91 rhodium	46 Pd 106.42 palladium	47 Ag 107.87 silver	48 Cd 112.41 cadmium	49 In 114.82 indium	50 Sn 118.71 tin	51 Sb 121.75 antimony	52 Te 127.60 tellurium	53 I 126.90 iodine	54 Xe 131.29 xenon	55 Cs 132.91 cesium	56 Ba 137.33 barium	57-71 La 138.91 lanthanum	72 Hf 178.49 hafnium	73 Ta 180.95 tantalum	74 W 183.84 tungsten	75 Re 186.21 rhenium	76 Os 190.23 osmium	77 Ir 192.22 iridium	78 Pt 195.08 platinum	79 Au 196.97 gold	80 Hg 200.59 mercury	81 Tl 204.38 thallium	82 Pb 207.21 lead	83 Bi 208.98 bismuth	84 Po (209) polonium	85 At (210) astatine	86 Rn (222) radon	87 Fr (223) francium	88 Ra (226) radium	89 Ac (227) actinium	90 Th 232.04 thorium	91 Pa 231.04 protactinium	92 U 238.03 uranium	93 Np (237) neptunium	94 Pu (244) plutonium	95 Am (243) americium	96 Cm (247) curium	97 Bk (247) berkelium	98 Cf (251) californium	99 Es (252) einsteinium	100 Fm (257) fermium	101 Md (258) mendelevium	102 No (259) nobelium	103 Lr (262) lawrencium	57 La 138.91 lanthanum	58 Ce 140.12 cerium	59 Pr 140.91 praseodymium	60 Nd 144.24 neodymium	61 Pm (145) promethium	62 Sm 150.36 samarium	63 Eu 151.96 europium	64 Gd 157.25 gadolinium	65 Tb 158.93 terbium	66 Dy 162.50 dysprosium	67 Ho 164.93 holmium	68 Er 167.26 erbium	69 Tm 168.93 thulium	70 Yb 173.04 ytterbium	71 Lu 174.97 lutetium

Key

Atomic number → **3** **Li** ← Symbol

Atomic molar mass → **6.94** ← Name → **lithium**

Based on $^{12}_6\text{C}$

() Indicates mass of the most stable isotope