

Physics

DATA SHEET

Charge on electron, q_e	$-1.602 \times 10^{-19} \text{ C}$
Mass of electron, m_e	$9.109 \times 10^{-31} \text{ kg}$
Mass of neutron, m_n	$1.675 \times 10^{-27} \text{ kg}$
Mass of proton, m_p	$1.673 \times 10^{-27} \text{ kg}$
Speed of sound in air	340 m s^{-1}
Earth's gravitational acceleration, g	9.8 m s^{-2}
Speed of light, c	$3.00 \times 10^8 \text{ m s}^{-1}$
Magnetic force constant, $\left(k \equiv \frac{\mu_0}{2\pi}\right)$	$2.0 \times 10^{-7} \text{ N A}^{-2}$
Universal gravitational constant, G	$6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
Mass of Earth	$6.0 \times 10^{24} \text{ kg}$
Planck constant, h	$6.626 \times 10^{-34} \text{ J s}$
Rydberg constant, R (hydrogen)	$1.097 \times 10^7 \text{ m}^{-1}$
Atomic mass unit, u	$1.661 \times 10^{-27} \text{ kg}$ $931.5 \text{ MeV}/c^2$
1 eV	$1.602 \times 10^{-19} \text{ J}$
Density of water, ρ	$1.00 \times 10^3 \text{ kg m}^{-3}$
Specific heat capacity of water	$4.18 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$

FORMULAE SHEET

$$v = f\lambda$$

$$I \propto \frac{1}{d^2}$$

$$\frac{v_1}{v_2} = \frac{\sin i}{\sin r}$$

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

$$R = \frac{V}{I}$$

$$P = VI$$

$$\text{Energy} = VI t$$

$$v_{\text{av}} = \frac{\Delta r}{\Delta t}$$

$$a_{\text{av}} = \frac{\Delta v}{\Delta t} \text{ therefore } a_{\text{av}} = \frac{v-u}{t}$$

$$\Sigma F = ma$$

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

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

$$W = Fs$$

$$p = mv$$

$$\text{Impulse} = Ft$$

$$E_p = -G \frac{m_1 m_2}{r}$$

$$F = mg$$

$$v_x^2 = u_x^2$$

$$v = u + at$$

$$v_y^2 = u_y^2 + 2a_y \Delta y$$

$$\Delta x = u_x t$$

$$\Delta y = u_y t + \frac{1}{2}a_y t^2$$

$$\frac{r^3}{T^2} = \frac{GM}{4\pi^2}$$

$$F = \frac{Gm_1 m_2}{d^2}$$

$$E = mc^2$$

$$l_v = l_0 \sqrt{1 - \frac{v^2}{c^2}}$$

$$t_v = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$m_v = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

FORMULAE SHEET

$$\frac{F}{l} = k \frac{I_1 I_2}{d}$$

$$d = \frac{1}{p}$$

$$F = BIl \sin \theta$$

$$M = m - 5 \log \left(\frac{d}{10} \right)$$

$$\tau = Fd$$

$$\frac{I_A}{I_B} = 100^{(m_B - m_A)/5}$$

$$\tau = nBIA \cos \theta$$

$$m_1 + m_2 = \frac{4\pi^2 r^3}{GT^2}$$

$$\frac{V_p}{V_s} = \frac{n_p}{n_s}$$

$$F = qvB \sin \theta$$

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

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

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

$$E = hf$$

$$c = f\lambda$$

$$A_0 = \frac{V_{\text{out}}}{V_{\text{in}}}$$

$$Z = \rho v$$

$$\frac{V_{\text{out}}}{V_{\text{in}}} = -\frac{R_f}{R_i}$$

$$\frac{I_r}{I_0} = \frac{[Z_2 - Z_1]^2}{[Z_2 + Z_1]^2}$$

PERIODIC TABLE OF THE ELEMENTS

KEY		Symbol of element		Name of element	
Atomic Number	Atomic Weight	Symbol	Name	Symbol	Name
1 H 1.008 Hydrogen		1 H	Hydrogen	2 He 4.003 Helium	
3 Li 6.941 Lithium	4 Be 9.012 Beryllium	3 Li	Lithium	4 Be	Beryllium
11 Na 22.99 Sodium	12 Mg 24.31 Magnesium	11 Na	Sodium	12 Mg	Magnesium
19 K 39.10 Potassium	20 Ca 40.08 Calcium	19 K	Potassium	20 Ca	Calcium
37 Rb 85.47 Rubidium	38 Sr 87.62 Strontium	37 Rb	Rubidium	38 Sr	Strontium
55 Cs 132.9 Caesium	56 Ba 137.3 Barium	55 Cs	Caesium	56 Ba	Barium
87 Fr [223.0] Francium	88 Ra [226.0] Radium	87 Fr	Francium	88 Ra	Radium
21 Sc 44.96 Scandium	22 Ti 47.87 Titanium	21 Sc	Scandium	22 Ti	Titanium
39 Y 88.91 Yttrium	40 Zr 91.22 Zirconium	39 Y	Yttrium	40 Zr	Zirconium
57-71 Lanthanides	72 Hf 178.5 Hafnium	57-71 Lanthanides	Lanthanides	72 Hf	Hafnium
89-103 Actinides	104 Rf [261.1] Rutherfordium	89-103 Actinides	Actinides	104 Rf	Rutherfordium
23 V 50.94 Vanadium	24 Cr 52.00 Chromium	23 V	Vanadium	24 Cr	Chromium
41 Nb 92.91 Niobium	42 Mo 95.94 Molybdenum	41 Nb	Niobium	42 Mo	Molybdenum
73 Ta 180.9 Tantalum	74 W 183.8 Tungsten	73 Ta	Tantalum	74 W	Tungsten
105 Db [262.1] Dubnium	106 Sg [263.1] Seaborgium	105 Db	Dubnium	106 Sg	Seaborgium
25 Mn 54.94 Manganese	26 Fe 55.85 Iron	25 Mn	Manganese	26 Fe	Iron
43 Tc [98.91] Technetium	44 Ru 101.1 Ruthenium	43 Tc	Technetium	44 Ru	Ruthenium
75 Re 186.2 Rhenium	76 Os 190.2 Osmium	75 Re	Rhenium	76 Os	Osmium
107 Bh [264.1] Bohrium	108 Hs [265.1] Hassium	107 Bh	Bohrium	108 Hs	Hassium
27 Co 58.93 Cobalt	28 Ni 58.69 Nickel	27 Co	Cobalt	28 Ni	Nickel
45 Rh 102.9 Rhodium	46 Pd 106.4 Palladium	45 Rh	Rhodium	46 Pd	Palladium
77 Ir 192.2 Iridium	78 Pt 195.1 Platinum	77 Ir	Iridium	78 Pt	Platinum
109 Mt [268] Meitnerium	110 Uun — Ununium	109 Mt	Meitnerium	110 Uun	Ununium
29 Cu 63.55 Copper	30 Zn 65.39 Zinc	29 Cu	Copper	30 Zn	Zinc
47 Ag 107.9 Silver	48 Cd 112.4 Cadmium	47 Ag	Silver	48 Cd	Cadmium
79 Au 197.0 Gold	80 Hg 200.6 Mercury	79 Au	Gold	80 Hg	Mercury
111 Uuu — Ununium	112 Uub — Ununium	111 Uuu	Ununium	112 Uub	Ununium
5 B 10.81 Boron	6 C 12.01 Carbon	5 B	Boron	6 C	Carbon
13 Al 26.98 Aluminium	14 Si 28.09 Silicon	13 Al	Aluminium	14 Si	Silicon
31 Ga 69.72 Gallium	32 Ge 72.61 Germanium	31 Ga	Gallium	32 Ge	Germanium
49 In 114.8 Indium	50 Sn 118.7 Tin	49 In	Indium	50 Sn	Tin
81 Tl 204.4 Thallium	82 Pb 207.2 Lead	81 Tl	Thallium	82 Pb	Lead
113 Uuq — Ununquadium	114 Uuq — Ununquadium	113 Uuq	Ununquadium	114 Uuq	Ununquadium
7 N 14.01 Nitrogen	8 O 16.00 Oxygen	7 N	Nitrogen	8 O	Oxygen
15 P 30.97 Phosphorus	16 S 32.07 Sulfur	15 P	Phosphorus	16 S	Sulfur
33 As 74.92 Arsenic	34 Se 78.96 Selenium	33 As	Arsenic	34 Se	Selenium
51 Sb 121.8 Antimony	52 Te 127.6 Tellurium	51 Sb	Antimony	52 Te	Tellurium
83 Bi 209.0 Bismuth	84 Po [210.0] Polonium	83 Bi	Bismuth	84 Po	Polonium
115 Uuh — Ununhexium	116 Uuh — Ununhexium	115 Uuh	Ununhexium	116 Uuh	Ununhexium
9 F 19.00 Fluorine	10 Ne 20.18 Neon	9 F	Fluorine	10 Ne	Neon
17 Cl 35.45 Chlorine	18 Ar 39.95 Argon	17 Cl	Chlorine	18 Ar	Argon
35 Br 79.90 Bromine	36 Kr 83.80 Krypton	35 Br	Bromine	36 Kr	Krypton
53 I 126.9 Iodine	54 Xe 131.3 Xenon	53 I	Iodine	54 Xe	Xenon
85 At [210.0] Astatine	86 Rn [222.0] Radon	85 At	Astatine	86 Rn	Radon
117 Uue — Ununseptium	118 Uuo — Ununoctium	117 Uue	Ununseptium	118 Uuo	Ununoctium

Lanthanides

57 La 138.9 Lanthanum	58 Ce 140.1 Cerium	59 Pr 140.9 Praseodymium	60 Nd 144.2 Neodymium	61 Pm [146.9] Promethium	62 Sm 150.4 Samarium	63 Eu 152.0 Europium	64 Gd 157.3 Gadolinium	65 Tb 158.9 Terbium	66 Dy 162.5 Dysprosium	67 Ho 164.9 Holmium	68 Er 167.3 Erbium	69 Tm 168.9 Thulium	70 Yb 173.0 Ytterbium	71 Lu 175.0 Lutetium
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Actinides

89 Ac [227.0] Actinium	90 Th 232.0 Thorium	91 Pa 231.0 Protactinium	92 U 238.0 Uranium	93 Np [237.0] Neptunium	94 Pu [239.1] Plutonium	95 Am [241.1] Americium	96 Cm [244.1] Curium	97 Bk [249.1] Berkelium	98 Cf [252.1] Californium	99 Es [252.1] Einsteinium	100 Fm [257.1] Fermium	101 Md [258.1] Mendelevium	102 No [259.1] Nobelium	103 Lr [262.1] Lawrencium
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Where the atomic weight is not known, the relative atomic mass of the most common radioactive isotope is shown in brackets.
The atomic weights of Np and Tc are given for the isotopes ²³⁷Np and ⁹⁹Tc.