

# USE WITH GRADES 5–11

## Periodic Table of the Elements

1 <b>H</b> 1.008																	2 <b>He</b> 4.003						
3 <b>Li</b> 6.941	4 <b>Be</b> 9.012																	5 <b>B</b> 10.81	6 <b>C</b> 12.011	7 <b>N</b> 14.007	8 <b>O</b> 15.999	9 <b>F</b> 18.998	10 <b>Ne</b> 20.18
11 <b>Na</b> 22.99	12 <b>Mg</b> 24.305																	13 <b>Al</b> 26.982	14 <b>Si</b> 28.086	15 <b>P</b> 30.974	16 <b>S</b> 32.066	17 <b>Cl</b> 35.453	18 <b>Ar</b> 39.948
19 <b>K</b> 39.098	20 <b>Ca</b> 40.078	21 <b>Sc</b> 44.956	22 <b>Ti</b> 47.88	23 <b>V</b> 50.942	24 <b>Cr</b> 51.996	25 <b>Mn</b> 54.938	26 <b>Fe</b> 55.85	27 <b>Co</b> 58.933	28 <b>Ni</b> 58.69	29 <b>Cu</b> 63.546	30 <b>Zn</b> 65.39	31 <b>Ga</b> 69.723	32 <b>Ge</b> 72.61	33 <b>As</b> 74.923	34 <b>Se</b> 78.96	35 <b>Br</b> 79.904	36 <b>Kr</b> 83.8						
37 <b>Rb</b> 85.47	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.906	40 <b>Zr</b> 91.224	41 <b>Nb</b> 92.906	42 <b>Mo</b> 95.94	43 <b>Tc</b> 98.91	44 <b>Ru</b> 101.07	45 <b>Rh</b> 102.91	46 <b>Pd</b> 106.42	47 <b>Ag</b> 107.87	48 <b>Cd</b> 112.41	49 <b>In</b> 114.82	50 <b>Sn</b> 118.71	51 <b>Sb</b> 121.75	52 <b>Te</b> 127.6	53 <b>I</b> 126.9	54 <b>Xe</b> 131.29						
55 <b>Cs</b> 132.91	56 <b>Ba</b> 137.33	57 <b>*La</b> 138.91	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.95	74 <b>W</b> 183.85	75 <b>Re</b> 186.2	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.08	79 <b>Au</b> 196.97	80 <b>Hg</b> 200.59	81 <b>Tl</b> 204.38	82 <b>Pb</b> 207.2	83 <b>Bi</b> 208.98	84 <b>Po</b> 209	85 <b>At</b> 210	86 <b>Rn</b> 222						
87 <b>Fr</b> 223	88 <b>Ra</b> 226.02	89 <b>**Ac</b> 227	104 <b>Rf</b> 261.11	105 <b>Db</b> 262.11	106 <b>Sg</b> 263.12	107 <b>Bh</b> 262.12	108 <b>Hs</b> 265	109 <b>Mt</b> 266	110 <b>Ds</b> 269	111 <b>Rg</b> 272													

\*Lanthanoid Series

58 <b>Ce</b> 140.12	59 <b>Pr</b> 140.91	60 <b>Nd</b> 144.24	61 <b>Pm</b> 145	62 <b>Sm</b> 150.36	63 <b>Eu</b> 151.97	64 <b>Gd</b> 157.25	65 <b>Tb</b> 158.92	66 <b>Dy</b> 162.5	67 <b>Ho</b> 164.93	68 <b>Er</b> 167.26	69 <b>Tm</b> 168.93	70 <b>Yb</b> 173.04	71 <b>Lu</b> 174.97
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\*\*Actinoid Series

90 <b>Th</b> 232.04	91 <b>Pa</b> 231.04	92 <b>U</b> 238.03	93 <b>Np</b> 237.05	94 <b>Pu</b> 244	95 <b>Am</b> 243	96 <b>Cm</b> 247	97 <b>Bk</b> 247	98 <b>Cf</b> 251	99 <b>Es</b> 254	100 <b>Fm</b> 257	101 <b>Md</b> 258	102 <b>No</b> 259	103 <b>Lr</b> 260
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Information for the Periodic Table of the Elements obtained from Royal Society of Chemistry.

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## Science Reference Sheet

### Motion and Forces

$$v_{avg} = \frac{\Delta x}{\Delta t} \quad v = v_0 + at$$

$$x = v_0 t + \frac{1}{2} at^2 \quad v^2 = v_0^2 + 2ax$$

$$\Sigma F = F_{net} = ma \quad a_c = \frac{v^2}{r}$$

$$F_g = G \frac{m_1 m_2}{R^2} \quad F_g = mg$$

$$\text{Mechanical Advantage (MA)} = \frac{\text{load force}}{\text{effort force}}$$

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

$a$  = acceleration

$a_c$  = centripetal acceleration

$F$  = force

$F_g$  = gravitational force or weight

$g$  = gravitational acceleration

$G$  = universal gravitational constant

$m$  = mass

$r$  = radius

$R$  = distance between  $m_1$  and  $m_2$

$t$  = time

$v$  = speed

$v_{avg}$  = average speed

$v_0$  = initial speed

$x$  = distance

### Waves

$$v = f\lambda \quad n = \frac{c}{v}$$

$c$  = the speed of light

$f$  = frequency

$n$  = index of refraction

$v$  = wave speed

$\lambda$  = wavelength

### Conservation of

#### Momentum and Energy

$$W = Fd \cos \theta \quad KE = \frac{1}{2} mv^2$$

$$PE = mgh \quad P = \frac{W}{t}$$

$$p = mv$$

$$\Delta p = m\Delta v = Ft$$

$$m_1 v_1 + m_2 v_2 = m_1 v_1' + m_2 v_2'$$

$d$  = distance

$F$  = force

$g$  = gravitational acceleration

$h$  = height

$KE$  = kinetic energy

$m$  = mass

$P$  = momentum

$P$  = power

$PE$  = potential energy

$t$  = time

$v$  = speed

$W$  = work

$\theta$  = angle

### Heat and Thermodynamics

$$Q = mc\Delta T \quad Q = mL$$

$$W = P\Delta V \quad Q = \Delta U + W$$

$c$  = specific heat capacity

$L$  = latent heat

$m$  = mass

$P$  = pressure

$Q$  = heat

$T$  = temperature

$U$  = internal energy

$V$  = volume

$W$  = work

### Physical Constants

Gravitational acceleration on Earth:

$$g = 9.8 \text{ m/s}^2$$

Universal gravitational constant:

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

Proton mass:

$$m = 1.67 \times 10^{-27} \text{ kg}$$

Electron mass:

$$m = 9.11 \times 10^{-31} \text{ kg}$$

Elementary charge:

$$e = 1.6 \times 10^{-19} \text{ C}$$

Speed of light:

$$c = 3.0 \times 10^8 \text{ m/s}$$

### General

$$d = \frac{m}{v}$$

$d$  = density

$m$  = mass

$v$  = volume