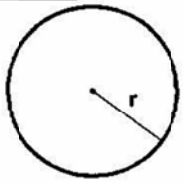
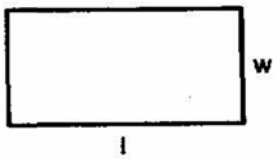
APPENDIX E
Geometry Formula Sheets

Circle



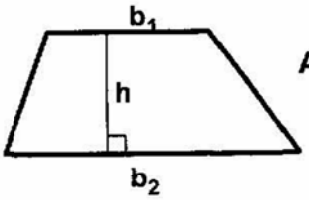
Area $= \pi r^2$
Circumference $= 2\pi r$

Rectangle



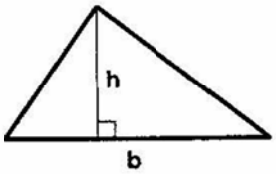
Area $= l \cdot w$
Perimeter $= 2l + 2w$

Trapezoid



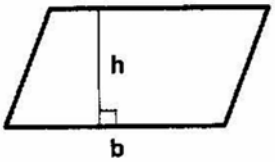
Area $= \frac{1}{2}h(b_1 + b_2)$

Triangle



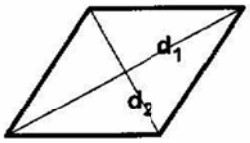
Area $= \frac{1}{2}bh$

Parallelogram



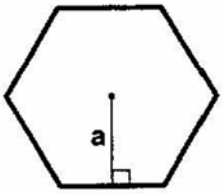
Area $= bh$

Rhombus or Kite



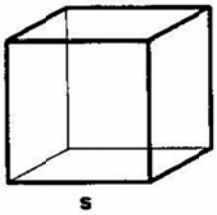
Area $= \frac{1}{2}d_1 \cdot d_2$

Regular Polygon



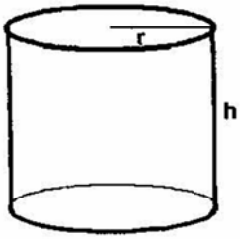
Area $= \frac{1}{2}a \cdot$ perimeter

Cube



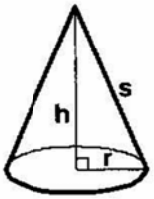
Volume $= s^3$
Surface area $= 6s^2$

Right Circular Cylinder



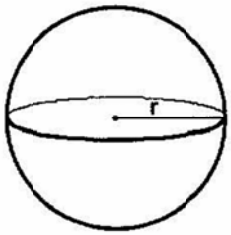
Volume $= \pi r^2 h$
Lateral area $= 2\pi r h$
Surface area $=$
$2\pi r h + 2\pi r^2$

Right Circular Cone



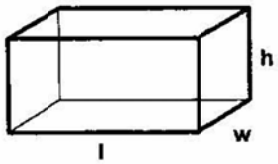
Volume $= \frac{1}{3}\pi r^2 h$
Lateral area $= \pi r s$
Surface area $= \pi r s + \pi r^2$

Sphere



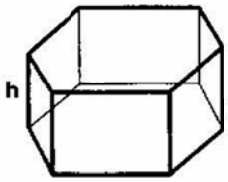
Volume $= \frac{4}{3}\pi r^3$
Surface area $= 4\pi r^2$

Rectangular prism



Volume $= l \cdot w \cdot h$
Lateral area $= 2(l + w) \cdot h$
Surface area $=$
$2wl + 2lh + 2wh$

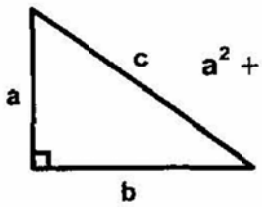
Right prism



Volume $=$ (base area) $\cdot h$
Surface area $=$
base area + face areas
Lateral area = sum of face areas

APPENDIX E
Geometry Formula Sheets Continued

Pythagorean theorem



$$a^2 + b^2 = c^2$$

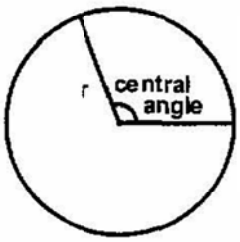
Distance between two points

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint between two points

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Sector of circle



$$\text{Arc length} = \frac{\text{circumference} \cdot \text{central angle}}{360°}$$

$$\text{Sector area} = \frac{\text{total area} \cdot \text{central angle}}{360°}$$

APPENDIX F
Science Formula Sheets

Equation	Variables
$v = \frac{d}{t}$	v = velocity d = displacement t = time interval
$W = F \times d$	W = work F = force d = displacement
$P = \frac{W}{t}$	P = power W = work t = time interval
$a = \frac{\Delta v}{\Delta t}$	a = acceleration Δv = change in velocity Δt = change in time
$F = ma$	F = force m = mass a = acceleration
$PE = mgh$	PE = gravitational potential energy m = mass g = acceleration due to gravity h = height

APPENDIX F
Science Formula Sheets Continued

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

KE = kinetic energy
m = mass
v = velocity

$$v = \lambda f$$

v = wave velocity
λ = wavelength
f = frequency

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

I = current
V = potential
R = resistance

$$p = mv$$

p = momentum
m = mass
v = velocity

APPENDIX G
Physics Formula Sheet

Formulas

Average Speed = $\frac{\Delta d}{\Delta t}$

$F = G\frac{m_1 m_2}{d^2}$

$p = mv$

Average Acceleration = $\frac{\Delta v}{\Delta t}$

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

$V = IR$

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

$W = F\Delta d$

$P = IV$

$v_f = v_i + a\Delta t$

$PE = mg\Delta h$

$Q = mc\Delta T$

$v_f^2 = v_i^2 + 2a\Delta d$

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

$v = f\lambda$ and $\lambda = \frac{c}{f}$

$F = ma$

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

Variables

a=acceleration
c=specific heat
d=distance
Δd=change in distance
f=frequency
ΔT=change in temperature
F=force
I=current
KE=kinetic energy
λ=wavelength
m=mass
P=power
PE=gravitational potential energy
Q=heat
R=resistance
Δt=change in time
v=velocity
Δh=change in height
T=period
Δv=change in velocity
V=voltage
W=work
p=momentum

Subscripts:
i=initial and f=final as subscripts

Definitions

G=universal gravitational constant=$6.67 \times 10^{-11} \frac{N \cdot m^2}{kg^2}$

c=speed of electromagnetic waves = 3.00×10^8 m/s

$g \approx 10\ m/s^2$

$1N = \frac{1kg \cdot m}{s^2}$

$1J = 1N \cdot m$

$1W = \frac{1J}{s}$

APPENDIX H
Periodic Table of the Elements

Periodic Table of the Elements

Atomic number — 28
Symbol — Ni
Name — Nickel
Atomic mass — 58.69

Period	Group 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H Hydrogen 1.00794																	2 He Helium 4.00260
2	3 Li Lithium 6.941	4 Be Beryllium 9.01218											5 B Boron 10.81	6 C Carbon 12.0111	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.998403	10 Ne Neon 20.179
3	11 Na Sodium 22.98977	12 Mg Magnesium 24.305											13 Al Aluminum 26.98154	14 Si Silicon 28.0855	15 P Phosphorus 30.97376	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 38.948
4	19 K Potassium 39.0983	20 Ca Calcium 40.08	21 Sc Scandium 44.9559	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.996	25 Mn Manganese 54.9380	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.69	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.9059	40 Zr Zirconium 91.224	41 Nb Niobium 92.9064	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.75	52 Te Tellurium 127.60	53 I Iodine 126.905	54 Xe Xenon 131.29
6	55 Cs Cesium 132.905	56 Ba Barium 137.33	57–71 Lanthanoids	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium 226.025	89–103 Actinoids	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (277)	109 Mt Meitnerium (268)	110 Ds Darmstadtium (271)	111 Rg Roentgenium (272)							

57 La Lanthanum 139.906	58 Ce Cerium 140.12	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967
89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	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)

Metals Nonmetals