

The background of the cover is a photograph of a sunset or sunrise over a body of water, with a dark silhouette of a wind turbine on the right side. The sky is a gradient of orange and yellow, and the water reflects the light. The wind turbine has three blades and a tall tower.

THIRTEENTH EDITION

# Physical Science

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THIRTEENTH EDITION

# PHYSICALSCIENCE

BILL W. TILLERY

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## PHYSICAL SCIENCE

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1 2 3 4 5 6 7 8 9 LWI 27 26 25 24 23 22

ISBN 978-1-265-13335-1

MHID 1-265-13335-2

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## Conversion Factors

### Length

1 in = 2.54 cm  
 1 cm = 0.394 in  
 1 ft = 30.5 cm  
 1 m = 39.4 in = 3.281 ft  
 1 km = 0.621 mi  
 1 mi = 5,280 ft = 1.609 km  
 1 light-year =  $9.461 \times 10^{15}$  m

### Mass

1 lb = 453.6 g (where  $g = 9.8 \text{ m/s}^2$ )  
 1 kg = 2.205 lb (where  $g = 9.8 \text{ m/s}^2$ )  
 1 atomic mass unit  $u = 1.66061 \times 10^{-27}$  kg

### Volume

1 liter = 1.057 quarts  
 1 in<sup>3</sup> = 16.39 cm<sup>3</sup>  
 1 gallon = 3.786 liter  
 1 ft<sup>3</sup> = 0.02832 m<sup>3</sup>

### Energy

1 cal = 4.184 J  
 1 J = 0.738 ft·lb = 0.239 cal  
 1 ft·lb = 1.356 J  
 1 Btu = 252 cal = 778 ft·lb  
 1 kWh =  $3.60 \times 10^6$  J = 860 kcal  
 1 hp = 550 ft·lb/s = 746 W  
 1 W = 0.738 ft·lb/s  
 1 Btu/h = 0.293 W  
 Absolute zero (OK) =  $-273.15^\circ\text{C}$   
 1 J =  $6.24 \times 10^{18}$  eV  
 1 eV =  $1.6022 \times 10^{-19}$  J

### Speed

1 km/h = 0.2778 m/s = 0.6214 mi/h  
 1 m/s = 3.60 km/h = 2.237 mi/h = 3.281 ft/s  
 1 mi/h = 1.61 km/h = 0.447 m/s = 1.47 ft/s  
 1 ft/s = 0.3048 m/s = 0.6818 mi/h

### Force

1 N = 0.2248 lb  
 1 lb = 4.448 N

### Pressure

1 atm = 1.013 bar =  $1.013 \times 10^5$  N/m<sup>2</sup> = 14.7 lb/in<sup>2</sup>  
 1 lb/in<sup>2</sup> =  $6.90 \times 10^3$  N/m<sup>2</sup>

## Metric Prefixes

Prefix	Symbol	Meaning	Unit Multiplier
exa-	E	quintillion	10 <sup>18</sup>
peta-	P	quadrillion	10 <sup>15</sup>
tera-	T	trillion	10 <sup>12</sup>
giga-	G	billion	10 <sup>9</sup>
mega-	M	million	10 <sup>6</sup>
kilo-	k	thousand	10 <sup>3</sup>
hecto-	h	hundred	10 <sup>2</sup>
deka-	da	ten	10 <sup>1</sup>
<b>unit</b>			
deci-	d	one-tenth	10 <sup>-1</sup>
centi-	c	one-hundredth	10 <sup>-2</sup>
milli-	m	one-thousandth	10 <sup>-3</sup>
micro-	μ	one-millionth	10 <sup>-6</sup>
nano-	n	one-billionth	10 <sup>-9</sup>
pico-	p	one-trillionth	10 <sup>-12</sup>
femto-	f	one-quadrillionth	10 <sup>-15</sup>
atto-	a	one-quintillionth	10 <sup>-18</sup>

## Physical Constants

Quantity	Approximate Value
Gravity (Earth)	$g = 9.8 \text{ m/s}^2$
Gravitational law constant	$G = 6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$
Earth radius (mean)	$6.38 \times 10^6 \text{ m}$
Earth mass	$5.97 \times 10^{24} \text{ kg}$
Earth-Sun distance (mean)	$1.50 \times 10^{11} \text{ m}$
Earth-Moon distance (mean)	$3.84 \times 10^8 \text{ m}$
Fundamental charge	$1.60 \times 10^{-19} \text{ C}$
Coulomb law constant	$k = 9.00 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$
Electron rest mass	$9.11 \times 10^{-31} \text{ kg}$
Proton rest mass	$1.6726 \times 10^{-27} \text{ kg}$
Neutron rest mass	$1.6750 \times 10^{-27} \text{ kg}$
Bohr radius	$5.29 \times 10^{-11} \text{ m}$
Avogadro's number	$6.022045 \times 10^{23}/\text{mol}$
Planck's constant	$6.62 \times 10^{-34} \text{ J}\cdot\text{s}$
Speed of light (vacuum)	$3.00 \times 10^8 \text{ m/s}$
Pi	$\pi = 3.1415926536$

## Greek Letters

Alpha	Α	α	Nu	Ν	ν
Beta	Β	β	Xi	Ξ	ξ
Gamma	Γ	γ	Omicron	Ο	ο
Delta	Δ	δ	Pi	Π	π
Epsilon	Ε	ε	Rho	Ρ	ρ
Zeta	Ζ	ζ	Sigma	Σ	σ
Eta	Η	η	Tau	Τ	τ
Theta	Θ	θ	Upsilon	Υ	υ
Iota	Ι	ι	Phi	Φ	φ
Kappa	Κ	κ	Chi	Χ	χ
Lambda	Λ	λ	Psi	Ψ	ψ
Mu	Μ	μ	Omega	Ω	ω

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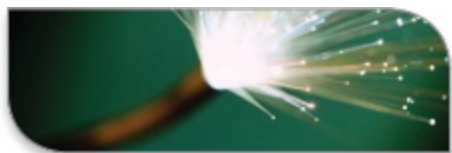


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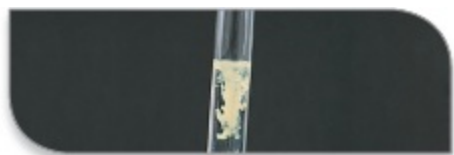
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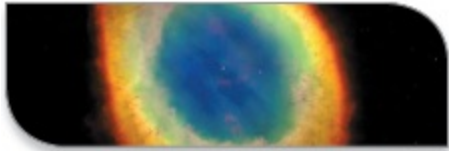
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Source: The Hubble Heritage Team (AURA/STScI/NASA)

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Lissa Harrison

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Doug Sherman/Geofile

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