

# UNITS AND CONVERSION FACTORS

## Standard International (SI) Units

PREFIX	ABBREVIATION	MULTIPLES OF TEN	NUMBER	NAME
zetta	Z	$10^{21}$	1,000,000,000,000,000,000,000	sextillion
exa	E	$10^{18}$	1,000,000,000,000,000,000	quintillion
peta	P	$10^{15}$	1,000,000,000,000,000	quadrillion
tera	T	$10^{12}$	1,000,000,000,000	trillion
giga	G	$10^9$	1,000,000,000	billion
mega	M	$10^6$	1,000,000	million
kilo	k	$10^3$	1,000	thousand
hecto	h	$10^2$	100	hundred
deka	da	$10^1$	10	ten
deci	d	$10^{-1}$	1/10	tenth
centi	c	$10^{-2}$	1/100	hundredth
milli	m	$10^{-3}$	1/1,000	thousandth
micro	$\mu$	$10^{-6}$	1/1,000,000	millionth
nano	n	$10^{-9}$	1/1,000,000,000	billionth
pico	p	$10^{-12}$	1/1,000,000,000,000	trillionth
femto	f	$10^{-15}$	1/1,000,000,000,000,000	quadrillionth
atto	a	$10^{-18}$	1/1,000,000,000,000,000,000	quintillionth
zepto	z	$10^{-21}$	1/1,000,000,000,000,000,000,000	sextillionth

## SI Units and SI-English Unit Conversions

### Length

The SI base unit for length is the *meter* (m).

1 centimeter (cm)	0.3937 inch
1 inch (in)	2.5400 centimeters
1 meter (m)	3.2808 feet; 1.0936 yards
1 foot (ft)	0.3048 meter
1 yard (yd)	0.9144 meter
1 kilometer (km)	0.6214 mile (statute); 3,281 feet
1 mile (mi) (statute)	1.6093 kilometers
1 mile (nautical)	1.8531 kilometers
1 fathom	6 feet; 1.8288 meters
1 angstrom (Å)	$10^{-8}$ centimeters
1 micrometer ( $\mu\text{m}$ )	0.0001 centimeters

**Velocity**

The SI base unit for velocity is the *kilometer/hour* (km/h).

1 kilometer (km)/hour	27.78 centimeters/second (cm/s)
1 mile (mi)/hour	17.60 inches/second

**Area**

The SI base unit for area is the *square meter* (m<sup>2</sup>).

1 square centimeter	0.1550 square inch
1 square inch	6.452 square centimeters
1 square meter	10.764 square feet; 1.1960 square yards
1 square foot	0.0929 square meter
1 square kilometer	0.3861 square mile
1 square mile	2.590 square kilometers
1 acre (U.S.)	4,840 square yards

**Volume**

The SI base unit for volume is the *cubic meter* (m<sup>3</sup>).

1 cubic centimeter	0.0610 cubic inch
1 cubic inch	16.3872 cubic centimeters
1 cubic meter	35.314 cubic feet
1 cubic foot	0.02832 cubic meter
1 cubic meter	1.3079 cubic yards
1 cubic yard	0.7646 cubic meter
1 liter	1,000 cubic centimeters
1 gallon (U.S.)	3.7853 liters

**Temperature**

The SI base unit for temperature is the *kelvin* (K).

$$\text{Celsius to Fahrenheit: } \quad ^\circ\text{F} = \left(\frac{9}{5}\right) ^\circ\text{C} + 32$$

$$\text{Fahrenheit to Celsius: } \quad ^\circ\text{C} = \left(\frac{5}{9}\right) ^\circ\text{F} - 32$$

$$\text{Celsius to kelvin: } \quad \text{K} = ^\circ\text{C} + 273.15$$

**Mass**

The SI base unit for mass is the *kilogram* (kg).

1 gram	0.03527 ounce
1 ounce	28.3496 grams
1 kilogram	2.20462 pounds
1 pound (lb)	0.45359 kilogram (kg)
1 metric ton (t)	10 <sup>3</sup> kg

## Pressure

The SI base unit for pressure is the *pascal* (Pa).

1 millimeter of mercury (mmHg)	1 torr
1 pascal (Pa)	1 N/m <sup>2</sup> = 1 kg/m · s <sup>2</sup>
1 atmosphere (atm)	1.01325 · 10 <sup>5</sup> Pa = 760 torr
1 bar	1 × 10 <sup>5</sup> Pa

## Energy

The SI base unit for energy is the *joule* (J).

1 joule (J) = force exerted by a current of 1 amp/second passing through a resistance of 1 ohm

1 watt (W)	1 joule/second
1 kilowatt-hour (kWh)	1,000 (10 <sup>3</sup> ) watts exerted for 1 hour
1 megawatt (MW)	1 million (10 <sup>6</sup> ) watts
1 joule	1 kg m <sup>2</sup> /s <sup>2</sup> = 1 coulomb volt
1 calorie (cal)	4.184 joules
1 food Calorie (Cal)	1 kilocalorie (kcal) = 4,184 joules
1 British thermal unit (BTU)	252 calories (cal) = 1,053 joules
1 standard barrel (bbl) of oil	42 gallons (160 liters) or 5.8 BTUs
1 metric tone of standard coal	27.8 million BTUs or 4.8 bbl oil

# ACRONYMS

ACRONYM	DESCRIPTION
AA	Attainment area
ACL	Alternative concentration limit
AMS	American Meteorological Society
AO	Agent Orange—an herbicide and defoliant containing dioxin used in Vietnam by the United States
API	American Petroleum Institute
AQCR	Air quality control region
ARAR	Applicable relevant and appropriate requirements (cleanup standards)
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AWEA	American Wind Energy Association
BACM	Best available control measure
BACT	Best available control technology
BAT	Best available technology
BATEA	Best available technology economically achievable
BCT	Best conventional technology
BDAT	Best demonstrational achievable (also “available”) technology
BDT	Best demonstrational technology
BEJ	Best engineering judgment
BIF	Boiler and industrial furnace
BMP	Best management practice
BOD	Biological oxygen demand—index of amount of oxygen used by bacteria to decompose organic waste
BPJ	Best professional judgment
BPT	Best practical control technology
BRS	Biennial reporting system
BTU	British thermal unit—energy required to raise 1 lb of water 1°F
C&D	Construction and demolition
CAA	Clean Air Act
CAIR	Comprehensive assessment information rule
CAMU	Corrective action management unit
CAS	Chemical abstract service
CBI	Confidential business information
CCP	Commercial chemical product
CDD	Chlorodibenzodioxin
CDF	Chlorodibenzofuran
CEM	Continuous emission monitoring
CEQ	Council on environmental quality
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act of 1980 (amended 1984)
CESQG	Conditionally exempt small quantity generator of hazardous wastes
CFC	Chlorofluorocarbon—an ozone-depleting refrigerant

(Continued)

ACRONYM	DESCRIPTION
CFR	Code of Federal Regulations
CHEMTREC	Chemical Transportation Emergency Center
CHIPS	Chemical Hazards Information Profiles
CIESIN	Center for International Earth Science Information Network
CNG	Compressed natural gas
COD	Chemical oxygen demand
CPSC	Consumer Product Safety Commission (16 CFR)
CTG	Control techniques guidelines
CWA	Clean Water Act
DCO	Delayed compliance order
DDT	Dichlorodiphenyltrichloroethane—a toxic pesticide
DMR	Discharge monitoring reports
DNA	Deoxyribonucleic acid—made of phosphates, sugars, purines, and pyrimidines; helix shape carries genetic information in cell nuclei
DO	Dissolved oxygen
DOD	Department of Defense
DOE	Department of Energy
DOJ	Department of Justice
DOT	Department of Transportation
DRE	Destruction and removal efficiency
EERE	Energy efficiency and renewable energy
EIS	Environmental impact statement
ELF	Extremely low frequency electromagnetic wave (< 300 Hz)—emitted by electrical power lines
EMS	Environmental Management System (also see ISO 14000)
EP	Extraction procedure
EPA	Environmental Protection Agency
EPR	Extended product responsibility
EREF	Environmental Research and Education Foundation
ERT	Environmental Resources Trust Inc.
ESA	Environmental site assessment
ESI	Environmental Sustainability Index
ESP	Electrostatic precipitator
EWEA	European Wind Energy Association
FDA	Food and Drug Administration (21 CFR)
FFCA	Federal Facility Compliance Act
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
First Third	August 17, 1988, Federal Register (53 FR 31138)—the first of the hazardous waste land disposal restrictions
FR	Federal Register
GATT	General Agreement on Tariffs and Trade—since 1947; over 100 member countries
GCM	Global Climate Model
GLP	Good laboratory practices
GMER	Green Mountain Energy Resources
GMO	Genetically modified organism
GMP	Good manufacturing procedures

(Continued)

ACRONYM	DESCRIPTION
GPO	Government printing office
GRAS	Generally recognized as safe
HazMat	Hazardous material
HAZWOPER	29 CFR 1910.120—the OSHA/EPA requirement to have all employees trained if they will be handling, managing, or shipping hazardous wastes
HHW	Household hazardous waste
HRS	Hazard ranking system
HSWA	Hazardous and Solid Waste Amendments—1984
HW	Hazardous waste
HWM	Hazardous waste management
Hz	Hertz—frequency with which alternating current changes direction
ID	Hazardous waste identification number assigned to RCRA generators, transporters, and TSDFs
IEA	International Energy Association
INPO	Institute of Nuclear Power Operations
INUR	Inventory update rule
IPM	Integrated pest management
ISB	In situ burning
ITC	Interagency Testing Committee
kWh	Kilowatt-hour
LAER	Lowest achievable emission rate
LCA	Life cycle analysis/assessment
LDR	Land disposal restrictions (40 CFR Part 268)
LED	Light-emitting diode
LEPC	Local emergency planning committee
LNG	Liquid natural gas
LOEL	Lowest observed effect level
LPG	Liquid petroleum gas (or propane)
LQG	Large quantity generator of hazardous wastes—this term has a specific definition under RCRA
LUST	Leaking underground storage tanks
MACT	Maximum achievable control technology
Maglev	Magnetic levitation train—using magnetic forces for high-speed movement
MARPOL	International Convention on the Prevention of Pollution from Ships
MCL	Maximum concentration limit or level
MRQ	Monthly Hotline Report Q&A—the Hotline prepares a monthly report that contains questions and answers on common or difficult RCRA topics. The EPA publishes this report. The questions and answers can be <i>usually</i> used as EPA guidance. Beware: The Hotline is run by an EPA contractor whose answers are often erratic and <i>not</i> legally binding.
MRT	Mean residence time—the amount of time a water molecule spends in a reservoir before moving on
MSDS	Material safety data sheet (under OSHA)
MSW	Municipal solid waste (trash and nonhazardous waste)

(Continued)

ACRONYM	DESCRIPTION
MW	Megawatt—1,000 kilowatts (1 million watts)
NAA	Nonattainment area
NAAQS	National Ambient Air Quality Standards
NAEWG	North American Energy Working Group
NAFTA	North American Free Trade Agreement—Canada, Mexico, and the United States
NCAR	National Center for Atmospheric Research
NCP	National contingency plan
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standard for Hazardous Air Pollutants
NGO	Nongovernmental organizations—over 10,000 organizations worldwide linked by ECONET
NIOSH	National Institute of Occupational Safety and Health
NIPDWR	National Interim Primary Drinking Water Regulation
NPDES	National Pollutants Discharge Elimination System
NPL	National Priorities List—list of Superfund sites
NRC	Nuclear Regulatory Commission
NSDWR	National Secondary Drinking Water Regulation
NSPS	New Source Performance Standards
NSR	New Source Review
NTIS	National Technical Information Service (usually charges you for the same information that search engines provide for free)
ODC	Ozone depleting chemical
OGF	Old-growth forest—high-biodiversity ecosystem with trees 300 to 1,000 years old
OH	Hydroxyl radicals—atmospheric molecule that reduces methane (CH <sub>4</sub> ), carbon monoxide (CO), and ozone
OPM	Operation and maintenance
ORD	Office of Research and Development
OSHA	Occupational Safety and Health Administration (29 CFR)
OSW	Office of Solid Waste
OSWER	Office of Solid Waste and Emergency Response
OTG	Off-the-grid power generation independent of a major power plant
PAIR	Preliminary Assessment Information Rule
PCB	Polychlorinated biphenyl—used in dyes, paints, light bulbs, transformers, and capacitors
PEL	Permissible exposure limit
pH	Logarithmic scale that measures acidity (pH 0) and alkalinity (pH 14); pH 7 is neutral
PM-10	Particulate matter < 10 micrometers
PNA	Polynuclear aromatic compounds
PNIN	Premanufacture notification
POP	Publicly owned treatment works
PPB	Parts per billion
PPM	Parts per million
PRP	Potentially responsible parties
PSD	Prevention of significant deterioration

(Continued)

ACRONYM	DESCRIPTION
PSP	Point source pollution
PV	Photovoltaic device—generates electricity through semiconducting material
PVC	Petrochemical formed from toxic gas vinyl chloride and used as a base in plastics
QA/QC	Quality assurance/quality control
R	Richter scale—logarithmic scale (0–9) used to measure the strength of an earthquake
Rad	Radiation absorbed dose—amount of radiation energy absorbed in 1 gram of human tissue
R&D	Research and development
RACM	Reasonably available control measure
RACT	Reasonably available control technique
RCRA	Resource Conservation and Recovery Act of 1976—resulted in hazardous waste regulations
rDNA	Recombinant DNA—new mix of genes spliced together on a DNA strand; (biotechnology)
Rem	Roentgen (R) equivalent man—biological effect of a given radiation at sea level is 1 rem.
RI/FS	Remedial Investigation/Feasibility Study
RNA	Ribonucleic acid—formed on DNA and involved in protein synthesis
RPCC	Release prevention, control, and countermeasure
RQ	Reportable quantity
RUST	RCRA underground storage tanks
SARA	Superfund Amendments and Reauthorization Act
SBS	Sick-building syndrome
S&B A	Slash & burn agriculture
SDWA	Safe Drinking Water Act of 1974
Second Third	June 23, 1989, Federal Register (54 FR 26594)—hazardous waste land disposal restrictions
SERC	State Emergency Response Commission
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SMCL	Secondary maximum contamination level
SOC	Schedule of compliance
SPCC	Spill prevention control and countermeasures
SPDES	State pollutant discharge elimination
SQG	Small quantity generator of hazardous wastes (has a specific definition)
SW-846	Test methods for evaluating solid waste, physical/chemical methods
SWMU	Solid waste management unit
TCDD	Tetrachlorodibenzodioxin
TCE	Tetrachloroethylene, perchloroethylene
TCLP	Toxic characteristic leaching procedure
Third Third	June 1, 1990, Federal Register (55 FR 22520)—refers to hazardous wastes “landban” land disposal restrictions
TOC	Total organic carbon
TRU	Transuranic wastes

(Continued)



ACRONYM	DESCRIPTION
TSCA	Toxic Substances Control Act of 1976—regulates asbestos, PCBs, new chemicals being developed for sale, and other chemicals
TSDF	Treatment, storage, or disposal facility (permitted hazardous waste facility)
TSS	Total suspended solids
TWA	Time weighted average
TWC	Third-world countries
UIC	Underground injection control
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDW	Underground source of drinking water
USGS	United States Geological Survey—manages LandSat which images the environment via satellite
USPS	United States Postal Service
UV	Ultraviolet radiation from the sun (UVA, UVB types)
VOC	Volatile organic compound—carbon-containing compounds that evaporate easily at low temperatures
VOME	Vegetable oil methyl ester—biodiesel derived from the reaction of methanol with vegetable oil
W	Watt—unit of electrical power
WAP	Waste analysis plan
WB	World Bank—owned by governments of 160 countries and funds hydroelectric plants and encourages ecotourism; does not fund nuclear energy
WCU	World Conservation Union
WGI	World Glacier Inventory
WHS	World Heritage Site—natural or cultural site recognized as globally important and deserving international protection
WRI	World Resources Institute

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# WEBSITES

Useful Environmental Science websites to use as resources in preparation for the AP Environmental Science exam.

## Atmosphere

- <http://epa.gov/climatechange/ghgemissions>

## Biodiversity

- <http://www.cbd.int>
- <http://www.conservation.org/learn/biodiversity/Pages/overview.aspx>

## Earth's Formation

- <http://hubble.nasa.gov>
- <http://www.ghcc.msfc.nasa.gov>

## Ecology

- <http://www.itopf.com/information-services/data-and-statistics/statistics>
- <http://earthtrends.wri.org>
- <http://www.footprintnetwork.org>
- <http://www.sciencedaily.com/releases/2008/05/080521205303.htm>
- <http://www.fas.org/sgp/crs/misc/RL33938.pdf>
- <http://www.fas.org/sgp/crs/misc/RS21232.pdf>
- <http://www.blm.gov/wo/st/en/prog/grazing.html>

## Fossil Fuels

- <http://www.evostc.state.ak.us/http://pubs.usgs.gov/dds/dds-060>
- <http://www.instituteforenergyresearch.org/energy-overview/fossil-fuels>
- <http://www.livescience.com/6215-oil-production-peak-2014-scientists-predict.html>
- <http://yearbook.enerdata.net>
- [http://www.fossil.energy.gov/education/energylessons/coal/MS\\_Coal\\_Studyguide\\_draft1.pdf](http://www.fossil.energy.gov/education/energylessons/coal/MS_Coal_Studyguide_draft1.pdf)

## General

- <http://geodata.grid.unep.ch>
- <http://apcentral.collegeboard.com/apc/public/repository/ap-environmental-science-course-description.pdf>
- <http://www.eia.gov/forecasts/ieo>

## Geothermal

- [http://energy.sandia.gov/?page\\_id=381](http://energy.sandia.gov/?page_id=381)
- <http://www.geothermal-energy.org>

## Glaciers

- <http://nsidc.org/cryosphere/index.html>
- [www.coolantarctica.com/toc.htm](http://www.coolantarctica.com/toc.htm)

## Global Warming

- <http://www.epa.gov/climatechange/index.html>
- <http://www.ipcc.ch>

## Green Energy

- <http://www.winrock.org>
- <http://www.eere.energy.gov>
- <http://www.green-energy-news.com>

## Nanotechnology

- [www.cnst.rice.edu](http://www.cnst.rice.edu)
- [www.nano.gov](http://www.nano.gov)

## Nuclear Energy

- <http://www.epa.gov/cleanenergy/energy-and-you/affect/nuclear.html>
- <http://www.nei.org>

## Oceans/Water

- [www.usgs.gov](http://www.usgs.gov)
- <http://www.weather.gov>
- <http://www.marine-conservation.org>
- [www.epa.gov/owow/nps/prevent.html](http://www.epa.gov/owow/nps/prevent.html)
- <http://news.sciencemag.org/sciencenow/2004/07/15-01.html>
- <http://www.oceanenergycouncil.com/index.php/Tidal-Energy/Tidal-Energy.html>

## Solar

- <http://www.solarbuzz.com/going-solar/understanding/technologies>
- <http://www.solarenergy.com>
- <http://www.seia.org>

## Space

- [www.nasa.gov/home/index.html](http://www.nasa.gov/home/index.html)
- [http://nssdc.gsfc.nasa.gov/photo\\_gallery](http://nssdc.gsfc.nasa.gov/photo_gallery)
- <http://earth.jsc.nasa.gov/sseop/efs>
- [www.noaa.gov/satellites.html](http://www.noaa.gov/satellites.html)

## Wastes

- [www.epa.gov/osw/](http://www.epa.gov/osw/)
- <http://www.epa.gov/superfund/index.htm>
- <http://www.itopf.com/marine-spills/effects>

## Weather

- [www.weather.com](http://www.weather.com)
- [www.theweathernetwork.com](http://www.theweathernetwork.com)

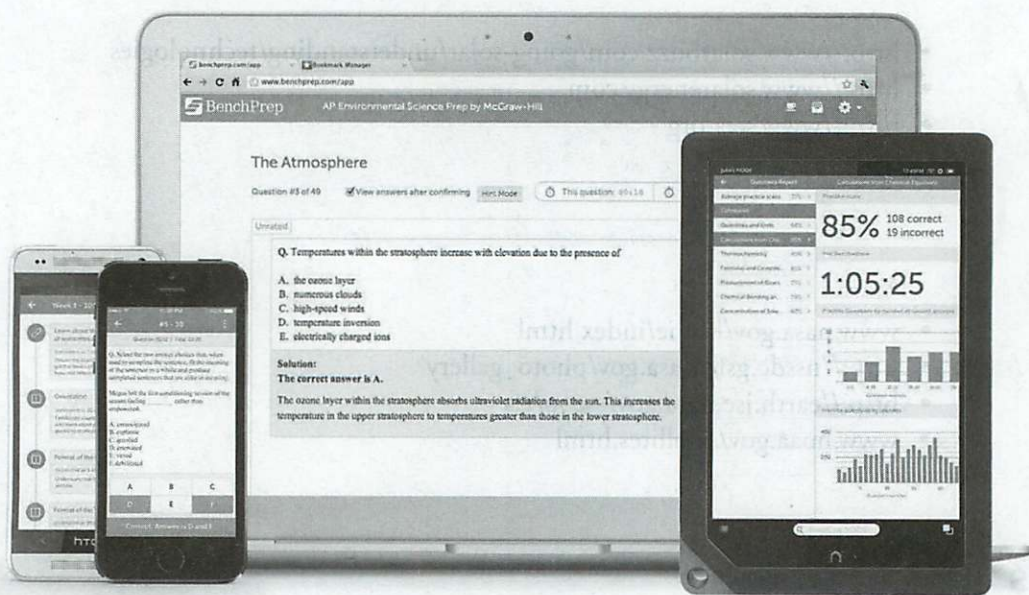
## Wind

- [www.awea.org](http://www.awea.org)
- <http://www.bwea.com>
- <http://www.windpoweringamerica.gov>

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