Encyclopedic Entry

altitude

For the complete encyclopedic entry with media resources, visit:
http://education.nationalgeographic.com/encyclopedia/altitude/

Altitude, like elevation, is the distance above sea level. Areas are often considered "high-altitude" if they reach at least 2,400 meters (8,000 feet) into the atmosphere.

The most high-altitude point on Earth is Mount Everest, in the Himalayan mountain range on the border of Nepal and the Chinese region of Tibet. Mount Everest is 8,850 meters (29,035 feet) tall. The urban area of El Alto, Bolivia, is the most high-altitude city on Earth. All 1.2 million residents live about 4,150 meters (13,615 feet) above sea level.

Altitude is related to air pressure. In fact, aviators and mountaineers can measure their altitude by measuring the air pressure around them. This is called *indicated altitude*, and is measured by an instrument called an altimeter.

As altitude rises, air pressure drops. In other words, if the indicated altitude is high, the air pressure is low.

This happens for two reasons. The first reason is gravity. Earth's gravity pulls air as close to the surface as possible.

The second reason is density. As altitude increases, the amount of gas molecules in the air decreases—the air becomes less dense than air nearer to sea level. This is what meteorologists and mountaineers mean by "thin air." Thin air exerts less pressure than air at a lower altitude.

High-altitude locations are usually much colder than areas closer to sea level. This is due to the low air pressure. Air expands as it rises, and the fewer gas molecules—including nitrogen, oxygen, and carbon dioxide—have fewer chances to bump into each other.

The human body reacts to high altitudes. Decreased air pressure means that less oxygen is available for breathing. One normal effect of altitude is shortness of breath, since the lungs have to work harder to deliver oxygen to the bloodstream. It can take days and even weeks for a body to adjust to high altitude and low air pressure.

People who spend too much time in high-altitude locations risk more serious symptoms of altitude sickness. These may range from headaches and dizziness to much more serious consequences, such as brain or lung damage. Above about 8,000 meters (26,000 feet), the human body cannot survive at all, and starts to shut down. Mountaineers call this altitude the "death zone."

To prevent severe altitude sickness, mountaineers bring supplemental (extra) supplies of oxygen and limit their time in the "death zone."

Different regions have different air pressures, even at the same altitude. Factors such as climate and humidity impact local air pressure. Air pressure also decreases around the poles. For this reason, if Mount Everest was located in the U.S. state of Alaska or the continent of Antarctica, it could never be summited without supplemental oxygen—the pressure would make the altitude seem 914 meters (3,000 feet) higher.

Astronomical Altitude

In astronomy, altitude has a somewhat different meaning. It describes the angle between the horizon and some point in the sky. For example, if a star is directly overhead, its altitude is 90 degrees. If a star has just set or is just about to rise, it is right at the horizon and has an altitude of 0 degrees.

The North Star, Polaris, does not rise or set because the Earth's axis passes directly through it. It thus has a constant altitude when viewed from anywhere in the Northern Hemisphere. This makes it incredibly useful in celestial navigation.

VOCABULARY

Term	Part of Speech	Definition
absolute altitude	*noun*	elevation, or the physical distance above the ground.
adjust	*verb*	to change or modify something to fit with something else.
aircraft	*noun*	vehicle able to travel and operate above the ground.
air pressure	*noun*	force pressed on an object by air or atmosphere.
altimeter	*noun*	device for measuring altitude.
altitude	*noun*	the distance above sea level.
altitude sickness	*noun*	illness caused by reduced oxygen levels at high elevations.
angle	*noun*	slanting space between two lines that ultimately meet in a point.
ascend	*verb*	to go up.
astronomy	*noun*	the study of space beyond Earth's atmosphere.
atmosphere	*noun*	layers of gases surrounding a planet or other celestial body.
axis	*noun*	an invisible line around which an object spins.
bloodstream	*noun*	flow of blood through an organism's body.
border	*noun*	natural or artificial line separating two pieces of land.
celestial navigation	*noun*	determining an object's position using the stars and planets as guides.
city	*noun*	large settlement with a high population density.
climate	*noun*	all weather conditions for a given location over a period of time.
consequence	*noun*	result or outcome of an action or situation.
decrease	*verb*	to lower.
density	*noun*	number of things of one kind in a given area.
elevation	*noun*	height above or below sea level.
exert	*verb*	to force or pressure.
expand	*verb*	to grow or get larger.
gas	*noun*	state of matter with no fixed shape that will fill any container uniformly. Gas molecules are in constant, random motion.
gradually	*adverb*	slowly, or at a measured pace.
gravity	*noun*	physical force by which objects attract, or pull toward, each other.

horizon	*noun*	line where the Earth and the sky seem to meet.
humidity	*noun*	amount of water vapor in the air.
indicate	*verb*	to display or show.
meteorologist	*noun*	person who studies patterns and changes in Earth's atmosphere.
molecule	*noun*	smallest physical unit of a substance, consisting of two or more atoms linked together.
mountaineer	*noun*	someone who climbs mountains.
mountain range	*noun*	series or chain of mountains that are close together.
Northern Hemisphere	*noun*	half of the Earth between the North Pole and the Equator.
North Star	*noun*	the star Polaris, located roughly above the North Pole. Also called the Lodestar or Pole Star.
oxygen	*noun*	chemical element with the symbol O, whose gas form is 21% of the Earth's atmosphere.
Polaris	*noun*	star that is currently located roughly over the North Pole. Also called the North Star or Lodestar.
pole	*noun*	extreme north or south point of the Earth's axis.
region	*noun*	any area on the Earth with one or more common characteristics. Regions are the basic units of geography.
sea level	*noun*	base level for measuring elevations. Sea level is determined by measurements taken over a 19-year cycle.
star	*noun*	large ball of gas and plasma that radiates energy through nuclear fusion, such as the sun.
summit	*verb*	to reach the highest point of a mountain.
symptom	*noun*	sign or indication of something.
urban area	*noun*	developed, densely populated area where most inhabitants have nonagricultural jobs.
vertical	*noun*	up-down direction, or at a right angle to Earth and the horizon.

For Further Exploration

Articles & Profiles

- National Geographic News: Altitude a Major Challenge to Climbers
- National Geographic News: Three High-Altitude Peoples, Three Adaptations to Thin Air