

Content Objectives:

- The air we breathe is made up of mixture of gases: 78% Nitrogen, 21% Oxygen, and less than 1% of Water Vapor and Carbon Dioxide.
- The mixture of gases in the atmosphere is necessary for life to exist on Earth.

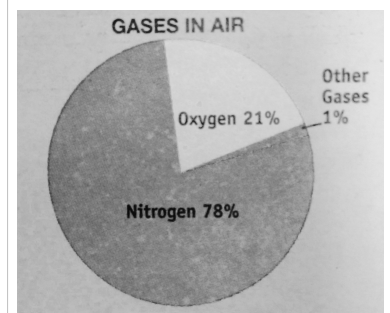
Life on Earth needs **air** to survive. Plants, animals, and humans could not survive without the mixture of gases we call air. Like other things that you can see (your desk, a car, yourself), air is made up of **particles** (tiny pieces) of matter. **Matter is anything that has mass and takes up space.** It may be hard to think of air as taking up space, but think about what happens when you blow up a balloon: the air from your lungs takes up space inside the balloon.

Air is a mixture of gases. These gases are made of tiny particles that are always moving. Sometimes they move quickly, sometimes they don't. There are four main gases in air that are important for life on Earth: **nitrogen, oxygen, carbon dioxide, and water vapor.** Air is mostly **nitrogen and oxygen.** Plants use nitrogen to make food and grow. Plants also use carbon dioxide to make food. Animals and humans use oxygen to get energy from the food they eat. Water vapor in air forms clouds which makes rain and other forms of precipitation possible.

The invisible blanket of air that surrounds Earth is called the atmosphere. The atmosphere begins on the ground and goes up about 400 miles. The atmosphere has many layers, but the layer to remember when you talk about weather is the bottom one. This layer is called the troposphere. The troposphere is the only layer that supports life and the only layer with weather. Most of the air in the atmosphere is found in the troposphere because gravity pulls most air particles down to Earth's surface. The higher up in the atmosphere you go, the farther apart the air particles are, which is why you need an oxygen mask to breathe when you are at high elevations like Mt. Everest.

Weather is what it is like in the atmosphere at a certain place and time. It is all the conditions of the atmosphere that are happening in a place at any given time. The type of weather a place experiences depends very much on air temperature and the amount of water vapor in the air.

- **Nitrogen:** this gas makes up the largest part of air (78%). It helps plants grow.
- **Oxygen:** this gas is the second largest part of air (21%). It is used by animals and humans to get energy from food.
- **Carbon Dioxide:** this gas makes up less than 1% of air. It is used by plants to make food.
- **Water Vapor:** this gas is less than 1% of air. It makes clouds and rain possible.
- **Atmosphere:** the invisible blanket of air surrounding Earth. It has several layers and is made of gases, liquids, and some solids.
- **Troposphere:** the bottom layer of the atmosphere, and the only layer that supports life and has weather.



Content Objective

- Earth's atmosphere acts like the glass of a greenhouse: it allows sunlight to pass through it, traps heat inside the atmosphere, and warms the Earth.
- The greenhouse effect keeps Earth at a temperature that makes it possible for life to exist.

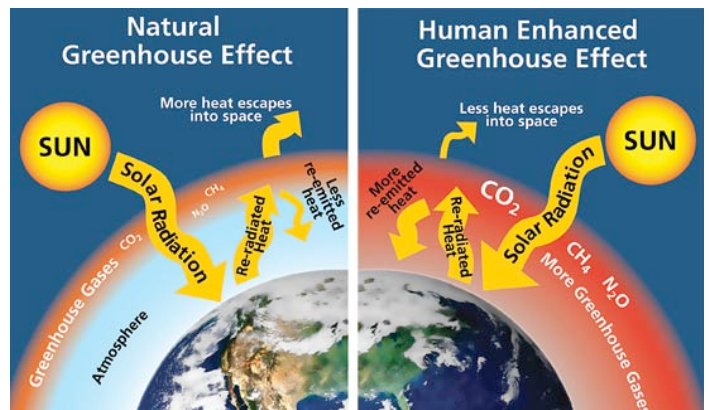
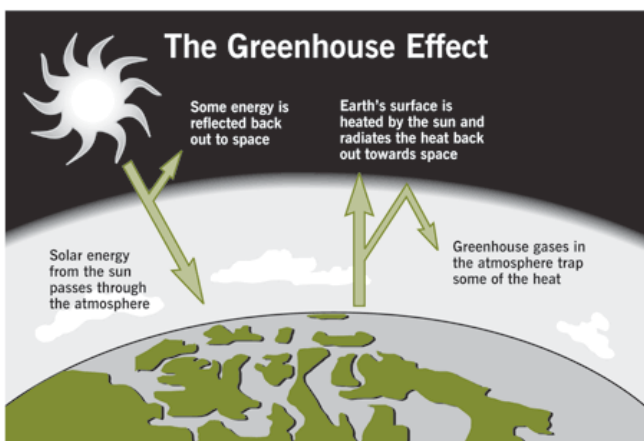
A greenhouse is a building that allows gardeners to grow plants even during colder weather. It has lots of windows that allow sunlight to pass through. The sunlight causes the things inside the greenhouse to heat up, like the plants, which helps them to survive.

If you leave the car windows closed on a hot summer day, you'll probably feel a burst of hot air when you open the door. If you get inside, you'll notice the surfaces inside the car—the seat, the dashboard, the steering wheel—are very hot. Why does this happen? Sunlight passed through the glass and caused the surfaces inside the car to heat up, just like in a greenhouse. This heat got trapped inside because the windows were closed.

Earth's atmosphere acts just like the glass of a greenhouse or the windows in your car. It allows sunlight to pass through it. The sun's rays cause the things on the surface of the Earth to heat up. The heat radiating or rising off of the surface of the Earth gets trapped by the gases in the atmosphere and keeps the planet at a temperature necessary for life to exist: about 57 degrees Fahrenheit.

Some scientists believe that air pollution is causing the Earth to heat up more. The idea is that there are extra gases (like carbon dioxide) in the atmosphere that cause more of the heat to stay inside the atmosphere instead of escape. Others think temperatures are rising because it's how the Earth works, or that it's a mix of both. Either way, the Earth needs an atmosphere for there to be a Greenhouse Effect. Without it, the Earth's average temperature would be much colder and life on Earth would be much different.

- **Greenhouse:** a building with many windows designed to keep plants warm during cold months.
- **Greenhouse Effect:** the process where heat from Earth's surface is trapped by the atmosphere.



Content Objectives:

- The sun heats the surface of Earth unevenly: some surfaces heat up quickly, and others heat up slowly.
- Wind is moving air, and it is caused by the uneven heating of Earth's surface.

The surface of Earth made of many different things, and they are not all the same color. Some parts are dark, like a farmer's field with rich, dark soil. Others are light, like the sand on a beach. Still other surfaces are all sorts of colors between light and dark.

In general, dark-colored surfaces heat up quicker than light-colored surfaces, so the farmer's field will get hotter before the lighter sand on the beach will. When air is warmed, the particles in air spread out. This makes the air lighter, so it rises up into the air, leaving cooler air close to the surface of the Earth. The rule is this: warm air rises, and cool air sinks. This movement of air is what causes wind.

Similarly, land heats up quicker than water does, but it also loses its heat more quickly. During the day, the warm air over the beach rises up into the atmosphere. The air over the water is cooler, so it moves toward the beach: this is a sea breeze, because the air is coming from over the water and moving toward the land.

At night the opposite thing happens because the air over land cools down before the air over the water does. The warm air over the water rises into the atmosphere, and the cooler air from over the land rushes in to take its place: this is a land breeze because it is coming from over the land.

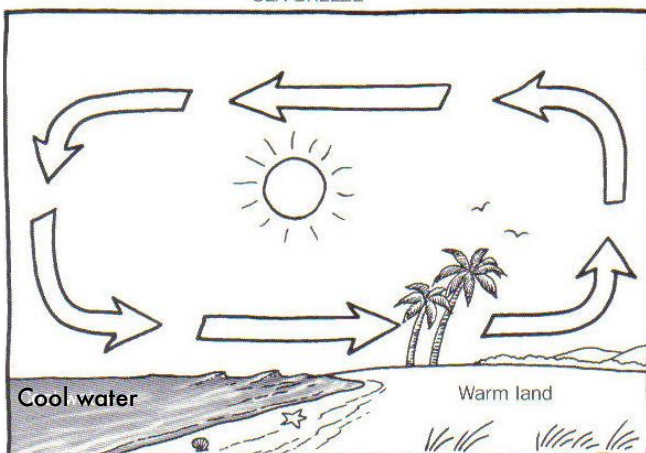
○ **Wind:** moving air caused by the uneven heating of Earth's surface

○ Warm air rises, and cool air sinks because warm air is lighter than cool air.

○ Winds are named for where they come from: a land breeze comes from over the land, and a sea/ocean breeze comes from over the water; a north wind comes from the north, which means it blows to the south.

○ Dark-colored surfaces heat up more quickly than light-colored surfaces.

SEA BREEZE



LAND BREEZE

