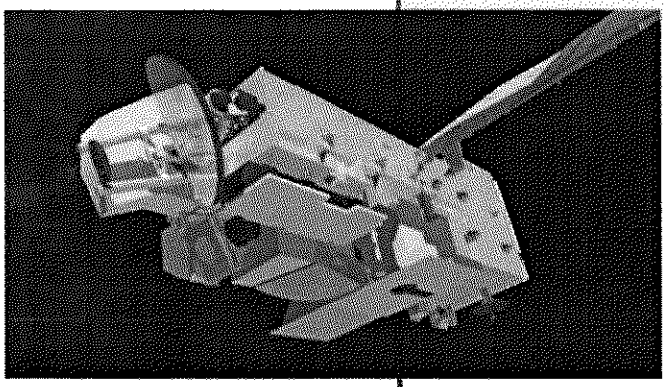
ACTIVITY 1

OBJECTIVES

Students will be able to:

1. Describe the main layers of Earth's atmosphere, the proportion of each in the atmosphere, and what role each plays in atmospheric phenomena.
2. Define how the temperature varies from layer to layer of atmosphere.
3. Calculate the quantities of gases in a particular volume of air, such as their classroom.



The Aura Earth-observing satellite launched in July 2004 is the latest in a line of NASA instruments and satellites that give us the ability to measure changes in climate and air quality

Photo courtesy of NASA/GSFC

Background

What we call the atmosphere comes in five main layers: exosphere, thermosphere, mesosphere, stratosphere, and troposphere. In the exosphere (640 to 64,000 km, or 400 to 40,000 mi), air dwindles to nothing as molecules drift into space. The thermosphere (80 to 640 km or 50 to 400 mi) is very hot despite being very thin because it absorbs so much solar radiation. The thermosphere contains the ionosphere and the magnetosphere. The exosphere and thermosphere make up the atmosphere's outer layer. The ionosphere contains electrically charged particles that can interfere with radio broadcasts. Charged particles in the magnetosphere are affected by Earth's magnetic field and under the right conditions, create the beautiful, shimmering Northern and Southern Lights.

The mesosphere (50 to 80 km or 31 to 50 mi) is where debris entering the atmosphere begins to burn up. The stratosphere (14.5 to 50 km or 9 to 31 mi) contains the ozone layer that absorbs nearly all the Sun's ultraviolet radiation. Without the protection of the ozone layer, life could not exist on land. The mesosphere and stratosphere make up the middle layer of the atmosphere.

Storms form in the troposphere (up to 14.5 km, or 9 mi), the layer of atmosphere closest to Earth's surface.

The air we breathe consists of 78 percent nitrogen and 21 percent oxygen. The remaining one percent is a mixture of traces gases including the greenhouse gases (carbon dioxide, methane, and water), hydrogen, argon, neon, and helium.

ACTIVITY 1

Activity Sheet

What's in the Atmosphere?

Layers of the Atmosphere

Exosphere: 640 to 64,000 km (400 to 40,000 mi)
Thermosphere: 80 to 640 km (50 to 400 mi)
Mesosphere: 50 to 80 km (31 to 50 mi)
Stratosphere: 14.5 to 50 km (9 to 31 mi)
Troposphere: up to 14.5 km (9 mi)

Temperatures

Exosphere:
Thermosphere: 230° C (440° F)
Mesosphere: -90° C (-130° F) at the top
Stratosphere: -3° C (26.6° F) at the top
Troposphere: -75° C (-103° F) near the top

What goes on in the atmosphere

Planes fly: 9 km (5.7 miles)
Earth-observing satellites fly: 705 km (438 mi)
Rain clouds: 2 km (1.2 mi)
Northern lights form: 100 km (62 mi)
Meteorites burn up: 80–100 km (50–62 mi)
Reflects radio waves: 96.5 km (60 mi)
Protective ozone layer: 22 km (14 mi)

What's in the air?

The air we breathe consists of 78 percent nitrogen and 21 percent oxygen. The remaining one percent is a mixture of traces gases including the greenhouse gases (carbon dioxide, methane, and water), hydrogen, argon, neon, and helium.