

What is Air? Is It Clean?



Target Grade Levels

Second - Fifth

Time

30 minutes

Materials

None

Knowledge and Skills (TEKS)

- Science:
 - Make wise choices in the conservation of resources;
 - Describe ways technology influences human capacity to modify the environment; and
 - Give examples of scientific discoveries and technological innovations that have shaped the world.
- Math:
 - Represent as in a graphic organizer; and
 - Summarize making charts.
- Visual Arts:
 - Produce visuals.

Overview

Students will be introduced to the three forms of oxygen and will then discuss how some of the gases in the air can be harmful.

Background Information

Ozone that exists as part of the “ozone layer” up high in the stratosphere is good. It protects us, and the earth, from the sun’s, however, harmful ultraviolet rays. Ozone at the ground-level is bad for us. Ground-level ozone affects people’s breathing, especially children, elderly, people with respiratory conditions, such as asthma, and those who exercise strenuously outdoors. At the ground-level, in the troposphere, ozone is formed when pollution from cars, factories, and other sources is “baked” by the sun. This bad ozone is likely to form on days when the temperature is above the 80°F and there is little wind or cloud cover. When the ozone at ground-level is really bad, you may see brown haze from nitrogen oxides (NO_x) or particles, but never ozone. Sometimes the whole haze pollution layer is called smog.

Thinking about how we contribute to air pollution and taking actions to prevent it will help ensure we keep our clean air.



Image courtesy of: www.epa.gov/oar/oaqps/gooduphigh/

Procedure

1) Vocabulary

- | | |
|---------------------|-------------------------------|
| a) elemental oxygen | g) ozone layer |
| b) molecular oxygen | h) smog |
| c) ozone | i) ground-level ozone |
| d) stratosphere | j) pollution |
| e) troposphere | k) volatile organic compounds |
| f) nitrogen oxides | l) haze |

2) Activities

- a) Discuss the fact that some of the gases we find in air can be harmful. One of these gases is ozone (O₃). In the atmosphere, we have three forms of oxygen:
- O = elemental oxygen
 - O₂ = molecular oxygen
 - O₃ = ozone
- b) Discussion questions with possible answers:
- i) Besides people, what needs clean air to live?
(1) All living organisms—plants, animals, bus, etc.
 - ii) Can students cite examples of activities that pollute our air (make it “dirty”)?
(1) Driving, factories, smokestacks, smoking, etc.
 - iii) Can students identify weather conditions that might cause ground-level ozone?
(1) Sunny weather, no wind, no clouds, etc.
 - iv) Why is ozone a problem for us from April to October?
(1) Lots of heat, long summer, etc.
 - v) What are some simple actions students can take that can help clean the air?
(1) Bike, walk, scooter (drive less), use less electricity, etc.

3) Review

Discuss with students how their actions directly help reduce the pollutants that contribute to ground-level ozone formation. (e.g. driving less creates less NO_x and VOC pollution, thus reducing the ingredients available to make ground-level ozone)

4) Evaluation

- a) Students can be quizzed on basic concepts.
- b) Students can perform the following extension activities as graded exercises.

5) Extension

- a) Students can track and chart weather conditions and maximum daily ozone levels via the Texas Commission on Environmental Quality's websites:
 - i) Map of Current Ozone Levels for San Antonio www.tnrcc.state.tx.us/cgi-bin/monops/select_curlev?region13_cur.gif
 - ii) Air Quality Index www.tnrcc.state.tx.us/cgi-bin/monops/psi_rpt
- b) Students can research other uses for ozone (such as water purification) and how its destructive properties can be put to good use.
- c) Students can create posters to educate their schoolmates on ozone's harmful health effects and/or how to reduce air pollution.

Adapted from: "Ozone Action! Let's Clear the Air: Educational Activities Kindergarten-5th grade." West Michigan Clean Air Coalition. 2003. www.wmcac.org/gradesk5.pdf.