



The Ozone Hole and Global Warming

The Ozone Hole and Global Warming

Objectives

- Reads information and answers questions about the ozone hole and global warming.
- Completes flow charts which illustrate issues affecting Antarctica.

Worksheet Information

- In 1987, a group of nations signed a document called the Montreal Protocol. The nations agreed to reduce their CFC (chlorofluorocarbons) emissions by half by the year 2000. Some changes have been made to the document since it was signed and the deadline was changed to January 1, 2005, with full elimination of the use of CFCs by 2010. Experts believe that as long as production and release of CFCs is regulated properly, global ozone levels should recover by 2050. Constant research is being done regarding the problem.
- Ozone depletion is usually worse further from the Equator. It was originally thought that an ozone “hole” only existed above Antarctica; however, a distinct area of very low levels of ozone has been discovered above the North Pole in the Arctic.
- Quiz questions relating to this section may be found on page 17.

Answers

page 78

1. (a) atom (b) atmosphere
(c) ultraviolet (d) cataracts
(e) phytoplankton (f) solvent
(g) ecosystem
- 2–3. Teacher check.

page 79

Teacher check.

Cross-Curricular Activities

- Students research to find websites dedicated to environmental issues and evaluate their bias or usefulness as a possible group to join or support.
- Students collate a series of figures about a particular ice shelf or ice sheet to record evidence of its disintegration.
- Students design projects which show alternative methods of keeping food fresh, traveling around, keeping cool, cleaning, etc.

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Antarctica is one of the world's greatest wildernesses. It is also greatly vulnerable to environmental changes as the result of human interference. The most significant of these changes is the depletion of the ozone layer, creating an ozone "hole" (really a thin area rather than a hole) over Antarctica, and global warming.



The Antarctic Ozone Hole

Ozone is a gas made up of three oxygen atoms. Most ozone can be found in the upper layer of the Earth's atmosphere, called the stratosphere, which starts between about 6 and 8 miles and continues to around 30 miles.

Ozone close to the Earth is harmful as it is a major component of smog and affects the function of the lungs. The ozone layer, however, protects the Earth from the harmful effects of ultraviolet rays from the sun. A decrease in the ozone layer could have harmful effects including:

- Skin cancer.
- Eye damage, such as cataracts.
- Damage to the immune systems of organisms.
- Reduction of the growth of phytoplankton in the oceans.
- Damage to DNA in various life forms.
- An adverse impact on crops and animals.
- Cooling of the Earth's stratosphere.

Scientists have noticed that in recent years the ozone layer at the South Pole has begun to thin or reduce in concentration. This is the result of pollutants in the atmosphere destroying ozone in the stratosphere.

The greatest cause of ozone breakdown is a group of chemicals called chlorofluorocarbons (CFCs) which are manufactured chemicals found in refrigeration systems, air conditioners, aerosol cans (in some countries), solvents and packaging. The other cause is nitrogen oxides, which are a by-product of fuel burning and ejected from aircraft exhausts. The only way to control ozone thinning is to reduce the production of CFCs and nitrogen oxides. (In many countries, CFC use in aerosol cans is now prohibited.)

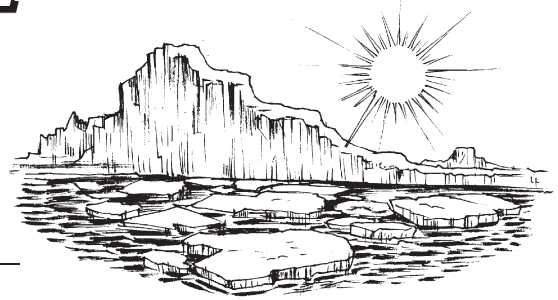
Global Warming

Global warming is an increase in the average temperature of the Earth's atmosphere, leading to climate change. It is thought by many to be caused by our use of fossil fuels such as oil, gas and coal.

The main problem with rising temperatures is that Antarctic icecaps shrink. This in turn accelerates global warming, as the snow and ice which usually form a protective, cooling layer over the Antarctic is lessened, allowing the Earth to absorb more sunlight and get hotter.

In Antarctica, global warming has caused ice shelves to disintegrate, collapse or break up, ocean temperatures to increase and ice thickness to decrease. In the Antarctic Peninsula region, an increase in annual temperature has caused the spread of the two flowering plants in the last few decades. Numbers of Adelie penguins have declined steadily as the pack ice they live on is shrinking. Chinstrap and Gentoo penguins have begun to take their place, as the new nesting sites become more suited to them. Krill numbers are decreasing because of a fall in the amount of sea ice, where they feed on algae under the surface. As krill form a vital part of the food chain in Antarctica, this will have a huge impact on the other species in the oceans.

These two problems are having a great impact on an area rich in unique ecosystems.



Use the text on page 77 to answer the questions.

- Write words which match the meanings.
 - the smallest part of an element that can take part in a chemical reaction _____
 - the gaseous envelope surrounding the Earth _____
 - invisible rays of the spectrum with wavelengths shorter than violet _____
 - an abnormality of the eye characterized by opaque lenses _____
 - the plant component of plankton, which includes fungi, algae, bacteria and yeasts _____
 - something with the power to dissolve _____
 - a community of organisms interacting with one another and with the environment in which they live _____
- Write your own explanation for the following terms:
 - The ozone hole is _____

 - Global warming is _____

- Complete the boxes using brief bullet points.

	Cause	Effect	Solution
The Ozone Hole			
Global Warming			

Fact File

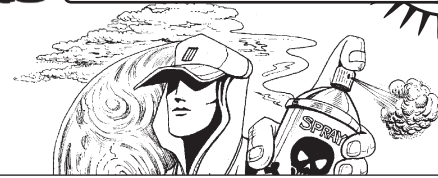
If all the ozone above your head was collected in a continuous layer, it would only be about 3 or 5 mm thick!

Environmental Issues Flow Charts

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1. Research and draw flow charts to illustrate:
 - (a) How CFCs cause the ozone layer to breakdown.



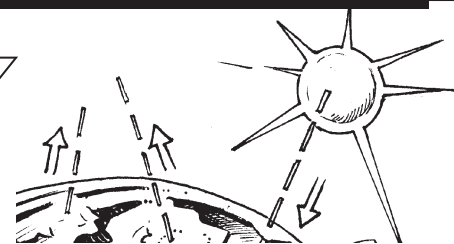
Blank area for drawing a flow chart illustrating how CFCs cause the ozone layer to breakdown.

- (b) How global warming changes the Earth's climate.

Blank area for drawing a flow chart illustrating how global warming changes the Earth's climate.

Fact File

Strong winds blowing around Antarctica form a "polar vortex" which isolates air over Antarctica from the rest of the world. This helps to make the ozone hole worse!



ANTARCTICA