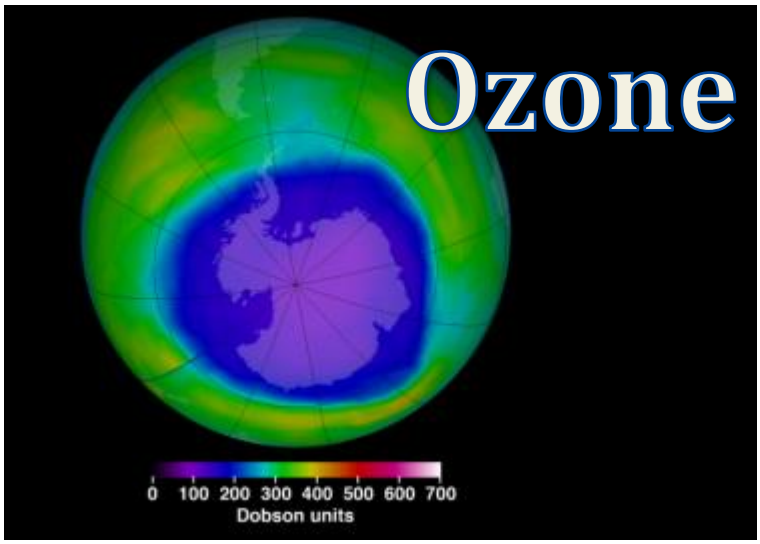
National Aeronautics and Space Administration

NASA eClips™

# Guide Lites

## Interactive Lesson: Ozone




youtube.com/nasaeclips

nasaeclips.arc.nasa.gov

www.nasa.gov

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# NASA eClips™ Guide Lites: Ozone Spotlite Interactive Lesson

**Student Misconception**
The ozone "hole" is often thought of by students as an actual hole or gap in the atmosphere, not as a region of relatively low ozone concentration. Students also incorrectly think that the hole is responsible for Earth's climate change.

**Objective**
In this activity, students explain what the ozone layer is, how it is changing and why it is important to life on Earth as a result of watching the Spotlite video, learning the vocabulary collaboratively, and discussing the relationship of the ozone layer to how radiation reaches Earth's surface.

**Background Information**

- There is not an actual hole in the ozone, but a thinning of the layer.
- Ozone is a molecule made of 3 oxygen atoms.
- There are layers of ozone in the troposphere and stratosphere.
- The worry is that the thinning of the ozone layer in the stratosphere allows radiation to reach Earth's surface.
- Radiation is harmful to life.
- NASA monitors and measures ozone levels in the atmosphere

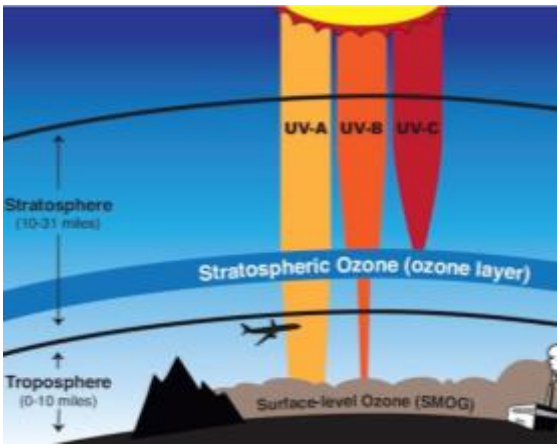

Image Credit: https://aura.gsfc.nasa.gov/ozone.html

**Pre-Assessment**
Use these questions to probe for students' prior knowledge:

- ❑ What is ozone?
- ❑ How is the ozone layer changing?
- ❑ Why is ozone important to life on Earth?
- ❑ What are some harmful effects of radiation?

**Engage**
1. Ask students to watch the Spotlite video on ozone that can be found at the following link, https://youtu.be/maLRzINR4UY. Other ozone Spotlite videos can be found on the NASA eClips™ website, https://nasaeclips.arc.nasa.gov/. After viewing the video, lead a discussion with students to identify the misconception addressed in the video.
(Misconception: There is an actual hole in the ozone layer and it is the cause of Earth's climate change.)

2. Identify key vocabulary words and phrases in the video.
(Examples: atmosphere, ozone, absorb, stratosphere, troposphere, UVA radiation. Additional words should be added as needed.)
**These words, and other key vocabulary terms, can be found in the NASA eClips™ Virtual Vocabulary, https://nasaeclips.arc.nasa.gov/teachertoolbox/vocab.

**Explain**
Use the Frayer Model to help students develop a conceptual understanding of key vocabulary. The Frayer model is a graphic organizer that allows students to demonstrate their

understanding and construct meaning of assigned vocabulary words. Working in groups, students are encouraged to provide examples from their own lives and experiences both in and out of the classroom to define vocabulary words and phrases as they relate to the science concept.

Using a digital interactive Frayer Model enables students to work collaboratively and simultaneously on the same digital document.
Several digital Frayer models can be found at:

- ClassFlow: **http://tinyurl.com/FrayeronClassFlow**
- PDF Filler: **http://tinyurl.com/FrayeronPDFfiller**

***Example:*** Place the word ***atmosphere*** in the center of the graphic organizer.

1. Explain to students why they are learning about this new vocabulary words.
2. Ask students to brainstorm *characteristics of atmosphere* and add responses to the area with the corresponding heading on the graphic organizer.
3. Have students research the topic using a variety of resources including their text book and notes
4. Next, ask students to add *examples* and *non-examples* in the Frayer model. *(Emphasize the higher level thinking skill of comparing and contrasting. How are the examples alike/different than the non-examples?)*
5. Using the information provided, ask students to develop their own definition of the word *atmosphere* that is clear and concise. An example to guide work is started below.
6. After completing the example together, assign a new vocabulary word to each group of students to work on collaboratively.
7. Groups will share their Frayer Models and lead discussions to check for understanding of each vocabulary word.
8. Compile final definitions and post so all students have access for later work.

**Implementation Note**

Doing this activity in pairs or teams builds students' collaboration skills.

**Evaluate**

After sharing Frayer Model vocabulary, ask students to once again answer the following questions:

- ❑ What is ozone?
- ❑ How is the ozone layer changing?
- ❑ Why is ozone important to life on Earth?
- ❑ What are some harmful effects of radiation?

Compare student responses to Pre-assessment and Evaluate questions to determine if students have a clear understanding of the vocabulary. Additional multiple-choice pre and posttest items are available at the ClassFlow Marketplace – *NASA Spotlite Ozone Interactive Lesson Plan* **-** https://prod.classflow.com/classflow/#!/product/itemId=077f0c73d0094d9685f171300212fd6b.

**Explore**

For additional videos and activities to reinforce content and develop student understanding, visit the related web site linked to the NASA eClips™ video *Real World: Ozone Alerts.* https://nasaeclips.arc.nasa.gov/search/?terms=ozone&v=real-world-ozone-alerts.

The Aura mission is dedicated to understanding the changing chemistry of our atmosphere and the mission's website contains information and resources that can be utilized. https://aura.gsfc.nasa.gov/ozone.html

**Extend**

To extend student understanding of the ozone layer utilize these activities that integrate mathematics skills:

*Visualizing the Ozone Hole Lesson* -
https://www.nasa.gov/pdf/752032main_Exploring_Color_Maps.en.pdf

MY NASA DATA Lesson: *Identifying Ozone Variations Over Different Locations* -
https://mynasadata.larc.nasa.gov/lesson-search/?page_id=474?&passid=77

Students who are interested in the instruments used to study ozone can be directed to learn about Stratospheric Aerosol and Gas Experiment III-ISS (SAGE III-ISS). This instrument is a key part of NASA's mission that measures Earth's sunscreen, or ozone, along with other gases and aerosols, or tiny particles in the atmosphere.
**https://sage.nasa.gov/missions/about-sage-iii-on-iss/**

## Frayer Model for Vocabulary Development

Use the graphic organizer to write definitions, characteristics, examples and non-examples for a vocabulary word. You can include drawings, graphics, and diagrams.