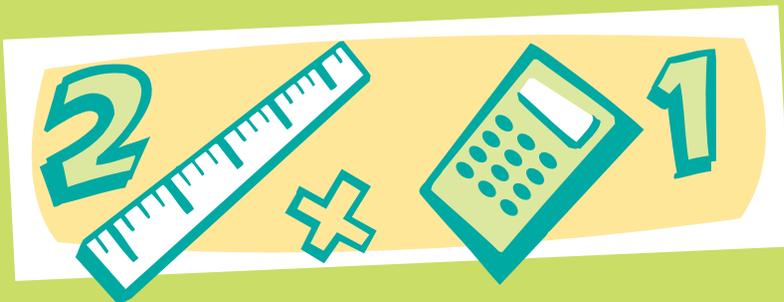
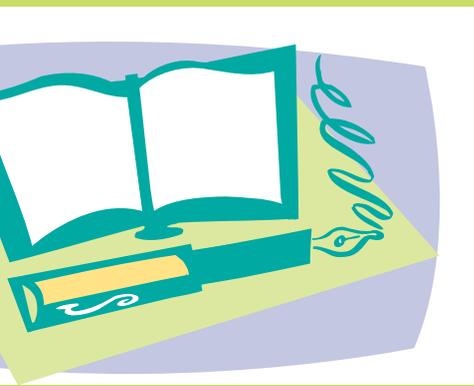
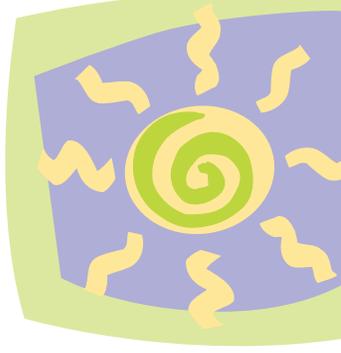
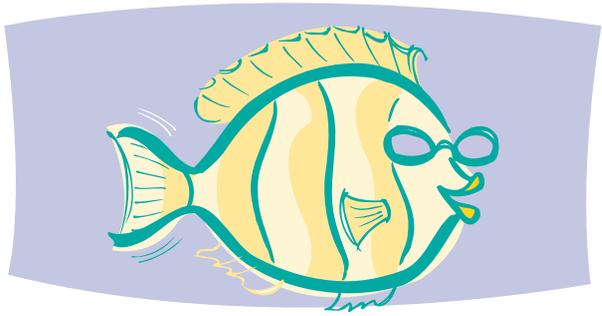
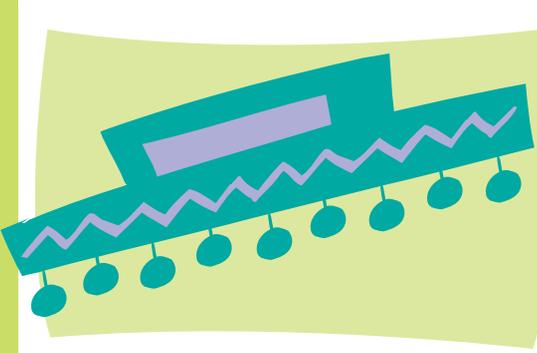


grades 6-8



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6-8 EDUCATIONAL STANDARDS



EDUCATIONAL STANDARDS

		SUNWISE ACTIVITY TITLE		SUBJECT		
English Language Arts	Conduct Short Research Projects to Answer a Question (W.6.7; W.7.7; W.8.7)	X	X	X	X	English/LA, Health
	Engage in a Range of Collaborative Discussions (SL.6.1; SL.7.1; SL.8.1)	X	X	X	X	English/LA, Health
	Analyze the Main Ideas and Supporting Details Presented in Diverse Media and Formats (SL.6.2; SL.7.2; SL.8.2)	X	X	X	X	English/LA, Health, Science
	Present Claims and Findings (SL.6.4; SL.7.4; SL.8.4)	X	X	X	X	English/LA, Health, Social Studies
	Write Informative/Explanatory Texts (W.6.2; W.7.2; W.8.2)			X		English/LA, Social Studies
	Write Narratives to Develop Events (W.6.3; W.7.3; W.8.3)			X	X	English/LA, Social Studies
	Determine the Meaning of Words and Phrases As They Are Used in an Informational Text (RI.6.4; RI.7.4; RI.8.4)	X				English/LA, Science, Social Studies
	Determine Two or More Central Ideas in an Informational Text (RI.6.2; RI.7.2; RI.8.2)			X	X	English/LA, Health
	Evaluate the Soundness of Reasoning and Relevance and Sufficiency of Evidence (RI.6.8; RI.7.8; RI.8.8)				X	English/LA, Health, P.E.
	Health Concepts		X		X	English/LA, Health, P.E.
Health	Influence Factors on Health Behaviors		X			English/LA, Health, P.E., Social Studies
	Health Information and Products	X			X	Math
	Interpersonal Communication		X			English/LA, Math
	Decision-making Skills		X		X	English/LA, Health, Math, Science
	Goal-setting Skills			X	X	English/LA, Health, Math, Science, Art
	Health Enhancing - Behaviors and Risks	X	X	X	X	English/LA, Science
	Personal, Family, and Community Health	X	X		X	Science
						Science
						English/LA, Health, Math, Social Studies
						English/LA, Social Studies
					English/LA, Health, Science	
					English/LA, Health, Science	
					Science, English/LA	
					Science, Health, English/LA	
					English/LA	
					Math	
					Science	
					Science, Math	
					Science, Math	

*Please note that the standards listed in the above table have been paraphrased. For more information on the standards used, please refer to the Educational Standards section of the Tool Kit (page 3).

6-8 EDUCATIONAL STANDARDS



EDUCATIONAL STANDARDS

		SUNWISE ACTIVITY TITLE	SUBJECT
		A Sunny Performance	English/LA, Health
		Sun Wise Show	English/LA, Health
		Sun Scoop	English/LA, Health, Science
		Sun Wise Virtual Vacation	English/LA, Health, Social Studies
		Sun Mythology	English/LA, Social Studies
		Sun-sational Scientists in History	English/LA, Social Studies
		The Sun Shines Around the World	English/LA, Science, Social Studies
		Why Does Winter Make Some People SAD?	English/LA, Health
		Sun-safe Beach Party	English/LA, Health, P.E.
		UV Frisbee Fun	English/LA, Health, P.E.
		Personal Skin Assessment	English/LA, Health, P.E., Social Studies
		Bargain Shopper	Math
		Skin Cancer in Your State	English/LA, Math
		Sun Wise Surveyor	English/LA, Health, Math, Science
		You Are the Architect	English/LA, Health, Math, Science, Art
		Detecting UV Light Using Tonic Water	English/LA, Science
		Gumdrop Science	Science
		UV Frisbee Science	Science
		Be a Sun Wise Traveler	English/LA, Health, Math, Social Studies
		A Sun Wise Legend	English/LA, Social Studies
		Keep an Eye on Sun Safety	English/LA, Health, Science
		Wild for Sun Protection	Science, English/LA
		UV ABCs	Science, Health, English/LA
		Supplemental	
		Sun Wise Flier	English/LA
		Sun Wise Word Problems	Math
		UV Meter Activities	
		What Works? Effectively Blocking UV Rays	Science
		Chart and Graph UV Intensity	Science, Math
		Reflecting UV Radiation	Science, Math
Mathematics	Operations and Algebraic Thinking		X X
	Numbers and Operations		X X
	Measurement and Data		X X
	Geometry		X
Physical Education	Demonstrates Competency in a Variety of Motor Skills and Movement Patterns		X X
	Demonstrates the Knowledge and Skills to Achieve and Maintain Fitness		X
	Exhibits Responsible Personal and Social Behavior That Respects Self and Others		X X
Science	Humans Are Dependent of Their Environmental Interactions (MS-ESS3-1)		X
	Patterns of Motion of the Sun Can Be Observed, Described, Predicted, and Explained (MS-ESS1-1)		X X
	When Light Shines on an Object, It Is Reflected, Absorbed, or Transmitted Through the Object (MS-PS4-2)		X
	Substances React Chemically in Characteristic Ways (MS-PS1-2)		X
	Human Activities Alter the Biosphere (MS-ESS3-3)		X
	Engineering, Technology, and Application of Science (MS-ETS1)		X X X
Social Studies	Culture		X
	People, Places, and Environment		X
	Individual Development and Identity		X
	Global Connections		X

*Please note that the standards listed in the above table have been paraphrased. For more information on the standards used, please refer to the Educational Standards section of the Tool Kit (page 3).



A Sunny Performance

Directions

Use creativity, imagination, and artistic abilities to write a song, commercial, public service announcement (PSA), skit, or one-act play about being sun safe.

Decide which medium you want to use. Brainstorm ideas for your project and determine the kind of message you want to relay. Ideas may include the following: the health effects of overexposure to the sun; sun protection methods — like avoiding burning, avoiding tanning, using sunscreen with SPF 30+, wearing protective clothing, and seeking shade; the UV Index; places where you need to be extra careful; the ozone layer; and the seasons. Visit the SunWise website, www.epa.gov/sunwise, and discover what you can do to protect yourself from the sun's harmful UV rays. After you complete your project, present or perform your finished product for your class. You may even be able to make a recording or a video!

Vocabulary Word

Public Service Announcement (PSA)—A brief announcement distributed by television, radio, or print media that relays an educational and/or social message to the general public.

SPF — Sun Protection Factor; a number indicating how protective a sunscreen is against UVB rays. An SPF 30+ sunscreen blocks about 97 percent of UVB rays or more.



A Sunny Performance

Estimated Time

50–60 minutes

Supplies

Information on sun safety (from the Internet, fact sheets in the *SunWisdom* section, etc.)
Video camera, computer, pencil and paper, or any other recording device (optional)

Learning Objective

The aim of this activity is for students to: 1) learn various ways to protect themselves from overexposure to the sun's harmful UV rays; and 2) understand how the use of specific words and phrases influences meaning and helps convey ideas, including the use of figurative language, technical meaning, and connotation. By researching ideas for their performance, the students will become familiar with sun safety messages. Assess group performances to determine if students have learned about the steps to be sun safe. Have students in the audience evaluate the effectiveness of performances by identifying the main message of the group and pointing out what language the group used that helped convey their message. Use the following questions to guide a discussion:

What was this group's message?

Were they convincing?

What will you do differently now to be sun safe?

Directions

Assign groups to collaborate on the production of a song, commercial, public service announcement (PSA), skit, or one-act play with a sun safety message. Before the students begin, have a brief class discussion about the health effects of overexposure to the sun, sun protection, the UV Index, places where you need to be extra careful, the ozone layer, and the seasons. Also, ask them to think of other PSAs, commercials, or advertisements that have been particularly effective (anti-smoking, anti-violence, etc.) and to carefully consider how their language can help to effectively convey their message.

First, instruct the groups to choose a presentation medium and then brainstorm ideas for the message they would like to relay. The students can visit the SunWise website, or you can copy fact sheets from the *SunWisdom* section of this Tool Kit. When the students have finished developing and rehearsing their project, have them present it to the rest of the class. If the tools are available, record or make a video of their performances.



SunWise Show

Directions

You know the importance of being safe in the sun and the dangers of overexposure to the sun's harmful rays, but some younger children in your local elementary school may not. Help them learn about being SunWise by creating a show.

First, make a list of all the important SunWise rules. Using the list, write a simple script for your show. The script should point out why it's important to be SunWise.

Create the props for your show. You can make puppets out of old socks. A cardboard box or similar item can serve as a stage. Remember your audience is young children, so develop the script accordingly. Once your script and props are ready, rehearse your show. Perform your production for a younger class.

Questions

- 1 Why is it important to be SunWise?
- 2 How can children be SunWise?

*Hippos secrete their own
oily pink sunscreen.*



SunWise Show

(This activity can also be done using PowerPoint.)

Estimated Time

2–3 class periods

Supplies

Socks

Glue

Decorations for puppets, including buttons, beads, and pom-poms for eyes and noses

Bottle caps and jar lids for making hats, eyes, or ears

Cardboard box for a stage

Construction paper to decorate the stage

Computer with PowerPoint (optional)

Learning Objective

This activity will give students an opportunity to play the role of SunWise instructor, while at the same time encouraging them to brush up on their own sun safety knowledge. It will also educate younger children about sun safety. Review SunWise concepts with the class before they begin work on their production.

Directions

Divide the class into groups. Each group will write a script for a SunWise show that will be presented to a younger class. The script should stress the importance of being safe in the sun and how the audience can be SunWise.

Next, if necessary, each group will create props for its show. Puppets can be made out of socks and other decorations. Have materials available for students to create props that are sun safe, like hats with a wide brim and sunglasses. Stages can be fashioned from cardboard boxes and decorated with construction paper. Be available to answer students' questions if you use a PowerPoint show.

Once the groups have completed scripts and props, they should rehearse their productions before presenting to a younger class.

Questions and Answers

- 1 Why is it important to be SunWise? *Being safe in the sun means avoiding overexposure to the sun's harmful UV rays, which can cause skin cancer and other health problems.*
- 2 How can children be SunWise? *Being SunWise involves wearing a sun-safe hat, broad-spectrum sunscreen with a Sun Protection Factor (SPF) of 30 or higher, and sunglasses; seeking shade whenever possible; and limiting time in the midday (10 a.m.–4 p.m.) sun, etc.*

Additional Resource

PowerPoint

<http://office.microsoft.com/en-us/powerpoint/default.aspx>



Sun Scoop

Directions

Use a video camera, computer, pencil and paper, or any other recording device to develop a news story. Story angles could include: how the sun impacts our lives, the health effects of overexposure to the sun, what people do to protect themselves from the sun, or how the UV Index works.

First, select a topic for your news story. Then, gather the facts (who, what, when, where, why, and how) using resources such as the Internet, encyclopedias, or your local newspaper. Interview an expert. This could be a science teacher, nurse, or local weather forecaster. Write a lead and the rest of the story. As a guide, answer the three questions below. Be prepared to share your news story with your class.

Talk with the editor of your school or local paper about printing the news story. Ask your teacher or principal if you can read it over the PA system during morning announcements.

Vocabulary Words

Story Angle—The topic or approach to a news story.

Who, What, When, Where, Why, and How—Questions that form the basic building blocks of any news story. A story might answer some or all of these questions.

Lead—The most important part of the story. The lead is always the first paragraph, and it answers some of the Who, What, When, Where, Why, and How questions.

Questions

- 1 Who is your expert and why did you select them? Prepare a short bio on your expert and include their credentials in your news story.
- 2 What questions will you ask the expert? Justify your reasoning regarding how you chose the questions.
- 3 What is the most important part—or lead—of your story? Give 3 reasons why you chose that particular lead.
- 4 Of the facts gathered, which ones should be included in your story? Construct an argument to support why you chose these facts.
- 5 Design and create two Public Service Announcements (PSAs) to share what you learned through this experience. One PSA should be written for adults and the other for lower elementary-age children. Be sure to choose terminology/vocabulary that is age-specific in both situations.



Sun Scoop

Estimated Time

30–60 minutes

Supplies

Video camera, computer, pencil and paper, or any other recording device (optional)

Paper and pencils

Research materials (encyclopedias, newspapers, or computers)

Learning Objective

This activity uses journalism to raise awareness about the science and risk of overexposure to the sun's harmful UV rays and ways to be sun safe. Assess what students have learned by asking them to include the following in their story: information about how the sun impacts our lives; at least three ways to be sun safe; the effects of ignoring these precautionary measures; and some background information about the sun and UV radiation.

Directions

Assign each student, or group of students, a story angle. If possible, arrange for a science teacher, nurse, or local weather forecaster to come to your classroom. Let the students interview the “expert.” Have the students respond to the questions below as a class and then write their stories individually or in groups.

Questions and Answers

- 1 Who is your expert and why did you select them? Prepare a short bio on your expert and include their credentials in your news story. Students should name their expert and summarize their credentials in a short bio.
- 2 What questions will you ask the expert? Justify your reasoning regarding how you chose the questions. *Students should list 3 – 5 questions and provide justification for their selections.*
- 3 What is the most important part —or lead —of your story? Give 3 reasons why you chose that particular lead. *Students should select one fact as the lead and provide 3 reasons for their selection.*
- 4 Of the facts gathered, which ones should be included in your story? Construct an argument to support why you chose these facts. *Students should list the other facts they will include in their story and construct an argument for their selections.*
- 5 Design and create two Public Service Announcements (PSAs) to share what you learned through this experience. One PSA should be written for adults and the other for lower elementary-age children. Be sure to choose terminology/vocabulary that is age-specific in both situations. *Students should construct two age-specific PSAs demonstrating what they have learned.*

Additional Resources

The National Elementary Schools Press Association
www.nespa.ua.edu

The New York Times Newspaper in Education Program
www.nytimes.com/learning/teachers/NIE/



SunWise Virtual Vacation

Directions

People all over the world enjoy the sun in very different ways. Some may enjoy the beach, while others may take hiking trips in the mountains. No matter where you go, it is important to be SunWise.

Plan a class trip, and make sure you have everything you need to protect yourself from overexposure to the sun's harmful UV rays. Pick a location and use the suggested websites to help answer questions about it. While researching the country, consider how the country's environment influences the behavior of the people who live there. Write a letter to your classmates and tell them about your trip and what you have learned. Be sure to give your classmates tips on how to be SunWise. Use the ten questions below as a guide for your letter. Read your letter to the class.

Have fun on your trip! The Internet has many "vacation" sites. You'll do some research and discover many things about different people, their countries, and the sun.

Some suggested vacation spots:

Galapagos
www.galapagos.org

Puerto Rico
www.seepuertorico.com

Spain
www.spain.info

India
www.incredibleindia.org

Kenya
www.porini.com/kenya.html

Australia
www.australia.com

Antarctica
www.expeditions.com/destinations/antarctica

Other resources to help you pick a place to visit:

www.geographia.com

<http://kids.nationalgeographic.com>



Resources to learn about the weather at your vacation spot and SunWise practices:

www.weather.com

www.intellicast.com

www.weatherbase.com

www.epa.gov/sunwise/kids/kids_actionsteps.html

Questions

- 1 How did you protect your skin and eyes while on your vacation?
- 2 What did you pack for your trip?
- 3 What did you do on your trip?
- 4 What do people in the country (or state) that you visited do for recreation? Where do they vacation?
- 5 What kind of outdoor activities do they like?
- 6 What is the climate like? What is the country's/state's environment?
- 7 How do the local people stay cool/warm?
- 8 What kinds of clothes do people wear?
- 9 What type of houses do people live in?
- 10 How do people protect their skin and eyes?
- 11 How does the country's environment influence the behavior of the people who live there?



SunWise Virtual Vacation

Estimated Time

45 minutes

Learning Objectives

This activity gives students the opportunity to learn about different cultures, develop Internet research skills, and think about their interaction with the sun during recreational activities. Students should also understand that humans are dependent on their environmental interactions—both living and nonliving. This research may alert them to the risks associated with vacation activities in the sun. Assess what they have learned about these risks by making sure they include sun safety tips for their classmates in the letter they compose.

Directions

Divide the students into small groups suitable for your classroom size and setup. Discuss possible “vacation” spots they would like to visit. Have each group pick a location and use the suggested websites to research the answers to the questions. You may want to develop a list of possible sites and make sure there are no duplicate locations. Students will compose a letter to their classmates that includes the answers to the questions. The groups will then share their letter with the class.

Some suggested vacation spots:

Galapagos
www.galapagos.org

Spain
www.spain.info

Puerto Rico
www.seepuertorico.com

India
www.incredibleindia.org

Kenya
www.porini.com/kenya.html

Australia
www.australia.com

Antarctica
www.expeditions.com/destinations/antarctica

Other resources to help you pick a place to visit:

www.geographia.com

<http://kids.nationalgeographic.com>

Physical Education and Social Studies Variation:

After choosing your vacation location, have students try or demonstrate the native sports and activities of that country. This activity can be coordinated with social studies lessons or an all-school cultural event. Try bocce ball, petanque, speedaway, rugby, badminton, croquet, or soccer, or make up your own versions of rugby, lacrosse, and games that will be new to participants and age appropriate. You can even dress in the country’s native clothing or discuss how citizens in these countries protect their skin. This event might also be used as an outreach vehicle to include parents or community members who have experience with activities native to other countries.



Resources to learn about the weather at your vacation spot and SunWise practices:

www.weather.com

www.intellicast.com

www.weatherbase.com

www.epa.gov/sunwise/kids/kids_actionsteps.html

Students should answer the following questions in their letter to the class.

Questions and Answers

Answers to questions 2–9 should reflect students' research on their location.

- 1** How did you protect your skin and eyes while on your vacation? *Do not burn, avoid tanning, use sunscreen, cover up and wear sunglasses, seek shade, and check the UV Index.*
- 2** What did you pack for your trip?
- 3** What did you do on your trip?
- 4** What do people in the country/state that you visited do for recreation? Where do they vacation?
- 5** What kinds of outdoor activities do they like?
- 6** What is the climate like? What is the country's/state's environment?
- 7** How do the local people stay cool/warm?
- 8** What kinds of clothes do people wear?
- 9** What types of houses do people live in?
- 10** How do people protect their skin and eyes? *Answers should reflect students' research on their location and include prevention action steps such as avoiding burning, avoiding tanning, using sunscreen, covering up and wearing sunglasses, seeking shade, and checking the UV Index.*
- 11** How does the country's environment influence the behavior of the people who live there?



Sun Mythology

Directions

Read the sun myth “Odhinn, One-Eyed Warrior” for inspiration, and then write your own original sun myth. Be creative. Your sun myth may focus on a fictitious or actual cultural group or figure.

“Odhinn, One-Eyed Warrior”¹

Odhinn is a Norse sun god. Odhinn is also known as Woden. The Germanic word “wuten” means “to rage.”

Befitting a lord of the sun, Odhinn is often depicted dressed as a warrior. His armor is forged in the sacred metal of solar deities. He wears a chest-plate of pure gold. On his head is a golden-horned helmet. His weapon is the golden spear forged magically by dwarfs, and he rides an eight-legged horse across the sky.

As a warrior lord, Odhinn is served by the Valkyries, warrior maids who participate in every Earthly battle and determine its outcome. Odhinn is also the inspiration behind the famed berserkers, warriors crazed with the fury of the battle.

The sun god has one eye. It is said that he gave the other eye for the gift of magic mead, a drink of poetic inspiration and knowledge. Odhinn plucked his eye from its socket and dropped it into the well of Mimir so he could drink from the magic waters and gain infinite wisdom.

The great inspiration of the enchanted well had a powerful effect on the warrior. He became known as a great healer and as the god of poetry. Still, he retained his position as the sun god, and in his battle fury, he was known as the One-Eyed Warrior.

To start writing your own sun myth, answer the following questions:

- 1 During what period of time does your sun myth take place?
- 2 Where does your sun myth take place?
- 3 In your sun myth, who are the main character(s)?
- 4 What powers does your main character(s) have?
- 5 What effect or change has your character(s) made?

¹ Adapted from the book [Sun Lore: Folktales and Sagas from Around the World](#), by Gwydion O’Hara



Sun Mythology

Estimated Time

30–45 minutes

Supplies

Sun myth texts listed below or others you discover on your own.

Krupp, Dr. E.C. [Beyond the Blue Horizon: Myths and Legends of the Sun, Moon, Stars, and Planets.](#) 1992.

McDermott, Gerald. [Arrow to the Sun: A Pueblo Indian Tale.](#) 1974.

O'Hara, Gwydion. [Sun Lore: Folktales and Sagas from Around the World.](#) 1997.

St Rain, Tedd. Ed. [Sun Lore of All Ages: A Survey of Solar Mythology, Folklore, Customs, Worship, Festivals, and Superstition.](#) 1999.

Luomala, Katharine. [Oceanic, American Indian and African Myths of the Snaring Sun.](#) 1988.

www.windows.ucar.edu

Learning Objective

The students will learn that people from all over the world have different stories about the sun. Before reading the story, ask students what they know about the sun; for example, its location in our galaxy; its life as a star; and its importance to the ecosystem of our planet. Write their ideas on the board.

After reading the story, assess what students have learned by comparing their own knowledge about the sun with that of other ancient cultures (the Norse, for example).

Directions

Use the example myth on the Student Page or other sun myth texts as a catalyst for a classroom discussion about the many cultures that have myths and folklore associated with the sun. Read one or two sun myths aloud or make photocopies of additional texts for silent reading.

Instruct your students to write their own sun myth. To get them started, have them answer the questions listed after the reading. Encourage students to use descriptive and colorful language. Their myths should focus either on a fictitious or actual cultural group or figure.

Once your students complete their assignment, have volunteers read their myths aloud to their classmates. After sharing a number of original sun myths, engage students in a discussion about the importance of the sun as a powerful energy supply and a source of life on Earth.

Discussion

Why do so many cultures, past and present, revere the sun? Possible answers include: In ancient times, people were afraid of the sun because they did not understand its motion across the sky; the sun is a producer of crops, and as such, they consider the sun a generous god; scientists study the sun as an example of a medium-sized Class III star that is merely one of 200–300 billion in this galaxy alone, but sustains all life on Earth.



Sunsational Scientists in History

Directions

Research and write short paragraphs about these topics and historic people:

Ptolemy
Geocentrism
Heliocentrism
Nicolas Copernicus
Galileo Galilei

Find a correlation between the topics and people. Discuss your findings with the class to piece the history together.

Draw a picture or write a short story about how you believe the world would be different if we still thought the sun revolved around the Earth.

Questions

- 1 Pretend you are Ptolemy, Copernicus, or Galileo and write a journal entry about your beliefs, how people are treating you, and what you think the world will be like in the future.
- 2 What if scientists had not discovered the adverse effects of overexposure to UV rays? What do you think would be different about how we plan our trips to the beach and other outdoor activities? Would sunscreen have been invented? Would people always burn when outside?



Sunsational Scientists in History

Estimated Time

30–45 minutes

Supplies

Access to the school library and/or the Internet

Learning Objective

Through this investigation, the students will learn about the scientists and societal beliefs that contributed to the information we now know about the sun. Use the questions to assess correlations the students have made from their research.

Directions

Take your class to the library to do research on the astronomical history of the sun.

Students will research and write short paragraphs about these topics and historic people:

Ptolemy
 Geocentrism
 Heliocentrism
 Nicolas Copernicus
 Galileo Galilei

Students should be able to see the correlation between the topics and the people. Discuss the findings with the class and piece the history together. What is the correlation?

Ptolemy, believed to have lived between AD 100–170, was a famous astronomer and mathematician, even though most of his theories were later proven incorrect. His theories formed the foundation for future astronomers and mathematicians. His theories dominated the scientific field until the 16th century. He considered the Earth as the center of the universe (geocentrism).

Nicolas Copernicus was a Polish astronomer who lived between 1473–1543. Before his time, people believed in the Ptolemaic (named after the Greek astronomer Ptolemy) model of the solar system. This model showed that the Earth was the center of the universe, but it did not work well enough to predict the positions of the planets. In 1543, Copernicus started a scientific revolution when he published a theory called heliocentrism, which stated that all the planets, including Earth, revolved around the sun.

Galileo Galilei was an Italian astronomer and physicist who lived between 1564–1642. He challenged ancient beliefs that heavenly bodies, like stars and planets, were divine and therefore perfect. In 1609, Galileo became the first person to use a telescope to look at the universe. He discovered sunspots, craters, and peaks in Earth's moon. After his great discoveries, he published a book about sunspots and discussed Ptolemaic and Copernican theories.



Questions and Answers

- 1** Pretend you are Ptolemy, Copernicus, or Galileo and write a journal entry about your beliefs, how people are treating you, and what you think the world will be like in the future. *Students should correctly describe the beliefs of their chosen astronomer and the persecution that astronomer underwent. Students should come up with creative ideas of what the world will be like in the future.*
- 2** What if scientists didn't discover the adverse effects of overexposure to the sun's UV rays? What do you think would be different about how we plan our trips to the beach and other outdoor activities? Would sunscreen have been invented? Would people always burn when outside? *Possible answers include: People would not consider the harmful impacts of overexposure to the sun's UV rays when they plan trips to the beach; sunscreen may never have been invented, since people would not know that they need to protect themselves from the sun; people may burn frequently when they are outside.*

Additional Resource

www.windows.ucar.edu

Enter site, click People, then click Renaissance.



The Sun Shines Around the World

Directions

Use encyclopedias, periodicals, the Internet, or books to research your assigned country and answer the questions below. Be prepared to share your findings with your classmates.

Questions

- 1 What is the name of the country you researched?
- 2 On what continent is the country?
- 3 What countries or physical features border the country?
- 4 In what types of houses do the people of this country live? Of what are the houses made? How do the houses help the people of this country protect themselves from the sun?
- 5 What kinds of clothes do the people of this country wear?
- 6 Describe a few customs that people in this country have that protect them from the sun.
- 7 What are at least three differences between your state and the country you researched?
- 8 Summarize how the environment of the country influences the behavior of the people who live there.



The Sun Shines Around the World

Estimated Time

20–45 minutes

Supplies

Map of the world (for display)

Research materials (encyclopedias, travel or geography magazines, or computers)

Learning Objective

This activity will teach students about a variety of ways people all over the world protect themselves from overexposure to the sun's harmful UV rays. Students will understand how a country's environment influences the behavior of the people who live there. After completing the activity, students should be able to describe different ways individuals from the country researched practice sun safety.

Directions

Assign a student or pair of students to research a country. Instruct the students to use the questions below as a guide.

Questions and Answers

Answers should match the country researched.

- 1 What is the name of the country you researched?
- 2 On what continent is the country?
- 3 What countries or physical features border the country? *Student should name bordering countries, bodies of water, etc.*
- 4 In what types of houses do the people of this country live? Of what are the houses made? How do the houses help the people of this country protect themselves from the sun?
- 5 What kinds of clothes do the people of this country wear?
- 6 Describe a few customs that people in this country have that protect them from the sun.
- 7 What are at least three differences between your state and the country you researched?
- 8 Summarize how the environment of the country influences the behavior of the people who live there.

Additional Resource

www.geographia.com

Geographia offers a variety of information on housing, clothing, and customs of countries throughout the world.



Why Does Winter Make Some People SAD?

Vocabulary Words

Lethargy—The quality or state of being lazy, sluggish, or indifferent.

Melatonin—A chemical produced in the pineal gland of the brain that tells the body when it is nighttime and makes us feel tired.

Pineal gland—The specific area of the brain that produces melatonin.

Serotonin—A chemical in the brain that regulates our moods (like happiness, anger, and aggression).

Directions

Read the information provided describing Seasonal Affective Disorder (SAD) and answer the questions.

What is SAD?

Overexposure to ultraviolet (UV) radiation from the sun can damage skin and eyes and cause skin cancer. But despite these and other harmful effects, the sun is necessary for life to survive on Earth. Too little sunlight can contribute to Seasonal Affective Disorder (SAD). Human

beings and animals react to changing seasons with changes in mood and behavior. Most people find they eat and sleep slightly more in winter and dislike the dark mornings and short days. At night, the pineal gland in our brain produces melatonin to make us sleepy, and when morning comes the sunlight triggers the pineal gland to stop producing melatonin so we can wake up. During the winter months there is less light and we produce more melatonin, which can make many people feel more tired than they would in the spring, summer, and fall. Although no one is sure exactly why too much melatonin can make us feel sad, it may be caused by lowering another chemical in the brain called serotonin. In many people, feelings of depression are caused by too little serotonin in the brain.

For some people, symptoms are severe enough to affect their ability to lead normal lives. These people may be suffering from SAD, also known as winter depression. People with SAD may have trouble with sleeping, overeating, depression, lethargy, as well as other physical and mental problems.

Whom does SAD affect?

Across the world, the incidence of SAD increases with distance from the equator, where the nights get very long during the winter (except in areas where there is a lot of snow on the ground, which helps to reflect sunlight and keep our melatonin



levels down). People with SAD have symptoms from around September until April, and the symptoms are worse during the darkest months. Both children and adults can suffer from SAD, and it usually affects more women than men.

How can SAD be treated?

SAD can be treated with daily exposure to bright light. Making sure to spend some time outside each day can help people to feel better. Some people with SAD also use a special machine, called a “light box,” which they shine on themselves in order to keep their melatonin levels down. These machines produce visible light, and do not emit harmful UV rays. The light produced by a light box is about as bright as a spring morning on a clear day. As little as 15 to 30 minutes of light box therapy helps some people to feel better.

Questions

- 1** Pretend you are a doctor. List three questions you would ask your patients to determine if they have SAD.
- 2** Consider the symptoms of SAD. Can you make an educated guess about the causes of SAD? List three possible causes of SAD.
- 3** If you noticed that one of your friends was frequently tired and grumpy during your winter vacation, what would you recommend he or she do?
- 4** Make a list of the risks and benefits of exposure to the sun.



Why Does Winter Make Some People SAD?

Estimated Time

30–45 minutes

Learning Objective

This activity will help students understand the science of the sun and its good effects on people. Students will read a short selection about Seasonal Affective Disorder (SAD). They will propose a cause for SAD after “diagnosing” the problem. Review their answers to question number four to assess if they understand the risks and benefits of exposure to the sun.

Directions

After instructing students to read the information provided describing SAD, ask them to answer the questions. If they have trouble answering the questions, help them by sharing some of the additional information provided. Discuss the cause and treatment of SAD with the class.

What is SAD?

Overexposure to ultraviolet (UV) radiation from the sun can damage skin and eyes and cause skin cancer. But despite these and other harmful effects, the sun is necessary for life to survive on Earth. Too little sunlight can also contribute to Seasonal Affective Disorder (SAD). Human beings and animals react to changing seasons with changes in mood and behavior.

Most people find they eat and sleep slightly more in winter and dislike the dark mornings and short days. At night, the pineal gland in our brain produces melatonin to make us sleepy, and when morning comes the sunlight triggers the pineal gland to stop producing melatonin so we can wake up. During the winter months there is less light and we produce more melatonin, which can make many people feel more tired than they would in the spring, summer, and fall. Although no one is sure exactly why too much melatonin can make us feel sad, it may be caused by lowering another chemical in the brain called serotonin. In many people, feelings of depression are caused by too little serotonin in the brain.

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Whom does SAD affect?

Across the world, the incidence of SAD increases with distance from the equator, where the nights get very long during the winter (except in areas where there is a lot of snow on the ground, which helps to reflect sunlight and keep our melatonin levels down). People with SAD have symptoms from around September until April, and the symptoms are worse during the darkest months. Both children and adults can suffer from SAD, and it usually affects more women than men.



How can SAD be treated?

SAD can be treated with daily exposure to bright light. Making sure to spend some time outside each day can help people to feel better. Some people with SAD also use a special machine, called a “light box,” which they shine on themselves in order to keep their melatonin levels down. These machines produce visible light, and do not emit harmful UV rays. The light produced is about as bright as a spring morning on a clear day. As little as 15 to 30 minutes of light box therapy helps some people to feel better.

Questions and Answers

- 1 Pretend you are a doctor. List three questions you would ask your patients to determine if they have SAD. *Possible answers: 1) Do you find you sleep more in the winter? 2) During the winter, do you have many mood swings? 3) Do you eat more during the winter months?*
- 2 Consider the symptoms of SAD. Can you make an educated guess about the causes of SAD? List three possible causes of SAD. *Possible answers: lack of sunlight, decreased levels of serotonin, increased levels of melatonin.*
- 3 If you noticed that one of your friends was frequently tired and grumpy during your winter vacation, what would you recommend he or she do? *Possible answers before group discussion include: get more rest, get more exercise, or spend more time with friends and family. Possible answers after group discussion include: spend time outside on sunny days, visit a sunny place, sit in front of a light box.*
- 4 Make a list of the risks and benefits of exposure to the sun. *Risks include: skin cancer, cataracts, premature aging of the skin, and suppression of the immune system. Benefits include: alleviation of depression caused by SAD, and vitamin D synthesis.*

Additional Resources

www.mayoclinic.org/diseases-conditions/seasonal-affective-disorder/basics/definition/CON-20021047
Information about SAD from Mayo Clinic.

http://kidshealth.org/teen/your_mind/feeling_sad/sad.html (Nemour Foundation)

Nemours is one of the largest nonprofit organizations devoted to children’s health. Their website is written in a question and answer format using non-clinical language. The site provides fundamental information about SAD.



Sun-safe Beach Party

Directions

Pretend that the class is at the beach and set up the gym the way you would at the beach. Start an indoor volleyball game, throw the UV Frisbee®, play a game with an inflatable beach ball, or gather some friends for a game of hackey sack. Set up face painting using zinc oxide cream.

After the “beach party,” your teacher will divide students into two groups. One group will take the position that people with dark tans look more attractive than people without tans. The other group will take the position that people who use sunscreen, hats, and clothing to protect themselves from the sun are more attractive and wise. With your group, develop arguments to support your position and prepare a short presentation for the class.

Vocabulary Words

Melanoma—Dark-pigmented malignant moles or tumors.

Malignant—Inclined to cause harm; very dangerous or harmful.

Questions

- 1 Dermatologists believe there is a link between childhood sunburns and malignant melanoma later in life. What can you do differently to prevent this from happening?
- 2 What does SPF stand for, and how does it affect you and what you do when you are outdoors?
- 3 What does UV stand for, and how does it affect you?
- 4 Sunscreen with SPF 30+ helps protect you from harmful UVB radiation. Prepare a short written statement to share with a younger child to explain what this means.



Sun-safe Beach Party

Estimated Time

30–45 minutes

Supplies

UV Frisbee®

Inflatable beach ball

Hacky sack

Zinc oxide cream in different colors

Volleyball equipment

Summer food (fruits, chips, water,
peanut butter and jelly sandwiches)

Learning Objective

The objective of this activity is to demonstrate and practice sun-safe behaviors. Students will practice taking a position and defending that position in a logical, respectable way. Assess what students have learned by asking what they would do differently when indoors versus outdoors.

Directions

Before the students engage in the activity, have a discussion about how this event will be different from a real day at the beach. Discuss pros and cons. Suggest ways to protect yourself when you are at the beach (e.g., do not burn, avoid tanning, use sunscreen, cover up, seek shade, and check the UV Index). At the conclusion of the party, divide students into two groups. Assign each group a position about tanning versus protecting one's skin from the sun. Give the students time to form their arguments and prepare their presentation.

Questions and Answers

- 1 Dermatologists believe there is a link between childhood sunburns and malignant melanoma later in life. What can you do differently to prevent this from happening? *Answers will list prevention tactics, such as wearing sunscreen, limiting time in the sun between 10 a.m. and 4 p.m., and wearing a hat and sunglasses.*
- 2 What does the sunscreen SPF stand for, and how does it affect you and what you do when you are outdoors? *SPF stands for Sun Protection Factor, and it reveals the relative amount of sunburn protection from UVB radiation that a sunscreen can provide an average user (tested on skin types 1, 2, and 3) when correctly used.*
- 3 What does UV stand for, and how does it affect you? *UV stands for ultraviolet. UV rays can cause skin cancer, premature aging of the skin, cataracts, and immune system suppression.*
- 4 Sunscreen with SPF 30+ helps protect you from harmful UVB radiation. Prepare a short written statement to share with a younger child to explain what this means. *Answers will vary and should be tailored for a younger audience. Although SPF ratings apply mainly to UVB rays, many sunscreen manufacturers include ingredients that protect the skin from some UVA rays as well. These “broad-spectrum” sunscreens are highly recommended. Students should understand that higher SPF's do not block more UVA rays unless the sunscreen is also labeled broad spectrum. An SPF of 30 protects the skin from 97 percent of UVB radiation, while SPF 50 blocks 98 percent.*



UV Frisbee® Fun

Directions

Before having UV Frisbee Fun, predict the time it will take the UV Frisbee to change color once it is exposed to sunlight.

Cover the UV Frisbee as you carry it outside, and start timing as soon as you expose it to the sun.

Questions

- 1 Why did you cover the UV Frisbee?
- 2 How long did the UV Frisbee take to change color once it was exposed to sunlight?
- 3 How close was your prediction?
- 4 What part of your body does the UV Frisbee represent? Compare the change in the UV Frisbee to the change in your body.





UV Frisbee® Fun

Estimated Time

30 minutes

Supplies

UV Frisbee

Stop watch

Additional non-UV Frisbees (optional)

Learning Objective

The objective of this activity is to demonstrate the effects of UV radiation while exercising at the same time. Assess the students' understanding of the effects of UV radiation by asking them to list some possible outcomes of overexposure to the sun's harmful UV rays.

Directions

Use the UV Frisbee included in the SunWise Tool Kit to show students the effects of UV radiation. For information about UV radiation and the health effects of sun overexposure, please review the *SunWisdom* section of the Tool Kit.

Explain to students how the UV Frisbee works. Before you begin UV Frisbee Fun, ask the students to predict the amount of time it will take the UV Frisbee to change color once it is exposed to outdoor light. Cover the UV Frisbee as you carry it outside, and start timing as soon as you expose it to the sun. Ask students why you covered the UV Frisbee. Once exposed to the sun, the UV Frisbee will begin changing color almost immediately.

Ask the students to remember their predictions and compare them to the actual time it took the UV Frisbee to change colors. Discuss the effects of UV radiation and the importance of being protected from the sun's harmful UV rays.

Questions

- 1 Why did you cover the UV Frisbee? *To protect it from exposure to the sun's UV rays.*
- 2 How long did the UV Frisbee take to change color once it was exposed to sunlight? *The UV Frisbee changed color almost immediately.*
- 3 How close was your prediction? *Answers will vary.*
- 4 What part of your body does the UV Frisbee simulate? *The skin.* Compare the change in the UV Frisbee to the change in your body. *Answer should reflect the idea that our skin changes color like the UV Frisbee if it is not protected from the sun's harmful UV rays.*

Now, search for a sun-safe spot on your playground and have some UV Frisbee Fun! If your class is large, use additional Frisbees.



Personal Skin Assessment

Risk Factor	SELF		Family Member 1		Family Member 2		Family Member 3	
	Yes	No	Yes	No	Yes	No	Yes	No
Light or fair skin								
Blue, green, or hazel eye color								
Blonde or red hair								
Freckles when in the sun								
Burn when in the sun								
40 or more moles								
Family or personal history of melanoma								
Living in the Sunbelt								
Living in high altitudes								
Two or more blistering sunburns								
Exposure to UV radiation from tanning machines or medical treatment								
Taking medications that increase the skin's photosensitivity (some antibiotics and antihistamines)								

Adapted from Project S.A.F.E.T.Y., *Risk and Risk Factors*, Elementary Safety Lesson Five.



Personal Skin Assessment

Estimated Time

30 minutes during one class period

15 minutes during second class period
(or optional homework exercise)

Supplies

Markers or crayons
Magazines (optional)
Glue (optional)

Learning Objective

After completing this activity, students will understand the need to be careful when at risk of overexposure to harmful UV rays. Students who possess risk factors will develop a heightened sense of their own risk. To assess student comprehension of the risk and prevention message, ask them to make a flier, poster, or collage for the classroom or school that depicts individuals practicing UV safety.

Directions

Teachers are cautioned to be sensitive to the privacy concerns of students during this activity. Also be aware that students may answer no to all the questions, thereby allowing for the misconception that they are not at risk for overexposure to UV radiation. Instruct students to evaluate their own risk factors, checking off yes or no in each column. Have students go back to their seats and by a show of hands, take a count of the responses on the risk assessment. Ask students to predict on paper the risk level of their family members. As a homework assignment, have students evaluate their families for risk factors. During the next class period, assign one student to be a recorder on the chalkboard of five to ten randomly selected responses you read aloud. Discuss risk factors with the class and ask students to list ways to prevent overexposure to the sun. Have them relate what they learned about tanning booths.

Using the fact sheets (located in the *Sun Wisdom* section of the Tool Kit) as your guide, discuss the prevention steps with the class. Stress the importance of protection from harmful UV rays, especially for individuals who have several risk factors.



Bargain Shopper

Directions

Make a list of items you might purchase to use as protection against the sun's harmful UV rays.

Now "go shopping" for these items. Look for them in magazine or newspaper ads, catalogs, or on the Internet. Check whether you have some of the products at home—they may still have a price tag. Develop a list that compares the prices for different items and brands.

Imagine that you have \$50 to spend on your protective items. Describe how you will use that money to buy sun-safe items. Keep in mind that some sun-safe items may be free.

Share your list with the class and see who was able to buy the most for \$50.

Items	Cost
	\$50.00



Bargain Shopper

Estimated Time

45 minutes

Students may also spend some time doing research as homework.

Supplies

Newspaper sales flyers

Catalogs

Computer

Learning Objective

The objective of this activity is to help students understand the variety of ways in which they can protect themselves from the sun's harmful UV rays. After completing this activity, students should understand that using sunscreen, hats, and sunglasses are examples of SunWise behavior. Assess whether the students understand that they must protect themselves from the sun's harmful UV rays by asking them to draw a diagram depicting their preparation for their next visit to the park or beach. Look for the gathering of sun safety gear as a key preparation element.

Directions

Instruct students to develop lists of items used to protect against the sun's harmful UV rays. For example: sunscreen, sunglasses, long-sleeved shirts, umbrellas, etc. Have the students "go shopping" for these items by looking up prices in advertisements, on the Internet, or at home. They should then develop a list of prices for each item. The list may duplicate some items (e.g., one cost for Brand X sunscreen and another for Brand Y).

Tell the students that they have \$50 with which to purchase protective items for a day at the beach, a ski trip, or any type of outing. They should figure out how to maximize their budget while still buying all the necessary items. Students can include "free" items, such as "staying indoors" or "eating lunch in the shade" in their budget.

Ask the students to share their lists with the class and see who was able to buy the most for \$50.



Skin Cancer in Your State

Directions

The estimated number of new melanoma cases diagnosed per year in each state is provided, along with the total population of each state. Calculate the percentage of individual cases of melanoma in each state by dividing the number of new cases by the total state population. Figure your percentage to three decimal places, and write it on the line provided for only 10 states, including your own. Then plot the data in the bar graph for the states you chose. Next, figure out the ratio of new cancer cases in those 10 states.

Questions

- 1 How high is the risk in your state?
- 2 Rank the states in order from lowest to highest risk. How does the risk in your state compare to others? Why are there differences?
- 3 What can you do to lower your risk for getting skin cancer?

One American dies of melanoma every hour.

More than 3.5 million cases of skin cancer are diagnosed each year, making it the most common of all cancers in the United States.

Skin Cancer in Your State

Estimated U.S. Melanoma Cases, 2012

State	New Melanoma Cases*	Population**	Percentage	Ratio
Alabama	1,090	4,822,023	_____	_____
Alaska	70	731,449	_____	_____
Arizona	1,650	6,553,255	_____	_____
Arkansas	570	2,949,131	_____	_____
California	9,250	38,041,430	_____	_____
Colorado	1,470	5,187,582	_____	_____
Connecticut	1,290	3,590,347	_____	_____
Delaware	280	917,092	_____	_____
District of Columbia	80	632,323	_____	_____
Florida	5,450	19,317,568	_____	_____
Georgia	2,150	9,919,945	_____	_____
Hawaii	280	1,392,313	_____	_____
Idaho	400	1,595,728	_____	_____
Illinois	2,460	12,875,255	_____	_____
Indiana	1,450	6,537,334	_____	_____
Iowa	850	3,074,186	_____	_____
Kansas	610	2,885,905	_____	_____
Kentucky	1,370	4,380,415	_____	_____
Louisiana	810	4,601,893	_____	_____
Maine	480	1,329,192	_____	_____
Maryland	1,420	5,884,563	_____	_____
Massachusetts	2,190	6,646,144	_____	_____
Michigan	2,700	9,883,360	_____	_____
Minnesota	1,130	5,379,139	_____	_____
Mississippi	510	2,984,926	_____	_____

* 2012 melanoma statistics are from the American Cancer Society:
www.cancer.org/acs/groups/content/@epidemiologysurveillance/documents/document/acspc-031941.pdf.

** The census data are from 2012. For more information about the estimated 2012 U.S. Census data by state, visit www.census.gov/popest/data/state/totals/2012/index.html.

Skin Cancer in Your State

Estimated U.S. Melanoma Cases, 2012

State	New Melanoma Cases*	Population**	Percentage	Ratio
Missouri	1,280	6,021,988	_____	_____
Montana	320	1,005,141	_____	_____
Nebraska	380	1,855,525	_____	_____
Nevada	510	2,758,931	_____	_____
New Hampshire	470	1,320,718	_____	_____
New Jersey	2,340	8,864,590	_____	_____
New Mexico	560	2,085,538	_____	_____
New York	4,700	19,570,261	_____	_____
North Carolina	2,360	9,752,073	_____	_____
North Dakota	130	699,628	_____	_____
Ohio	3,030	11,544,225	_____	_____
Oklahoma	750	3,814,820	_____	_____
Oregon	1,290	3,899,353	_____	_____
Pennsylvania	3,470	12,763,536	_____	_____
Rhode Island	290	1,050,292	_____	_____
South Carolina	1,150	4,723,723	_____	_____
South Dakota	170	833,354	_____	_____
Tennessee	1,640	6,456,243	_____	_____
Texas	4,020	26,059,203	_____	_____
Utah	780	2,855,287	_____	_____
Vermont	220	626,011	_____	_____
Virginia	2,150	8,185,867	_____	_____
Washington	2,140	6,897,012	_____	_____
West Virginia	520	1,855,413	_____	_____
Wisconsin	1,370	5,726,398	_____	_____
Wyoming	150	576,412	_____	_____
TOTAL	76,250	313,914,040		



Skin Cancer in Your State

Estimated Time

40–50 minutes

Learning Objective

This activity will raise student awareness of skin cancer statistics. It will also help students gauge the risk they incur from their environment and reinforce the SunWise message, while they practice math skills. Assess whether they understand the importance of protecting themselves from harmful UV rays by asking them to make a bar chart that demonstrates risk in their state and nine others.

Directions

This exercise will show students their relative risk for melanoma, as determined by location. It will also give them practice in calculating percentages and ratios, working with decimals, and graphing data.

The estimated melanoma rates by state, from the American Cancer Society, and the estimated state populations, from the U.S. Census Bureau, are listed. The students should calculate the percentage (to three decimal places) of people in 10 states, including their own, expected to be diagnosed with skin cancer. They will then graph the information to get a sense of the effects of skin cancer on the population. To further understand these effects, have the student calculate ratios in the space provided.

Questions and Answers

- 1 How high is the risk in your state? *Students should answer based on their calculations.*
- 2 Rank the states in order from lowest to highest risk. How does the risk in your area compare to others? Why are there differences? *Answers will vary and should address location of state. Students should have each state ranked from 1–10, and note their state's risk relative to other states.*
- 3 What can you do to lower your risk for getting skin cancer? *Do not burn. Limit time in the midday sun, seek shade, always use sunscreen, wear a hat, cover up, wear sunglasses that block UV radiation, avoid sunlamps and tanning parlors, and check the UV Index.*

Skin Cancer in Your State

Estimated U.S. Melanoma Cases, 2012

State	New Melanoma Cases	Population	Percentage	Ratio
Alabama	1,090	4,822,023	0.023%	1:4424
Alaska	70	731,449	0.010%	1:10449
Arizona	1,650	6,553,255	0.025%	1:3972
Arkansas	570	2,949,131	0.019%	1:5174
California	9,250	38,041,430	0.024%	1:4113
Colorado	1,470	5,187,582	0.028%	1:3529
Connecticut	1,290	3,590,347	0.036%	1:2783
Delaware	280	917,092	0.031%	1:3275
District of Columbia	80	632,323	0.013%	1:7904
Florida	5,450	19,317,568	0.028%	1:3545
Georgia	2,150	9,919,945	0.022%	1:4614
Hawaii	280	1,392,313	0.020%	1:4973
Idaho	400	1,595,728	0.025%	1:3989
Illinois	2,460	12,875,255	0.019%	1:5234
Indiana	1,450	6,537,334	0.022%	1:4509
Iowa	850	3,074,186	0.028%	1:3617
Kansas	610	2,885,905	0.021%	1:4731
Kentucky	1,370	4,380,415	0.031%	1:3197
Louisiana	810	4,601,893	0.018%	1:5681
Maine	480	1,329,192	0.036%	1:2769
Maryland	1,420	5,884,563	0.024%	1:4144
Massachusetts	2,190	6,646,144	0.033%	1:3035
Michigan	2,700	9,883,360	0.027%	1:3661
Minnesota	1,130	5,379,139	0.021%	1:4760
Mississippi	510	2,984,926	0.017%	1:5853
Missouri	1,280	6,021,988	0.021%	1:4705
Montana	320	1,005,141	0.032%	1:3141
Nebraska	380	1,855,525	0.020%	1:4883
Nevada	510	2,758,931	0.018%	1:5410
New Hampshire	470	1,320,718	0.036%	1:2810
New Jersey	2,340	8,864,590	0.026%	1:3788
New Mexico	560	2,085,538	0.027%	1:3724
New York	4,700	19,570,261	0.024%	1:4164
North Carolina	2,360	9,752,073	0.024%	1:4132
North Dakota	130	699,628	0.019%	1:5382
Ohio	3,030	11,544,225	0.026%	1:3810
Oklahoma	750	3,814,820	0.020%	1:5086
Oregon	1,290	3,899,353	0.033%	1:3023
Pennsylvania	3,470	12,763,536	0.027%	1:3678
Rhode Island	290	1,050,292	0.028%	1:3622
South Carolina	1,150	4,723,723	0.024%	1:4108
South Dakota	170	833,354	0.020%	1:4902
Tennessee	1,640	6,456,243	0.025%	1:3937
Texas	4,020	26,059,203	0.015%	1:6482
Utah	780	2,855,287	0.027%	1:3661
Vermont	220	626,011	0.035%	1:2846
Virginia	2,150	8,185,867	0.026%	1:3807
Washington	2,140	6,897,012	0.031%	1:3223
West Virginia	520	1,855,413	0.028%	1:3568
Wisconsin	1,370	5,726,398	0.024%	1:4180
Wyoming	150	576,412	0.026%	1:3843
TOTAL	76,250	313,914,040		



SunWise Surveyor

Directions

You are a surveyor. You measure and map land areas and have been assigned to determine the current availability of shade on your school's property. This will help school administrators decide if the grounds are sun safe.

Take a survey of the grounds during a period when students are using them. Don't forget to be SunWise as you walk around the school!

Begin by drawing a map of the school grounds. Observe and mark on the map the most popular places where students congregate and play. These Play Areas can include sports fields, jungle gyms, blacktops, eating areas, and any other places where kids hang out.

Survey and mark the parts of the Play Areas that are covered in shade. Take note of what time of day it is, and how the movement of the sun might affect the shaded areas.

Measure the dimensions of the Play Areas, and write down your results. Then, measure the shade-covered portions of these areas. For circular-shaped areas, such as under a tree, measure the diameter of the shady spot. Record your results.

Questions

- 1 What is the total area of the Play Areas on your school's grounds?
- 2 What is the total area of the portions of those Play Areas covered by shade?
- 3 What percentage of the Play Areas on your school's grounds is sun safe?
- 4 How will the shaded Play Areas change with the movement of the sun?
- 5 What changes would you suggest for the play areas to increase the shaded areas in the playground?



SunWise Surveyor

Estimated Time

One to two class periods

Supplies

Clipboards (optional)

Measuring tapes, yardsticks, or metersticks

Learning Objective

This activity will raise student awareness of daytime exposure to the sun. Students will also become more aware of the motion of the sun, and that its movements can be observed, described, and predicted. Students will focus on the amount of shade provided for their outdoor hours at school, and the importance of providing sun-safe areas on the property. They will also describe the movement of the sun across the sky in the course of a single day and over the course of a year and describe how the movement affects shaded areas in outdoor areas of the school. Assess student comprehension by asking students to design a more SunWise playground (see the “You Are the Architect” activity).

Directions

Tell your students that they are surveyors who have been assigned to determine the current availability of shade on your school’s property in order to help school administrators decide if the grounds are sun safe.

Have the class take a survey of the grounds during a period of time when students are present, such as recess or lunchtime.

Have the students begin by drawing a scaled map of the school grounds, observing and marking on the map the most popular places where students congregate and play. These Play Areas can include sports fields, jungle gyms, blacktops, eating areas, and any other places where kids hang out. Now have students survey and mark the parts of the Play Areas that are covered in shade and consider if the dimensions of the shaded areas might change over the course of the day and the school year.

Have the students measure the dimensions of the Play Areas, record their results, and measure the shade-covered portions of these areas. For circular-shaped areas, such as under a tree, students will measure the diameters and calculate the areas of the shady spot, and write down these results as well.



Questions and Answers

- 1** What is the total area of the Play Areas on your school's grounds? *Answers will vary. Students will determine this figure by using algebraic formulas to calculate the area of each Play Area and then adding the sums together. $A = l \times w$*
- 2** What is the total area of the portions of those Play Areas covered by shade? *Answers will vary. Students will determine this figure by using algebraic formulas to calculate the area of each shade-covered area and then adding the sums together.*
- 3** What percentage of the Play Areas on your school's grounds is sun safe? *This answer will be determined by dividing the total area of shady spots by the total area of the Play Areas.*
- 4** How will the shaded Play Areas change with the movement of the sun? *Answers will vary, but should reflect an understanding of the motion of the sun.*
- 5** What changes would you suggest for the play areas to increase the shaded areas in the playground? *Answers will vary.*

This activity was adapted from California Department of Health Services, School Shade Protocol, Cancer Prevention and Nutrition Section.

Additional Resource

CDC's Shade Planning for America's Schools

www.epa.gov/sunwise/doc/cdc_shade_planning.pdf



You Are the Architect

Directions

You are an architect who has been selected to submit a design proposal for a SunWise playground. First, get together with your classmates and brainstorm ideas. You need to consider the ways that many of today's playgrounds fail to protect children from overexposure to the sun's harmful rays. How can these problems be solved?

Blueprint your idea for a SunWise playground structure, taking into account the movement of the sun across the sky over the course of a single day and over the course of a year. Then, build a model of it for presentation. Present your design proposal to your class. Be sure to discuss how your design offers superior protection from overexposure to the sun's harmful rays.

Vocabulary Words

Blueprint—A detailed construction plan.

Brainstorm—Developing new ideas through unrestrained participation in discussion.

Some spiders can spin silk that glistens in UV light. They weave it into shapes that look like flower petals to attract unsuspecting bugs. Sadly, we can't see any of this.



You Are the Architect

Estimated Time

More than one class period

Supplies

Toothpicks

Popsicle sticks

Glue (for paper and/or wood)

Construction paper

Scissors

Pipe cleaners

Scotch tape

Rubber bands

String/Yarn

Directions

Tell your students that they have been selected to submit a design proposal for new SunWise playground structures for a local elementary school. Brainstorm ideas with the class of how to build a SunWise playground. Remember to discuss potential problems and how to solve them. Ask students to consider the movement of the sun across the area where the playground is to be constructed. Have a discussion about how this information should be used when planning a “sun-safe” outdoor area.

Have the students draw plans/blueprints of their ideas. You may want to have them work in teams. Ask the students to make a model of their favorite idea. Have the students present their ideas to the class and explain the advantages their SunWise model has over typical playgrounds



Detecting UV Light Using Tonic Water

Directions

In this activity, you will use tonic water to do an experiment with ultraviolet light. Fill the beaker labeled “tonic” almost to the brim with tonic water. Fill the other beaker almost to the brim with tap water.

Place the beakers outside, so that direct sunlight strikes the surface of the liquid in both beakers. Hold a black piece of paper or cloth behind the beakers.

Observe the surfaces of the tonic and tap waters in the two beakers. Write a paragraph describing what happened in the experiment. Be sure to use all of the vocabulary words when writing your explanation. Then answer the questions.

Vocabulary Words

Fluorescence—Luminescence caused by the absorption of a photon at one wavelength that triggers the emission of another photon usually at a longer wavelength. The absorbed photon is typically in the ultraviolet range, and the emitted light is usually in the visible range.

Ultraviolet light—Electromagnetic radiation that has a shorter wavelength than visible light and is not visible to the human eye.

Photon—The elementary particle that is the carrier of electromagnetic radiation of all wavelengths, including ultraviolet light and visible light.

Wavelength—In a periodic wave, the distance between identical points (e.g., peaks) in consecutive cycles. Examples of waves are light and sound waves. Visible light includes a wavelength range of 400–700 nanometers and a color range of violet through red.

Questions

- 1 What differences do you see between the two beakers?
- 2 What time of day is it? Where is the sun in the sky?
- 3 How might the position of the sun affect your results?
- 4 What is contained in the sunlight that causes these results?

This activity is adapted from the Project LEARN module, Ozone in Our Atmosphere.



Detecting UV Light Using Tonic Water

Estimated Time

40–50 minutes

Supplies

Two beakers, labeled “tap water” and “tonic water”

Tonic water

Tap water

Black paper or cloth

Sunlight

Learning Objective

This activity will demonstrate the presence of UV light in sunlight. When a photon of UV energy is absorbed, it is re-emitted by the quinine in tonic water as a photon of visible light. This process is called fluorescence. The amount of fluorescence that occurs is influenced by the amount of UV. This will reinforce the concept that UV light is always present in sunlight, although invisible to the naked eye. Have students write a paragraph explaining what has happened in this experiment, using the following words: fluorescence, photon, wavelength, ultraviolet light. The students should demonstrate the ability to research the scientific background of a certain phenomenon. Students should show comprehension of the idea that it is the size of the UV wavelengths that causes them to appear invisible. But when a photon of UV energy is absorbed in the tonic water, the quinine re-emits the energy as a photon of visible light.

After completing the tonic water experiment, students will investigate the chemical reactions that were involved in the changes of the tonic water and the tap water. Students will also understand that when light shines on an object, it is reflected, absorbed, or transmitted through the object depending on the objects’ materials and the frequency (color) of the light.

Directions

Fill the beaker labeled “tonic” almost to the brim with tonic water. Fill the other beaker almost to the brim with tap water. Place the beakers outside, so that direct sunlight strikes the surface of the liquid in both beakers. Ask the students to predict what they might observe. Hold a black piece of paper or cloth behind the beakers. Have the class look across the surfaces of the two beakers.

Questions and Answers

- 1 What differences do you see? *The top $\frac{1}{4}$ inch of the tonic water should glow blue.*
- 2 What time of day is it? Where is the sun in the sky? *Answers will vary.*
- 3 How might the position of the sun affect your results? *Best results occur around noon when the sun is directly overhead. The higher the sun is in the sky, the shorter the distance the UV light must travel through the ozone layer, allowing more UV radiation to reach the Earth’s surface.*
- 4 What is contained in the sunlight that causes these results? *UV radiation. Students should grasp the concept that UV radiation is always present in sunlight.*



Gumdrop Science

Directions

As you observe the Gumdrop Science demonstration, answer the questions below.



Define the following terms:

Diatomic molecule

Triatomic molecule

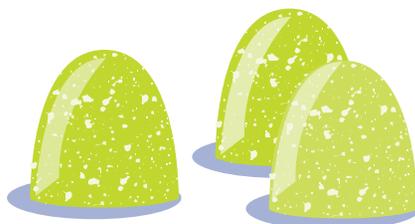
Chlorofluorocarbons (CFCs)

Hydrochlorofluorocarbons (HCFCs)

UV radiation

Stratosphere

Catalyst



Questions

- 1 What effect does an increase in HCFCs and CFCs in the stratosphere have on ozone? What effect will that have on us?
- 2 How is the breakup of ozone in the stratosphere similar to its formation? 
- 3 Why is ozone good in the stratosphere and bad in the troposphere?

Gumdrop Science

Estimated Time

40–50 minutes

Supplies

Gumdrops in the following colors:

black, red, green, yellow and white¹

Toothpicks

Flashlight

Transparent colored plastic sheets,
preferably blue, to cover the flashlight lens

White piece of paper

Learning Objective

This activity will demonstrate to students the photochemical reactions involved in the creation and destruction of stratospheric ozone on a molecular level. It will emphasize the damage caused by man-made HCFCs and CFCs in our atmosphere. The students will be able to explain the role of stratospheric ozone, demonstrate the formation of ozone, identify the sources of stratospheric ozone layer depletion, and explain why HCFCs and CFCs are destructive to the ozone layer. Assess the students' comprehension of the HCFC/CFC problem and their absorption of this lesson into their world view: ask students to make a list of everyday products that use or formerly used HCFCs, and formulate a plan for reducing or eliminating the need for HCFCs in their lives.

Definitions

Diatomic molecule—A diatomic molecule is composed of two atoms. Diatomic oxygen is present in the air we breathe.

Triatomic molecule—A triatomic molecule is composed of three atoms. Triatomic oxygen is also known as ozone.

¹ The colors used in this model are based on the Institute of Physics color scheme, one employed by several producers of molecular modeling sets. If the suggested colors of gumdrops are not available, please substitute with colors that are available, making sure to be consistent in the colors you use to represent each element.

Chlorofluorocarbons (CFCs)—Man-made chemical compounds consisting of chlorine, fluorine, and carbon. Releasing CFCs into the atmosphere causes ozone layer depletion.

Hydrochlorofluorocarbons (HCFCs)—Man-made chemical compounds consisting of hydrogen, chlorine, fluorine, and carbon, which also deplete the ozone layer. Because HCFCs are less harmful to the ozone layer than CFCs, they have been used as an interim replacement for CFCs.

UV radiation—Electromagnetic radiation that has a shorter wavelength than visible light and is not visible to the human eye.

Stratosphere—A layer of the atmosphere above the troposphere, 6 to 30 miles above the Earth's surface, where the ozone layer is located.

Catalyst—A substance that modifies and increases the rate of a chemical process without being consumed in the process.

Questions and Answers

- 1 What effect does an increase in HCFCs and CFCs in the stratosphere have on stratospheric ozone? What effect will that have on us? *Increased HCFCs and CFCs in the stratosphere have destroyed many ozone molecules for several decades and continue to weaken the ozone layer that protects us from the sun's harmful UV rays. One CFC molecule can destroy up to 100,000 ozone molecules.*
- 2 How is the breakup of ozone in the stratosphere similar to its formation? *Both processes involve UV radiation.*
- 3 Why is ozone good in the stratosphere and bad in the troposphere? *In the stratosphere, ozone partially filters UV radiation. In the troposphere, ozone is a major component of smog.*

Gumdrop Science

Background Information

Ozone, a triatomic molecule of oxygen (O_3), is made when short-wavelength UV radiation breaks the bonds of diatomic oxygen (O_2) in the stratosphere. The freed single oxygen atoms (O) are highly reactive and bond with diatomic oxygen to form ozone. This is a naturally occurring process in the stratosphere that is kept in balance, unless man-made chemicals like HCFCs or CFCs are introduced. CFCs are the primary cause of ozone layer depletion around the world, but since 1996, the production of CFCs has been prohibited in the United States. HCFCs, which are also ozone depleting but less harmful than CFCs, have replaced CFCs in many applications. Although the United States is incrementally decreasing the use of HCFCs, they can still be found in some home air-conditioners, refrigerated display cases in supermarket stores, and foam products. When HCFCs or CFCs reach the stratosphere, they react with UV light, and a chlorine atom is released. The chlorine atom, acting as a catalyst, then bonds with an ozone molecule and destroys it by pulling away the third oxygen atom. Then, the free atoms of oxygen destroy the weak bond between the oxygen and chlorine, pulling it away to form O_2 . This process replaces the chlorine atom, which is then free to repeat the process for decades, thereby destroying ozone faster than it can be replaced naturally.

The ozone layer is found in the stratosphere, between 6 and 30 vertical miles from the Earth's surface. As ozone in the stratosphere is depleted, more harmful UV radiation can penetrate through the layer and reach the Earth. In humans, increased UV radiation can cause cataracts, skin cancer, immune system weakening, and premature aging of the skin.

Directions

Natural Ozone Layer Formation

Instruct the students to connect three or four pairs of red gumdrops with a toothpick to simulate diatomic oxygen molecules, which are present in the air we breathe. Have another student shine the flashlight on one of these molecules, with a colored plastic sheet covering the lens, simulating UV radiation from the sun.

The molecule bombarded with UV radiation will break apart, leaving two single oxygen atoms. The blue plastic represents the short UV wavelengths that are responsible for the breakup of diatomic oxygen. The individual oxygen atoms are now free to join the other diatomic oxygen molecules to form triatomic oxygen, or ozone.

Unnatural Ozone Layer Depletion

In the stratosphere, ozone meets up with HCFCs such as HCFC-22. Have the students make a model of HCFC-22 using one black gumdrop for the carbon, two yellow gumdrops for the fluorine, one green gumdrop for the chlorine, and one white gumdrop for the hydrogen. Stick three toothpicks into the carbon to form what looks like a three-legged stool. Put the chlorine atom on one free toothpick end and the fluorine atoms on the other two. With the "stool" standing on the desk, put another toothpick in the carbon and attach the hydrogen to it. Also, have the ozone models from above and a free oxygen atom handy.

Lay the HCFC molecule and the ozone side-by-side on a white piece of paper, representing the stratosphere. Bombard them with simulated UV radiation from your flashlight. The flashlight should be covered with a different colored plastic sheet, representing a longer wavelength of UV light. This UV radiation will



Gumdrop Science continued

cause one chlorine atom (green gumdrop) to break off the HCFC. The free chlorine then attacks ozone molecules, breaking them up into diatomic and single oxygen molecules, and combines with the free oxygen (red gumdrop). This newly formed molecule is unstable, and the oxygen atom breaks free again to join another free oxygen atom and form diatomic oxygen. This leaves the chlorine atom free to attack and break up other ozone molecules, a destructive process that goes on for decades.



UV Frisbee® Science

Directions

Before observing the UV Frisbee demonstration, make some predictions.

What do you predict will happen to the UV Frisbee when your teacher applies sunscreen to the plastic covering it? What about when it is covered with cloth?

Predict the amount of time it will take the UV Frisbee to change color once it is exposed to sunlight.

Now, observe the UV Frisbee as your teacher applies a variety of materials to it. Record your observations on the data chart below. Record the color of the UV Frisbee after each material is applied to it. Use the data you have collected to answer the questions.

Questions

- 1 Did the UV Frisbee change color when exposed to normal room light? Why or why not?

- 2 What happened to the color of the UV Frisbee in the sunlight? After five minutes?

- 3 What effects did the different sunscreens have on the UV Frisbee?

- 4 What did you note about the surface area of the UV Frisbee that was covered with cotton cloth?

Frisbee Test Number	One Minute	Three Minutes	Five Minutes
Plain Indoors			
SPF 0			
SPF 30			
SPF 50			
Plain Sunglasses			
UV Blocking Glasses			
Cotton Fabric			
UV Blocking Fabric			

This activity is adapted from the Project LEARN module, *Ozone in Our Atmosphere*.



UV Frisbee® Science

Estimated Time

30 minutes

Supplies

UV Frisbee

Sunscreen (including baby oil, SPF 30, and SPF 50)

Regular eyeglasses

Sunglasses with UV-protective coating on lenses

2" x 2" swatches of cloth (cotton, UV blocking fabric, and “tan-through” fabric)

Clear plastic wrap or hotel shower cap

Stop watch

Newspaper

Masking tape and marker

Learning Objective

The objective of this activity is to demonstrate the effects of UV radiation. After completing this activity, students should be able to describe at least three ways they can protect themselves against harmful UV radiation. Have students describe their outdoor behavior before seeing the UV Frisbee demonstration. How will they change their outdoor behavior? (See the *SunWisdom* section of the Tool Kit for a list of sun safety tips.)

Directions

Use the UV Frisbee included in the SunWise Tool Kit to show students the effects of UV radiation and

the effects of different materials on blocking out UV radiation. For more information about UV radiation, please review the *SunWisdom* section of the Tool Kit. Before you begin the UV Frisbee demonstration, ask the students to make some predictions.

- What do you predict will happen to the UV Frisbee when your teacher applies sunscreen to the plastic covering it? What about when it is covered with cloth? *Answers will vary.*
- Predict the amount of time it will take the UV Frisbee to change color once it is exposed to outdoor light. *Answers will vary.*

Students should watch you perform the experiment and record their observations on the data chart provided to them on the Student Page of this activity.

- Observe the plain UV Frisbee while still inside your classroom.
- Cover the UV Frisbee with a piece of clear plastic or hotel shower cap. Apply a small circle of baby oil and of sunscreen (all SPF levels) to the protected surface of the UV Frisbee. Use masking tape and marker to identify each SPF level. Cover the UV Frisbee with the newspaper or place it in a box and take it outside. Uncover the UV Frisbee and begin timing. The unprotected area of the UV Frisbee will change color. The circle with baby oil (SPF 0) will change color, but those with SPF 30 and higher will not change color.



UV Frisbee Science Directions continued

- Tape the two pairs of glasses to the UV Frisbee. Cover the UV Frisbee with the newspaper or box and take it outside. Uncover the UV Frisbee and begin timing. The area under the glasses without UV protective coating will change color. The area under the sunglasses with UV protective coating will not change color (might change slightly). Return to your classroom and remove the sunglasses.
- Tape the different swatches of fabric to the UV Frisbee. Use masking tape and marker to identify each fabric. Cover the UV Frisbee with the newspaper or box and take it outside. Uncover the UV Frisbee and begin timing. The unprotected area of the UV Frisbee will change color. The area underneath the UV blocking fabric will not change color. Other fabrics will filter out a portion of UV depending on the thickness and tightness of the weave of the fabric. Return to your classroom and remove the fabric swatches.

Questions and Answers

- 1** Did the UV Frisbee change color when exposed to normal room light? Why or why not? *The UV Frisbee will not usually change color because there is very little UV radiation in indoor lighting.*
- 2** What happened to the color of the UV Frisbee in the sunlight? After five minutes? *The UV Frisbee changed from clear to purple.*
- 3** What effects did the different sunscreens have on the UV Frisbee? *Generally, results do not differ much for sunscreens with SPF 30 or higher. It is important to note that SPF 50 does not block significantly more UVB rays than SPF 30. SPF 30 sunscreen blocks approximately 97 percent of the sun's UVB rays while SPF 50 blocks approximately 98 percent. If the sunscreen is broad-spectrum, then the UVA protection is proportional to the UVB protection. So, when coupled with the broad-spectrum claim, a higher SPF value shows higher protection against UVA.*
- 4** What did you note about the surface area of the UV Frisbee that was covered with cotton cloth? *Answers will vary depending on the thickness and tightness of the weave of the cotton cloth.*



Be a SunWise Traveler

Directions

You are planning a trip. Use maps, a world globe, and websites to research your assignment and answer the questions below. Share your findings with your class.

Vocabulary Word

Mean—The average value of a set of numbers. A mathematical value that is intermediate between other values.

Activities and Questions

- 1 Using a world map or globe, identify where you live.
- 2 Using the world map or globe, identify where you would like to visit. Why would you like to visit this location? What time of year would you like your visit to occur?
- 3 Using the UV Index maps located on the EPA SunWise website, www.epa.gov/uvindex, identify what the UV Index mean (average) is where you live at this time of the year.
- 4 Using the UV Index maps located on the World Health Organization website, www.who.int/uv/resources/link/indexlinks/en/, identify what the UV Index mean (average) is where you would like to visit and at the time of year your visit would occur.
- 5 What is the mean yearly UV Index where you live?
- 6 What is the mean yearly UV Index of the place where you want to visit?
- 7 What do you notice about your local UV Index in comparison to the UV Index at the location you want to visit during the time you want to visit?
- 8 Are there similarities and differences? Why?
- 9 What SunWise action steps should you take when visiting your destination?
- 10 Develop a “SunWise Travel Alert” for your destination. Be sure to list the conditions that a traveler is likely to encounter and sun-safe behaviors they should practice. This alert may be in the form of a poster, newspaper ad, TV or radio announcement, or a Web page.





Be a SunWise Traveler

Estimated Time

45–60 minutes (students may work individually or in small groups)

Supplies

Maps of the United States and the world

Computers

Action Steps for Sun Protection (see *SunWisdom* section)

Learning Objective

This activity gives students the opportunity to learn about how people all over the world need to protect themselves from the sun's harmful UV rays. It will help students make connections and comparisons between their local environment and sun-safe behaviors they practice when visiting other parts of the world.

Background/Talking Points

People often travel to, or vacation in, locations with extreme UV intensity, especially in comparison to the UV intensity at that time of year in the traveler's city or town. Additionally, travelers may not realize how intense the sun is at that time of year and may not adequately prepare for the UV radiation that they are exposed to, resulting in severe sunburns. Studies have shown that as much as 88 percent of sunburns in children occur during sunny vacations. A serious potential problem

surfaces when you combine this information with the fact that sunburn is a risk factor for skin cancer. By raising awareness of the dangers specifically associated with travel/vacations to UV intense destinations, our goal is for children and their caregivers to receive no sunburns during travel/vacations.

In addition:

- UV rays are reflected by snow, sand, water, and pavement. Fresh snow may reflect up to 80 percent of the incident UV radiation. This is important at higher altitudes and latitudes. Sand and water also reflect UV radiation and can increase UV exposure at the beach.
- The higher in altitude you go, the more intense the UV rays become due to the shorter distance from the sun and less atmosphere for the UV radiation to travel through.

Directions

Engage students by asking them if they have a place in mind that they would like to travel to someday. Or ask them if they have a friend or relative that lives far away from them (be cognizant of students that may have family in the military) that they might like to visit. Have students identify the place they would like to visit along with the time of year they would like to do this traveling. Students will identify the UV Index mean (average) where they live and the place they would



like to visit, then make a connection or comparison of the two locations. They will then identify SunWise action steps they should take when visiting their choice of destinations. Instruct students to respond to the activities and questions individually or in pairs. Then, have them share their findings with the class.

Student Activities and Questions

Answers should reflect students' research on their location.

- 1 Using a world map or globe, identify where you live.
- 2 Using the world map or globe, identify where you would like to visit. Why would you like to visit this location? What time of year would you like your visit to occur?
- 3 Using the UV Index maps located on the EPA SunWise website, www.epa.gov/uvindex, identify what the UV Index mean (average) is where you live at this time of the year.
- 4 Using the UV Index maps located on the World Health Organization website, www.who.int/uv/resources/link/indexlinks/en/, identify what the UV Index mean (average) is where you would like to visit and at the time of year your visit would occur.
- 5 What is the mean yearly UV Index where you live?
- 6 What is the mean yearly UV Index of the place where you want to visit?
- 7 What do you notice about your local UV Index in comparison to the UV Index at the location you want to visit during the time you want to visit?
- 8 Are there similarities and differences? Why?
- 9 What SunWise action steps should you take when visiting your destination?
- 10 Develop a "SunWise Travel Alert" for your destination. Be sure to list the conditions that a traveler is likely to encounter and sun-safe behaviors they should practice. This alert may be in the form of a poster, newspaper ad, TV or radio announcement, or a Web page.

Resources to Learn More About Your Destination and SunWise Practices

www.weather.com/activities/health/skin

www.intellicast.com

www.weatherbase.com

www.epa.gov/sunwise/kids/kids_actionsteps.html

For full page maps, please see the UV Index maps located at www.epa.gov/uvindex and www.who.int/uv/resources/link/indexlinks/en/.

A SunWise Legend

Wise Heart Saves the Day¹

Once upon a time, a very long time ago, there lived a young Indian boy who was both smart and kind and who longed to make the world a better place for his people. His name was Wise Heart, and he belonged to the Cahto Indian Tribe that lived in what is now northern California. The world in which Wise Heart lived was cold and barren, with few plants or trees. During the day, his world was gloomy and grim, lit by only a faint, dim light that seemed to come from very far away. At night, his world was always cloaked in deep darkness, a darkness that was broken only by the campfire and the torches that the elders alone were allowed to carry.

Wise Heart knew that the world had not always been such a dark and gloomy place. Sometimes as his tribe huddled around the campfire at night, the elders told stories—ancient stories—of a time when a bright light they called the Sun had warmed the world during the day, while its distant relatives, the Moon and Stars, had filled the night. Wise Heart had also seen the ancient tribal cave paintings that showed a world filled with the bright light of the Sun and with towering trees and plants. Whenever Wise Heart or the other children asked the elders how the world had lost its Sun, Moon, and Stars, the elders would become quiet and warn the children not to ask such questions.

One night, while Wise Heart slept, he dreamed of the beautiful, Sun-filled world that he had seen in the cave paintings. There were blue skies, trees laden with delicious fruit, and smaller plants with fragrant flowers. Then, in his dream, he heard the sound of a fiercely shrieking wind, and the Sun suddenly seemed to be torn from the sky, leaving only a dim glow in its wake. Wise Heart woke from his dream troubled and unable to fall back asleep.

When the dim light of day returned, Wise Heart cautiously approached the oldest and most respected of the elders, a stooped old man named Running Water. The boy recounted his dream and asked the old man if he knew what had happened to the Sun so many years before. At first Running Water scolded the boy and warned him not to wonder about such things. Finally, however, seeing the boy's determination to know the truth, Running Water relented. He told the boy that many years before, an Evil Spirit had become jealous of the brilliance and warmth of the Sun and had stolen it from the sky and hidden it in a deep canyon on the far side of the world. The Evil Spirit had also stolen the Moon and Stars and hidden them away as well so that the humans would not have enough light to be able to search for and free the Sun from its captor. From that day on, Running Water explained, the world had been dimly lit. Bound with thick ropes to a giant boulder, the Sun could make only a few of its rays reach above the edge of the deep canyon.

All that day Wise Heart thought about Running Water's words. He watched his people as they struggled to survive by eating the few fish in the stream and few small plants on the hillsides. By the time darkness fell, Wise Heart had made a decision. He would journey across the mountains, to the far side of the world. He would find the deep canyon where the Sun, Moon, and Stars were being held by the Evil Spirit, and somehow, he would free them. That, he decided, was how he would help make the world better for his people.

Early the next evening, Wise Heart secretly set out for the distant mountains, carrying only a skin of water, some dried fish, and a sharp knife. As he traveled, he asked the kind spirits of his people to help him, and they did. Guided by a fierce and powerful eagle and thousands of fireflies, Wise Heart found his way through the steep, dark mountain range. A sure-footed

mountain goat led him to the edge of the deep canyon in which the Evil Spirit was guarding the Sun, Moon, and Stars. Just at that moment, a traveling family of field mice offered to chew through the ropes that bound the Sun, Moon, and Stars while Wise Heart distracted the Evil Spirit. Accepting their offer of help, Wise Heart climbed cautiously over the rim of the canyon and slowly began to climb down the steep cliff toward the canyon floor below. Just as he reached the bottom, the silence was suddenly pierced by the same sound of shrieking wind that he had heard in his dream. The Evil Spirit, red-faced and shaking with rage, stepped between Wise Heart and the Sun, Moon, and Stars and demanded to know why the boy had intruded in his canyon. Before Wise Heart could answer, the Evil Spirit noticed the boy's water skin and demanded that he be given some water to quench his thirst and to cool his sun-scorched body. In reply, Wise Heart said, "Powerful spirit, I am happy to give you all my water, but first let me add some special herbs that will quench your thirst and cool your sun-scorched body better than plain water." The Evil Spirit agreed, and after Wise Heart had added the herbs, which were really sleeping herbs, he drank the water greedily. Soon after, the Evil Spirit fell asleep.

Immediately, as if on cue, the family of mice began gnawing through the thick ropes that held the Sun, Moon, and Stars captive. When they had almost completed their task, the Evil Spirit, feeling the heat of the Sun's rays as it slowly began to ascend into the sky, awoke from his slumber. With a piercing shriek, the Evil Spirit rushed to recapture the Sun. Just before he could do so Wise Heart cut through the remaining fragments of rope with his knife. With the ends of the rope held

tightly in his hands, Wise Heart and the mice sailed into the sky. A short time later, as the Sun passed over Wise Heart's village, they all jumped safely into the soft boughs of the tallest fir trees. From there, Wise Heart looked up to see the first and most beautiful sunrise that he would ever see.

Wise Heart returned to his tribe as a hero. The people hailed him as the Sun Guard and thanked him for returning light and warmth to the day and light to the night. Almost immediately, the trees and plants began to grow larger, and the people danced and celebrated in the warmth and brightness of the Sun. After several hours, however, the people began to complain. They said, "It's too hot! I'm thirsty!" Others complained of feeling tired and of their skin feeling red and sore. Wise Heart was amazed that his gift that had at first caused so much joy was now causing so much pain and discomfort. He thought for a moment and then quickly led his tribe to the river's edge. There he told his people to drink deeply and to coat their skin with mud from the riverbank. He told them, "The mud will soothe your skin and protect it from the powerful rays of the Sun," and they found that he was right. Now Wise Heart was truly a hero. His tribe could now enjoy the Sun and all the beauty it gave to the world, without being hurt by its powerful rays. Even today, Wise Heart is a hero, for though he did not know it, he had developed the first sunscreen with an SPF of 45!

The legend is available with illustrations at the Children's Melanoma Prevention Foundation website, www.melanomaprevention.org.

¹ This story has been adapted from traditional tales by Jane Shanny and Mary Ellen Maguire-Eisen of the Children's Melanoma Prevention Foundation.



A SunWise Legend

Estimated Time

1 hour

Supplies

Large paper

Markers

Learning Objective

The students will learn that people from all over the world have different stories about the sun. Before the story is read, ask the students about the power of the sun, both good and bad. Write their ideas on the paper. After reading the story assess what they have learned by asking them to research other legends about the sun or to perform a skit about the sun and why it is important to people around the world.

Directions

Have the class read “Wise Heart Saves the Day,” a legend about the origin of the sun inspired by the Native American Cahto Tribe of California (on the Student Page of this activity). After the class has finished reading, explain to them that people from all over the world have different ideas and beliefs about the sun. Discuss what they remember from the story and the lessons it shares about the sun and sun safety. Ask them why the sun is so important that people from all over the world tell stories about it (e.g., it makes plants grow, provides light.) Ask them what other stories or legends they have heard about the sun and why they think so many cultures—past and present—revere the sun. After discussing the legend and the sun, follow on activities can include:

Ask your students to research other legends and mythology about the sun and sun gods (e.g., Ra, the ancient Egyptian sun god, Apollo from Roman and Greek mythology, Amaterasu from Japanese mythology, or Sol from Norse mythology). Ask your students to explain why they think the sun and the sun gods and goddesses were so important to these ancient cultures.

Divide the class into groups and have each group create a skit to present to the class about the sun, its importance to people around the world, and its power.



Keep an Eye on Sun Safety

Directions

UV radiation can cause damage to the eyes of both animals and humans. One example of eye damage is a cataract. A cataract is the clouding of the eye's lens, which makes it difficult to see. Sea lions and seals that live in a zoo may develop cataracts because of not enough shade in their enclosure or because of looking up at the sun during feeding and training with the zookeeper. In addition, the reflection from the water causes extra UV exposure for both the animals and the visitors at the zoo.

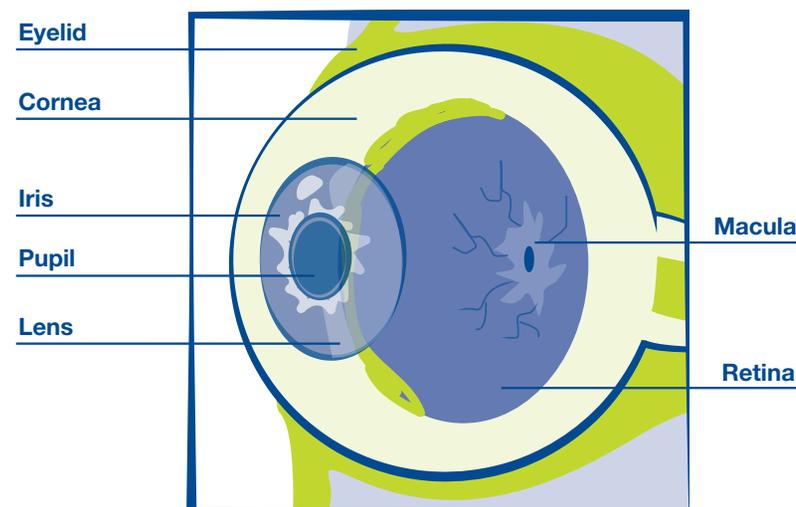
Design an outdoor zoo exhibit for seals and sea lions that helps protect their eyes and the zoo visitors' eyes from too much sun exposure. How should visitors dress for a sun-safe day at the zoo?

Many animals have natural adaptations that protect them from the sun. Find examples of these animal adaptations by visiting the SunWise website www.epa.gov/sunwise or the website of your local zoo. In your exhibit design, include signs that point visitors in the direction of these animals.

Vocabulary Words

Cataract—A clouding of the eye's lens that can blur vision

Lens—A transparent structure in the eye that helps focus light





Keep an Eye on Sun Safety

Estimated Time

30–45 minutes

Supplies

Paper

Pens or Pencils

Learning Objective

The aim of this activity is for students to learn the importance of protecting their eyes from overexposure to the sun's harmful UV rays. By understanding animal adaptations for sun protection and designing a sun-safe enclosure for zoo animals, students will draw connections to the ways they can protect themselves from overexposure to the sun. Assess if they have learned how to protect their eyes from UV radiation by facilitating a classroom evaluation of each group's exhibit design.

Directions

Assign groups to collaborate on the design of a sun-safe outdoor exhibit for seals and sea lions. Before the students begin, have a brief discussion on the damaging effects that UV radiation has on the eyes of both animals and humans (for additional background information on cataracts and UV-induced eye damage, refer to the "Prevent Eye Damage" fact sheet on the SunWise website). Use the following questions to guide a discussion:

- 1 Does the exhibit design provide enough shade for the animals?
- 2 Do the visitors have a shaded area where they can watch the animals?
- 3 How should visitors dress for a sun-safe day at the zoo?
- 4 Where can zoo visitors find other sun-safe animals?

Describe to the students how seals and sea lions in zoos can be prone to cataracts due to the following: 1) lack of shade in the enclosure; 2) reflection of UV rays from the water and from the light surfaces of the tank/enclosure; 3) looking up toward the sun during feeding and training with the zookeepers; and 4) living longer in captivity than in the wild (in addition to overexposure to UV radiation, cataracts can also develop from old age).

Ask students to brainstorm animals that have natural adaptations to protect themselves from the sun. The students may research animal adaptations on the SunWise website or on your local zoo's website, or you can guide them to examples of adaptations using the "Search for SunWise Animals" resource on the SunWise website. Explain to the students that humans can "adapt" too with simple sun safety habits. For eye protection, these habits include the following: avoiding overexposure to the sun; wearing a wide-brimmed hat and sunglasses with 99-100% UVA/UVB protection; seeking shade when the sun's UV rays are most intense between 10 a.m. and 4 p.m.; checking the UV Index; and using extra caution around reflective surfaces such as water, snow, and sand.



When the students have finished their exhibits, lead them in a discussion to evaluate each design. Relate the issue of eye protection to the students' environments. Ask the students where they might get the most UV exposure in their daily lives. Remind the students that sun safety is important for all outdoor activities, including recess at school, swimming, boating, biking, soccer, baseball, etc. Ask the students to think of ways they can better protect their eyes from too much sun exposure.

Additional Resources

Search for SunWise Animals, available on the SunWise website

(www.epa.gov/sunwise/doc/animals_zoo.pdf)

SunWise Animal Quiz, available on the SunWise website

(www.epa.gov/sunwise/doc/Animal_WhoAmI.pdf)

Prevent Eye Damage, available on the SunWise website

(www.epa.gov/sunwise/doc/eyedamage.pdf)

Activity Enrichment

- Connect this activity with the UV-sensitive Frisbee activity. Have the students bring their sunglasses to class and test their effectiveness using the Frisbee. Place the sunglasses on the inner surface of the Frisbee and then carry it outside. Once the Frisbee has changed color, carry it back indoors and remove the sunglasses. If there is a white area in the shape of the sunglasses, then the sunglasses are effective at blocking UV radiation.
- Have students brainstorm activities and occupations that may lead to a person's eyes being exposed to excessive UV radiation. Answers may include sports (baseball, skiing, swimming, surfing, etc.) and outdoor jobs (fishing, construction, landscaping, farming, etc.). Ask the students how they could protect their eyes during each activity.
- In addition to overexposure to UV radiation, risk of cataracts also increases with age. Ask the students if they know of anyone who has cataracts or other eye damage. Offer the students the opportunity to interview that person and report back to the class. Remind the students to ask their interviewee about previous sun exposure and sun protection habits.
- Have the students experience what it is like to have cataracts by taking an old pair of glasses and applying a light coat of non-toxic snow spray. Students can take turns wearing the glasses.
- Connect this activity with a visit to your local zoo or aquarium. Plan a sun-safe animal tour using the "Search for SunWise Animals" resource on the SunWise website.



Wild for Sun Protection

Directions for Activity 1:

Use the Internet and other resources to investigate ways animals protect themselves from overexposure to the sun's harmful UV rays. Complete the activities and answer the questions below. Then, share your findings with your class.

Vocabulary Words

Habitat—The area or natural environment where a particular organism, such as a plant or animal, lives.

Adaptation—An alteration or adjustment in a physical or behavioral trait that makes an organism such as a plant or animal better suited to live in its habitat.

Pigmentation—A substance such as chlorophyll or melanin that gives color to plant, animal, or human tissue.

Ecosystem—A complex set of relationships between a community of living organisms such as plants and animals in conjunction with their environment.

Activities and Questions:

- 1 Using the Internet and other resources, investigate how three animals protect themselves from overexposure to the sun's harmful UV rays and complete the provided chart.
- 2 What is the specific environment of the animal? In your answer, include a description of the climate, landforms, temperature, wind, rain, soil, and amount of sun exposure.

- 3 What characteristics of your animal make it well suited to its environment? In your answer, include both physical features and behaviors.
- 4 Select one animal from your chart and construct an argument on how increases in temperature and increases in exposure to UV rays would affect that animal's chances for survival.
- 5 How might the animal's ecosystem be affected if it were eliminated? Support your arguments with facts from your research.
- 6 Present your argument to the class in a three minute presentation.

Directions for Activity 2:

Using the Internet and other resources, investigate recent findings on skin damage in whales. Your research should specifically focus on the rising incidence of "sunburn cells," or skin cells damaged by UV radiation. Then, identify possible causes of this problem. After you complete your research, meet with the other team to compare notes and discuss possible solutions to the problem. Determine a way to present your findings to the class.



Animal #1	Habitat	Physical Adaptations	Behavioral Adaptations
Animal #2	Habitat	Physical Adaptations	Behavioral Adaptations



Animal #3	Habitat	Physical Adaptations	Behavioral Adaptations
Notes for argument			



Wild for Sun Protection

Estimated Time

30-60 minutes per activity

Supplies

Research materials

Internet access

Animal and the Sun Chart

Learning Objective

The aim of this activity is for students to expand their knowledge of animal adaptations in terms of anatomy and behaviors that aid in their survival in a particular habitat. After completing the activity, students should understand that animals have specific physical and behavioral adaptations that allow them to survive in a particular environment. Specifically, they should understand that animals living in places with a lot of sun exposure have unique biological defenses that help protect them from overexposure to the sun's harmful UV rays.

Directions for Activity 1:

Divide the students into small teams suitable for your classroom size and setup. Have each team use the Internet and other resources to investigate ways animals protect themselves from overexposure to the sun's harmful UV rays. You may want to provide some suggested examples. Students will select three animals, complete the provided chart, and write a summary that includes answers to the following questions:

- 1 What is the specific environment of the animal? In your answer, include a description of the climate, landforms, temperature, wind, rain, soil, and amount of sun exposure.
- 2 What characteristics of your animal make it well suited to its environment? In your answer, include both physical features and behaviors.

Directions for Activity 2:

Divide the students into two teams. Have each team investigate recent findings on skin damage in whales, specifically focusing on the rising incidence of "sunburn cells," or skin cells damaged by UV radiation. They will identify possible causes of this problem. After researching, have the two teams meet together to compare notes and discuss possible solutions to the problem. Then, have the teams determine a way to present their findings to the class.

Additional Resources:

Acute sun damage and photoprotective responses in whales <http://rspb.royalsocietypublishing.org/content/278/1711/1581.full?sid=7f8644c1-e5cf-4095-bb8a-376d80c5ea7a>

Desert Animals
www.desertusa.com/animals.html



UV ABCs

Directions

Research ultraviolet (UV) radiation and answer the questions below. Present your findings with your class.

Questions

- 1 What types of energy come from the sun?
- 2 What is UV radiation and how does it travel to Earth?
- 3 Why are UV rays harmful to living organisms?
- 4 How can humans protect themselves from harmful UV rays?
- 5 What are the three types of UV radiation, and which types can be absorbed by the ozone layer?
- 6 What is the stratospheric ozone layer?
- 7 Describe the phenomenon that we call the ozone hole. What did scientists determine was the cause of the ozone hole?
- 8 What is being done to address the ozone depletion problem?
- 9 Visit the following website:
<http://uv.biospherical.com/student/page8.html>. Perform the first three experiments and present your findings to your class.



UV ABCs

Estimated Time

2 – 3 periods of 45 minutes

Learning Objective

Students will understand ultraviolet (UV) radiation: what it is, where it comes from, what it does, what stops it, and how it varies over the course of a day or a year.

Recommended Resources to Learn About UV Radiation

NSF Polar Programs UV Monitoring Network:

<http://uv.biospherical.com/student/page3.html>

SunWise Program:

www.epa.gov/sunwise/doc/wvradiation.html

Directions:

Assign students to small groups and have them investigate UV radiation using the guiding questions. After students have finished their research, have them present their findings to the class by creating a Powerpoint slideshow, a poster, or a skit. For more information about UV radiation, please review the SunWisdom section of the Tool Kit.

Vocabulary:

Ultraviolet Radiation—Electromagnetic radiation that has a shorter wavelength than visible light and is not visible to the human eye.

Electromagnetic Radiation—A form of energy which exhibits wave-like behavior as it travels through space. Ultraviolet rays are one type of electromagnetic radiation.

Wavelength—In a periodic wave, the distance between identical points (e.g., peaks) in consecutive cycles. Examples of waves are light and sound waves. Visible light includes a wavelength range of 400 – 700 nanometers and a color range of violet through red.

Ozone Layer—A layer in the stratosphere, which is located 6 –30 miles above the Earth's surface. It protects people from the damaging effects of the sun's rays by absorbing some UV radiation.



Questions:

- 1 What types of energy come from the sun? *Heat, light, and radiation or electromagnetic radiation.*
- 2 What is UV radiation and how does it travel to Earth? *UV radiation is electromagnetic radiation that has a shorter wavelength than visible light. UV radiation travels in waves to Earth.*
- 3 Why are UV rays harmful to living organisms? *UV rays are very powerful. They can change the chemical structure of molecules and cause cell damage and deformities by mutating genetic code.*
- 4 How can humans protect themselves from harmful UV rays? *Answers should include: do not burn, avoid tanning, use sunscreen, cover up, seek shade, and check the UV Index.*
- 5 What are the three types of UV radiation, and which types can be absorbed by the ozone layer? *The three types of UV radiation are UVA, UVB, and UVC. UVA is not absorbed by the ozone layer, UVB is partially absorbed by the ozone layer, and UVC is completely absorbed by the ozone layer and atmosphere.*
- 6 What is the stratospheric ozone layer? *The ozone layer forms a thin shield high up in the sky—between six and 30 miles above the Earth’s surface. The ozone layer protects life on Earth from the sun’s UV rays.*
- 7 Describe the phenomenon that we call the ozone hole. What did scientists determine was the cause of the ozone hole? *In the 1980s, scientists began finding clues that the ozone layer was going away or being depleted—causing holes in the ozone layer. Chlorofluorocarbons (CFCs) were used a lot in industry and in households to keep things cold and to make foam and soaps. Strong winds carry CFCs into the stratosphere where UV radiation breaks them apart, releasing chlorine atoms. The chlorine atoms break apart ozone molecules in the stratosphere.*
- 8 What is being done to address the ozone depletion problem? *Countries around the world, including the United States, have seen the threats caused by ozone depletion and agreed to a treaty called the Montreal Protocol. This Protocol will help humans to stop making and using ozone-eating chemicals.*
- 9 Visit the following website: *<http://uv.biospherical.com/student/page8.html>. Perform the first three experiments and present your findings to your class.*



SunWise Flier Supplemental

Directions

Let's make a SunWise flier on the computer. Use fun images and text to communicate your message. Your flier should teach people how they can protect themselves from the sun's harmful UV rays. Brainstorm ideas with your teacher and classmates before you begin.

Helpful Ideas For Your Flier

Decide on a theme for your flier. Your theme should focus on having fun and being sun safe.

Think about designing your flier in a fun way that shows action. Show students participating in activities during all seasons. You could also focus on one season and make different scenes showing people being sun safe (e.g., summer scene at the beach or in the park). Make sure you show people wearing sun-safe items to reinforce your flier theme.

Safety Tips You Can Use For Your Flier

Do Not Burn. Overexposure to the sun is the most preventable risk factor for skin cancer.

Avoid Sun Tanning and Tanning Beds. UV rays from tanning beds and the sun cause skin cancer and wrinkling. If you want to look like you've been in the sun, consider using a sunless self-tanning product, but continue to use sunscreen with it.

Generously Apply Sunscreen. Generously apply sunscreen to all exposed skin using a Sun Protection Factor (SPF) of at least 30 that provides broad-spectrum protection from both ultraviolet A (UVA) and ultraviolet B (UVB) rays. Reapply every two hours, even on cloudy days, and after swimming or sweating.

Wear Protective Clothing. Wear protective clothing, such as a long-sleeved shirt, pants, a wide-brimmed hat, and sunglasses, when possible.

Seek Shade. Seek shade when appropriate, remembering that the sun's UV rays are strongest between 10 a.m. and 4 p.m.



Use Extra Caution Near Water, Snow, and Sand. Water, snow, and sand reflect the damaging rays of the sun, which can increase your chance of sunburn.

Check the UV Index. The UV Index provides important information to help you plan your outdoor activities in ways that prevent overexposure to the sun's rays. Developed by the National Weather Service and EPA, the UV Index is issued daily nationwide.

Get Vitamin D Safely. Get Vitamin D safely through a diet that includes vitamin supplements and foods fortified with Vitamin D. Don't seek the sun.

Early Detection of Melanoma Can Save Your Life. Carefully examine all of your skin once a month. A new or changing spot should be evaluated.



SunWise Flier Supplemental

Estimated Time

30–45 minutes

Supplies

Computer

Directions

Instruct students that they will be creating a flier that teaches people about protecting themselves from overexposure to the sun's harmful UV rays. To help students get started, hold a brainstorming session. Touch on issues such as the health effects of overexposure to the sun and the ways we can protect ourselves.

Students should also incorporate the SunWise safety tips into their flier. These tips can be found in the *SunWisdom* section of this Tool Kit or on the SunWise website, www.epa.gov/sunwise.

Depending on your resources, ask the students to print out their fliers in color or black-and-white and present them to the class. If printing is not available, the students can rotate around the computer lab to see each other's work. If possible, post the students' work on bulletin boards around the school.



SunWise Word Problems

Supplemental

Directions

Answer the following word problems about sun-safe products and behavior.

- There are two SPF numbers whose sum is 90. Four times the first equals twice the second. What are the numbers?
- Three bottles of sunscreen and two pairs of sunglasses weigh 32 oz. Four bottles of sunscreen and three pairs of sunglasses weigh 44 oz. All bottles of sunscreen weigh the same, and all pairs of sunglasses weigh the same. What is the weight of two bottles of sunscreen and one pair of sunglasses?
- A clothing company can make long-sleeved shirts for \$4 each with a daily overhead of \$600. If they sell shirts at \$5.20 each, how many shirts must they sell to have a profit of 10 percent above their daily cost?
- Scientists use a mathematical formula to calculate the UV Index. When calculating the UV Index, one factor they use is a value representing the total effect a given day's UV radiation will have on skin. This value is then adjusted for the effects of elevation and clouds. UV radiation at the Earth's surface increases about 6 percent per kilometer above sea level. Clear skies allow 100 percent of the incoming UV radiation from the sun to reach the surface, whereas scattered clouds transmit 89 percent, broken clouds transmit 73 percent, and overcast conditions transmit 31 percent. Once adjusted for elevation and clouds, this value is then divided by a conversion factor of 25 and rounded to the nearest whole number. This results in a number that typically ranges from 0 to the mid-teens. This value is the UV Index.

The formula for calculating the UV Index is:

$$(UV \text{ radiation effect on skin}) \times (\text{percent elevation}) \times (\text{sky conditions}) / \text{conversion factor} = UV \text{ Index}$$

Now, calculate the UV Index for three days using the following information. The UV radiation effect on skin is 300 for each day. You live one kilometer above sea level. The first day has clear skies, the second day has scattered clouds, and the third day has overcast conditions. What is the UV Index for each day?



SunWise Word Problems

Supplemental

Estimated Time

40–50 minutes

Directions

Have the class solve the following word problems. The variables in the problems are not scientifically accurate.

Questions and Answers

- There are two SPF numbers whose sum is 90. Four times the first equals twice the second. What are the numbers? *30, 60*
- Three bottles of sunscreen and two pairs of sunglasses weigh 32 oz. Four bottles of sunscreen and three pairs of sunglasses weigh 44 oz. All bottles of sunscreen weigh the same, and all pairs of sunglasses weigh the same. What is the weight of two bottles of sunscreen and one pair of sunglasses? $2(8)+4=20$ oz.
- A clothing company can make long-sleeved shirts for \$4 each with a daily overhead of \$600. If they sell shirts at \$5.20 each, then how many shirts must they sell to have a profit of greater than 10 percent above their daily cost? *550 shirts*
- Scientists use a mathematical formula to calculate the UV Index. When calculating the UV Index, one factor they use is a value representing the total effect a given day's UV radiation will have on skin. This value is then adjusted for the effects of elevation and clouds. UV radiation at the Earth's surface increases about 6 percent per kilometer above sea level. Clear skies allow 100 percent of the incoming UV radiation from the sun to reach the surface, whereas scattered clouds transmit 89 percent, broken clouds transmit 73 percent, and overcast conditions transmit 31 percent. Once adjusted for elevation and clouds, this value is then divided by a conversion factor of 25 and rounded to the nearest whole number. This results in a number that typically ranges from 0 to the mid-teens. This value is the UV Index.

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Now, calculate the UV Index for three days using the following information. The UV radiation effect on skin is 300 for each day. You live one kilometer above sea level. The first day has clear skies, the second day has scattered clouds, and the third day has overcast conditions. What is the UV Index for each day?

Day 1: $300 \times 1.06 \times 1.00 / 25 = 13$
Day 2: $300 \times 1.06 \times 0.89 / 25 = 11$
Day 3: $300 \times 1.06 \times 0.31 / 25 = 4$

For more information on how the UV Index is calculated visit the SunWise website at www.epa.gov/sunwise/uvcalc.html.