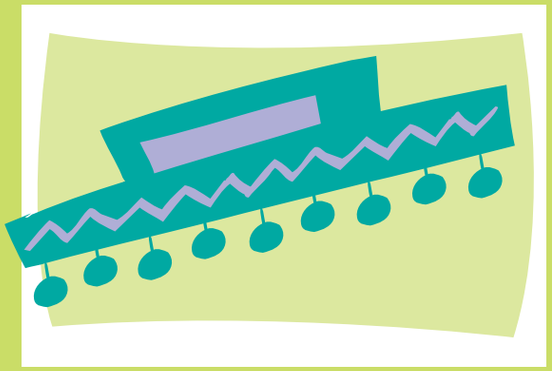
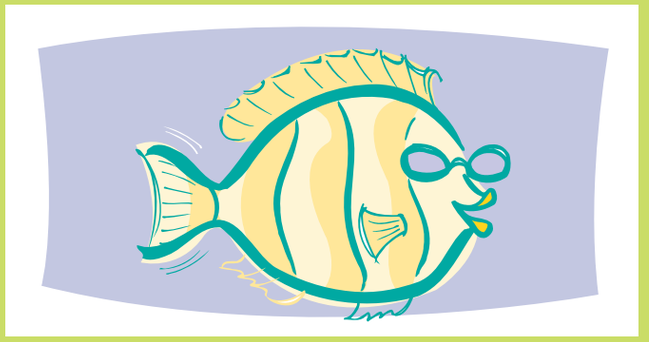
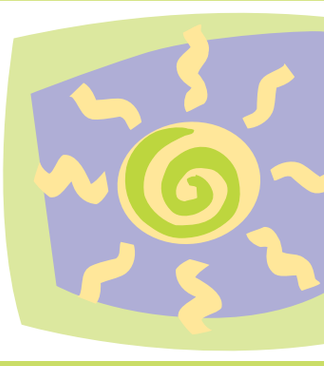
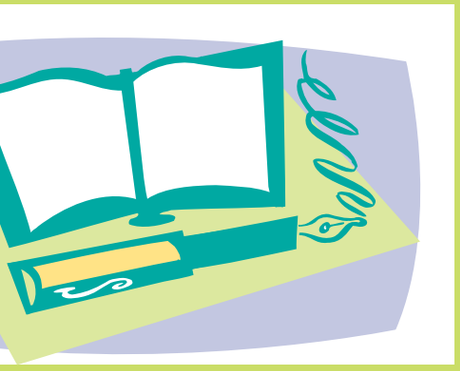
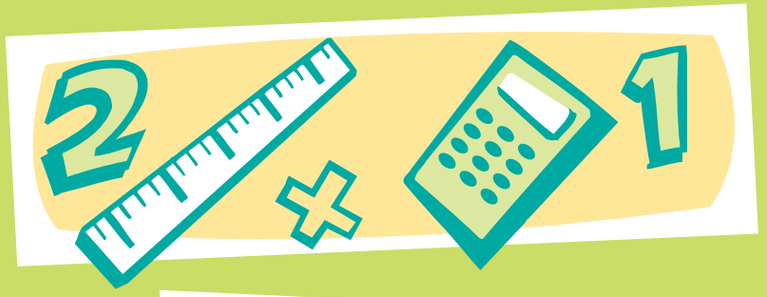
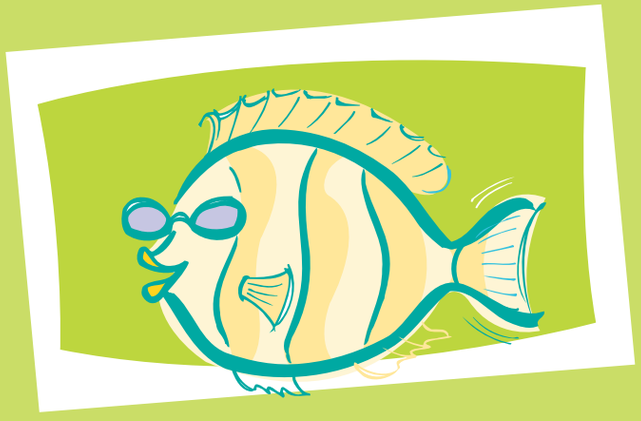
grades 6-8



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a program that **radiates** good ideas

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	EDUCATIONAL STANDARDS	SUNWISE ACTIVITY TITLE	A Sunny Performance	SunWise Show	Sun Scoop	SunWise Virtual Vacation	Sun Mythology	Sunsational Scientists in History	The Sun Shines Around the World	Why Does Winter Make Some People SAD?	Sun-safe Beach Party	UV Frisbee Fun	Personal Skin Assessment	Bargain Shopper	Skin Cancer in Your State	SunWise Surveyor	You Are the Architect	Detecting UV Light Using Tonic Water	Gumdrop Science	UV Frisbee Science	Be a SunWise Traveler	A SunWise Legend	Keep an Eye on Sun Safety	Wild for Sun Protection	UV ABCs	Supplemental	SunWise Flier	SunWise Word Problems	UV Meter Activities	What Works? Effectively Blocking UV Rays	Chart and Graph UV Intensity	Reflecting UV Radiation
		SUBJECT	English/LA, Health	English/LA, Health	English/LA, Health, Science	English/LA, Health, Social Studies	English/LA, Social Studies	English/LA, Social Studies	English/LA, Science, Social Studies	English/LA, Health	English/LA, Health, P.E.	English/LA, Health, P.E.	English/LA, Health, P.E., Social Studies	Math	English/LA, Math	English/LA, Health, Math, Science	English/LA, Health, Math, Science, Art	English/LA, Science	Science	Science	English/LA, Health, Math, Social Studies	English/LA, Social Studies	English/LA, Health, Science	Science, English/LA	Science, Health, English/LA		English/LA	Math		Science	Science, Math	Science, Math
English Language Arts	Conduct Short Research Projects to Answer a Question (W.6.7; W.7.7; W.8.7)		X		X	X		X	X						X						X			X	X							
	Engage in a Range of Collaborative Discussions (SL.6.1; SL.7.1; SL.8.1)		X	X	X					X	X	X	X		X			X				X	X			X						
	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	X																							
	Present Claims and Findings (SL.6.4; SL.7.4; SL.8.4)		X	X	X	X			X							X	X				X			X	X							
	Write Informative/Explanatory Texts (W.6.2; W.7.2; W.8.2)					X																											
	Write Narratives to Develop Events (W.6.3; W.7.3; W.8.3)						X	X																									
	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																														
	Determine Two or More Central Ideas in an Informational Text (RI.6.2; RI.7.2; RI.8.2)							X		X																							
	Evaluate the Soundness of Reasoning and Relevance and Sufficiency of Evidence (RI.6.8; RI.7.8; RI.8.8)										X												X										
Health	Health Concepts				X					X	X		X																				
	Influence Factors on Health Behaviors				X																				X								
	Health Information and Products		X							X																							
	Interpersonal Communication				X																												
	Decision-making Skills				X						X	X																					
	Goal-setting Skills										X	X																					
	Health Enhancing - Behaviors and Risks		X	X	X	X					X	X	X			X	X				X		X										
	Personal, Family, and Community Health		X		X					X			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).

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www.epa.gov/sunwise

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

SUNWISE ACTIVITY TITLE	SUBJECT
Supplemental	
SunWise Flier	English/LA
SunWise 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

*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).

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

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/

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

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.

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 SPFs 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 *SunWisdom* 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/@epidemiologysurveilance/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 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

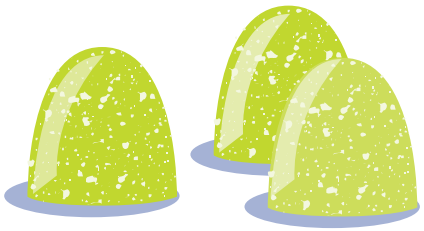
Chlorofluorocarbons (CFCs)

Hydrochlorofluorocarbons (HCFCs)

UV radiation

Stratosphere

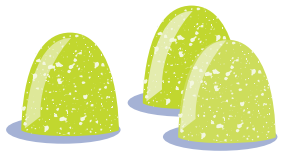
Catalyst



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 troposphere and bad in the troposphere?

Gumdrop Science

Estimated Time
40–50 minutes

Supplies
Gumdrops in the following colors:
black, red, green, yellow and white[1]
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.

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.*

[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.

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/uvradiation.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 completed 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

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.

1 There are two SPF numbers whose sum is 90. Four times the first equals twice the second. What are the numbers?

2 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?

3 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?

4 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 radiation effect on skin) × *(percent elevation)* × *(sky conditions)* / *conversion factor* = *UV 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

1 There are two SPF numbers whose sum is 90. Four times the first equals twice the second. What are the numbers? *30, 60*

2 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.*

3 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*

4 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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Day 1: 300 × 1.06 × 1.00 / 25 = 13
Day 2: 300 × 1.06 × 0.89 / 25 = 11
Day 3: 300 × 1.06 × 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*.