

## UV Bead Magic

### Student Objective

The student:

- will be able to explain how the amount of UV radiation varies in differing conditions of sun and shade
- will be able to explain the importance of using sunscreen.

**Key Words:**

ultraviolet radiation (UV)

**Time:**

½ hour

### Materials:

- Ultraviolet Detecting beads (3 or 4 per student) \*
- yarn or cord
- crayons
- flashlight (2 or 3 per class)
- pan of water outside in the sun
- sink or pan of water inside
- hand towels
- Science Discovery Sheet

### Background Information

Sunburn is a condition resulting from an overexposure of the skin to the ultraviolet rays found in sunlight. Everyone, even dark skinned persons, are at risk for sunburn. Fair skinned, blue-eyed blonds and redheads are especially susceptible to being sunburned.

We all need exposure to the sun, as it is our primary source of vitamin D. But it does not take much time in the sun for most people to get the needed amount of vitamin D. When we stay in the sun for periods of time without skin protection, the sun's ultraviolet rays can cause minor to major damage. Damages from the sun can be skin damage, sun poisoning, eye damage, immune systems suppression, and in some cases even cancer. The sun weakens the skin's elasticity leading to premature aging, such as early wrinkles and a tough leathery look. Over exposure also leads to the development of flat, scaly, reddish patches called Solar Keratoses, which sometimes are precancerous. The most serious consequence of over exposure to the sun is skin cancer. It is not uncommon for people under 30, living in Florida, to have developed skin cancer. Over 700,000 new cases of this most common form of cancer occur each year. No tan is a safe tan.

Not all sunlight is "equal" in UV concentration. The intensity of the sun's rays depends upon the time of year, as well as the altitude and latitude of your location. UV rays are strongest during summer. Extra protection is also required near the equator, where the sun is strongest, and at high altitudes, where the air and cloud cover are thinner, allowing more damaging UV rays

to get through the atmosphere. Even during the winter months, if your family goes skiing in the mountains, be sure to apply plenty of sunscreen; UV rays reflect off both snow and water, increasing the probability of sunburn. Even on cloudy, cool or overcast days, UV rays travel through the clouds and reflect off sand, water, and even concrete. Clouds and pollution don't filter out UV rays, and they can give a false sense of protection. This "invisible sun" can cause unexpected sunburn and skin damage. Often people are unaware that they are developing sunburn on cooler or windy days because the temperature or breeze keeps skin feeling cool on the surface.

**UV Beads** - The UV sensitive beads contain a pigment that changes color when exposed to ultra-violet light from the sun or certain other UV sources. The pony beads are not, however, affected by visible light so they will remain white indoors or when shielded from UV light. The electromagnetic radiation needed to affect change is between 360 and 300 nm in wavelength. This includes the high-energy part of UV Type A (400 - 320 nm) and the low energy part of UV Type B (320-280 nm). Long fluorescent type black lights will work well with these beads. Incandescent black lights (the type used to make fluorescent paints glow), will not change the color of the beads nor will UV Type C (280-1 nm). The beads will however, respond to differing amounts of UV light, becoming a brighter color when more UV light is present. Students should also be able to see changes in the intensity of color when there is cloud cover versus a clear day, or in the morning versus noontime.

### **Procedure**

1. Lead a classroom discussion on sun exposure, ultraviolet radiation and sunscreen.
2. Introduce the class to the key words **ultraviolet radiation (UV)**.
3. Explain to the class that they are going to be investigating where ultraviolet radiation can be found.
4. Show students the UV sensitive beads. Ask them what they think will happen when the beads are taken outside and exposed to the sun (ultraviolet radiation).
5. Take the beads outside so that the students can see how they become colorful when exposed to UV radiation.
6. Return to the classroom and divide the students into lab groups of 5-6 students each.
7. Explain the lab procedure to the class.
  - They will each receive some beads (3 - 4) and a cord. They are to string the beads on the cord and knot the end so that the beads do not get lost.
  - They will be taking the beads to various locations around the school and at home tonight. Instruct the groups to travel together from one location to another (you may want to number the stations and have a specific order that the students are to follow). They should carry the beads in their pockets or under the hem of their shirt to keep them out of the light until they get to the designated location.
  - If the beads change color, they are to color in the box below the picture of the location. If the beads are very bright, they are to color in the box brightly, if the beads are pale colored, they are to color in the box lightly.
8. Pass out the beads and help the students string them as needed.
9. Students should go to the various locations and color their charts accordingly.
10. After the students have completed their Science Discovery Sheets, lead a discussion on

which locations had the most UV radiation, and where it would be important to wear sunscreen to block the UV radiation.

### **Key Words and Definitions**

- **ultraviolet radiation** - a part of the spectrum of sunlight that is located beyond the visible light spectrum at its violet end and having a wavelength shorter than those of visible light but longer than those of X-rays

### **Further Activities**

1. Investigate other situations for UV radiation, such as a sunlit window, a tinted window, under thin material, outside in the shade, or in their bedroom.
2. Read to the class the news article “Chilean Alert Over Ozone Danger.” Lead a discussion about how it would be to have to wear a hat and dark glasses every time they are outside. Older students can also discuss the quote of the Punta Arenas’ resident who states that she doesn’t have the money to buy the necessary sunglasses. What do they think should be done about this situation? Make sure you leave the discussion with a hopeful outcome. Explain that scientists are working to stop the ozone hole problem, and as concerned citizens, we can help by reducing the amount we pollute the air.

### **Related Reading**

- *Sammy Learns About Sunscreen* by Manisha Shelley Kaura (Bookstand Publishing, 2015)  
Through Sammy’s adventure on the beach and getting a painful sunburn, children learn about sunscreen and its importance in preventing skin cancer.

\* Ultraviolet Detecting Beads may be purchased from Educational Innovations:  
<http://www.teachersource.com/>

## Chilean Alert Over Ozone Danger



Preschoolers in Punta Arenas, Chile, wear dark sunglasses during an orange alert day, meaning those with pale skin can stay in the sun for only seven minutes.

**Photograph courtesy of Salon.com (11/03/00)**

**BBC News Online: World: Americas**  
**Tuesday, 10 October, 2000, 11:18 GMT 12:18 UK**

Chilean authorities have warned people in the southern tip of the country not to go out in the sun following reports of dangerous levels of ultraviolet radiation caused by the depletion of the ozone layer. Health officials said that the radiation levels were currently so high that unprotected skin would burn after just seven minutes in the sun.

United Nations experts say the ozone hole over the Antarctic this year has reached its deepest since measurements began 15 years ago. The earth's protective layer shields the planet and humans from harmful ultra-violet radiation which can cause skin cancer and destroy tiny plants in the food chain.

### **Warning**

Chile's health officials warned up to 120,000 residents of Punta Arenas city, which is nearly 1,400 miles (2,240km) from the capital Santiago, not to go out in the sun during the day. "We are warning people throughout the region not to go out in the sun between 11am and 3pm," said Lidia Amarales, Chile's health minister. "If people have to leave their homes they should wear high factor sun creams, UV protective sunglasses, wide-brimmed hats and clothing with long

sleeves," said Amarales.

People in this area are used to warnings about high ultra-violet levels. Some residents of Punta Arenas city and the island of Tierra del Fuego have taken precautions but for others, life has carried on as normal. "I have to go to buy bread and scarcely have money for that, so forget the sunglasses and suncream," said Adriana Cerpa.

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### Florida NGSS Standards & Related Subject Common Core

			.1	.2	.3	.4	.5	.6
<b>Grade K</b>								
<b>The Practice of Science</b>	<b>Big Idea 1</b>	SC.K.N.1	X	X	X		X	
<b>Grade 1</b>								
<b>The Practice of Science</b>	<b>Big Idea 1</b>	SC.1.N.1	X		X			
<b>Earth in Space and Time</b>	<b>Big Idea 5</b>	SC.1.E.5				X		
<b>Grade 2</b>								
<b>The Practice of Science</b>	<b>Big Idea 1</b>	SC.2.N.1	X					
<b>Mathematics Standards</b>	<b>Kindergarten:</b> MAFS.K.MD.1.1, MAFS.K.MD.1.2							

### Kindergarten Benchmarks

#### Science--Big Idea 1: The Practice of Science

- SC.K.N.1.1 - Collaborate with a partner to collect information.
- SC.K.N.1.2 - Make observations of the natural world and know that they are descriptors collected using the five senses.
- SC.K.N.1.3 - Keep records as appropriate -- such as pictorial records -- of investigations conducted.

#### Mathematics--Measurement and Data

- MAKS.K.MD.1.1 - Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
- MAKS.K.MD.1.2 - Directly compare two objects with a measurable attribute in common, to see which object has ‘more of /’ less of’ the attribute, and describe the difference.

### First Grade Benchmarks

#### Science--Big Idea 1: The Practice of Science

- SC.1.N.1.1 - Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.
- SC.1.N.1.3 - Keep records as appropriate - such as pictorial and written records of investigations conducted.

#### Science--Big Idea 5: Earth in Space and Time

- SC.1.E.5.4 - Identify the beneficial and harmful properties of the Sun.

### Second Grade Benchmarks

#### Science--Big Idea 1: The Practice of Science

- SC.2.N.1.1 - Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.

### **National Next Generation Standards**


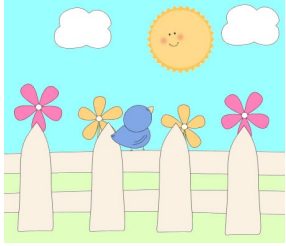


#### **Kindergarten Standards**





##### **Science–Energy**

- K-PS3-1 - Make observations to determine the effect of sunlight on Earth’s surface.

Note: Related Common Core Mathematics Standards are listed in the Florida section above.

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 <p><b>In the classroom</b></p>	 <p><b>Outside</b></p>	 <p><b>In the restroom</b></p>	 <p><b>In a dark room with a flashlight</b></p>

 <p><b>Under water inside</b></p>	 <p><b>Under water outside</b></p>	 <p><b>Riding in a bus or car</b></p>	 <p><b>At night</b></p>