Fun With the Sun

Introduction



The Sun gives of a great deal of energy in the ultraviolet (UV) range of the EM spectrum. We cannot see this energy, but it can damage our skin and cause cataracts. These activities will let students detect ultraviolet light and test various substances that can protect us from it.

Students Will Learn…

- UV sensitive beads change color in the presence of ultraviolet light.
- Earth's atmosphere scatters ultraviolet light.
- You can get a sunburn on a cloudy day.
- Certain substances block UV light while allowing visible light to pass.

What You Need

For the class:

- ❑ Bag of UV sensitive beads (if you want more UV beads, they are available from Educational Innovations at www.teachersource.com)
- ❑ 1 UV light (sometimes called a "black light")
- ❑ 1 pill bottle
- ❑ Sheet of acetate
- ❑ Sunscreen

Getting Ready

Plug in and test the UV light. Be sure that students do not stare into the UV light for long periods of time.

GO: Fun With the Sun

1. Show the students the UV beads and ask them for any observations they can make about the beads.

2. Place a small handful of beads on the table and turn on the UV light. Hold the UV light over the beads for a few seconds. Ask the students what changed about the beads. Ask the students what they think caused this change. (You might want to shine an ordinary flashlight on the beads if the students think that light made them change color).

3. Have the students take the beads outside in the Sun, if possible. Ask the students why they think the beads change color in the Sun.

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4. Tell the students that the black light and the sunlight both contain ultraviolet light. Our eyes cannot see ultraviolet light, but the beads will change color in the presence of ultraviolet light.
5. Give each pair of students a few beads. Have the students put the beads in a pocket or other dark place and take the beads outside. Have the students face away from the Sun and take out the beads. Make sure they keep the beads in their shadow. Ask the students why the beads changed colors even though they were in the shadows.

6. Tell the students that ultraviolet light is scattered by Earth's atmosphere. UV light from the Sun bounces off molecules in our atmosphere. Some of this UV light ends up bouncing into areas that are in shadow. Therefore, the beads will change colors even if they are in shadow!

7. Put some UV beads in the pill bottle. Expose the pill bottle to the Sun or the UV lamp. Ask the students what they notice about the beads.

8. Tell the students that pill bottles are designed to block UV light while letting through visible light. UV light can damage drugs so it is important to block UV light.



9. Divide the students into small groups. Give each group of students a sheet of acetate. Have the students spread sun block on top of the sheet. Place some UV beads on the table and place the acetate sheet over the beads. Shine the UV light on the beads. Have the students observe if the beads change color.

10. Ask the students if they think the sunblock would help prevent sunburn and why.

What's Really Happening Here…

UV sensitive beads contain pigments that change color when exposed to ultraviolet light. When the light is removed, the beads will slowly return to their original white color. Any UV light source will cause the beads to change color. The two most common sources are the Sun and black lights.

When you hold the beads in your shadow, they still change color even though they are not in direct sunlight. Our atmosphere scatters light. Short wavelength light is scattered more than long wavelength light. Scattering of short wavelength blue light is why our sky is blue (see Module 4, "Excuse Me, While I Kiss the Sky," for more information). UV light has an even shorter wavelength so it is scattered even more than blue light. If your eyes could detect UV light, you would see UV light coming from every direction in the sky!

Pill bottles block UV light so the drugs inside are not damaged. However, we also want to be able to see inside the bottle so we know how many pills are left.

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Sunblock is designed to filter out the UV radiation. Sunblock uses substances such as PABA to absorb UV radiation and keep it from reaching the skin. You can see the blocking effect by spreading the sunblock on a sheet of acetate and placing the acetate over the beads. It is messier if you spread the sunblock directly on the beads.

Going Further

1. There are many substances that allow visible light to pass and block UV light. You can test items such as windows, car windshields, and sunglasses to see which allow UV light to pass through and which block UV light.

2. You can also test different sunscreens and see which are most effective. Can you tell the difference between an SPF 15 sunscreen and an SPF 30 sunscreen?

3. The color of the beads becomes deeper when it is exposed to more intense UV light. Your students can create a scale where pale shades represent low intensity UV and dark colors represent high intensity UV. You can then do some more quantitative experiments with different substances to see how well they block UV light.

4. Some students will claim that the sunblock blocks UV light because you can't see through it when it is spread on acetate. We have found that cream cheese is a substance that blocks visible light but not UV light. Spread some cream cheese on the acetate and place it on top of the UV beads. Shine the UV light on the acetate to show that the beads change color.

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