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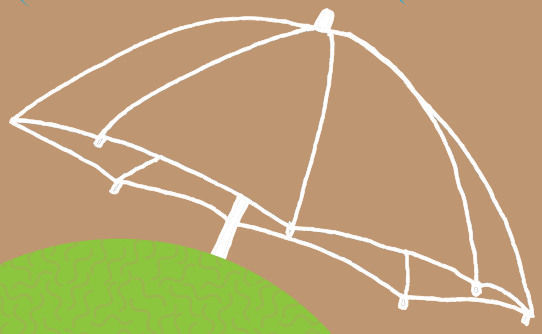

WOW!
"Wonders Of Water"

"It's Your Planet – Love It!"
Journey STEM Activities

These activities are from the Leader's Guide Book, "How to Guide Brownies Through 'WOW! Wonders of Water.'" These activities correlate directly with the science activities found in your Leader Guide. Your STEM kits in a box contain the supplies necessary to complete each of these activities, except where noted.

You will use the material in these kits to help the girls achieve their Journey badges as Brownies. These activities MUST be completed as part of their Journey throughout the course of the year.

Each activity includes a leader guide that gives background on the information covered in the activity.

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WOW!

"Wonders Of Water"

Session 1

"Making Rainbows"

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In this activity, you will be leading the girls through the experience of making their own rainbows. You will teach them about the properties of light and how a rainbow is formed.

Activity Materials:

- Clear drinking glass
- Pencil, spoon, straw (to demonstrate refraction)
- Small mirror
- Flashlight
- Prism

Key Terms:

(Share as many of the facts in this section as you wish.)

• Light: Light, or visible light, is a kind of energy called "electromagnetic (EM) radiation." Visible light is not harmful. There are other kinds of EM radiation, too (radio waves, microwaves, x-rays, etc.), but visible light is the part we can see and is the part that makes the rainbow.

Light is made up of all the colors put together. With light, unlike crayons and paint, when you mix all the colors together, you get white. When light hits the Earth's atmosphere, it is white. Light travels in fast, straight lines called rays. How fast does light move? At 186,000 miles per second! The light from the sun takes approximately 8 minutes to reach the earth. So when you look at the sun, you are looking at what it looked like 8 minutes ago!

As you know, the sun is a star. Other stars are much farther away. They are light years away. Although we are discussing units of time, a light year is actually a measurement of distance. It is the distance light travels in a year, approximately 6 trillion miles. The closest star to us, Alpha Centauri, is 4.9 light years away. That means it takes the light from Alpha Centauri 4.9 years to reach us. When we look at Alpha Centauri from earth, we are actually seeing what it looked like 4.9 years ago. Stars that are thousands or millions of light years away take that amount of time to reach us. So when we look up at the stars at night, we are seeing what they looked like thousands to millions of years ago. We are looking into the past!

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WOW!
"Wonders Of Water"

Key Terms Continued:

- **Reflection:** a "mirror-like" representation of an object's image being bounced back from another surface.
- **Refraction:** an object's visual proportion being distorted or refined when passing from one medium to another through an angle. Today you will be putting a straw in a glass of water at an inclining angle, and you will see that the straw appears to be "bent" once it is submerged in water. That is an example of refraction.
- **Prism:** A prism is a piece of glass or other see-through material that has several flat sides called faces. Many prisms have three long faces in between two triangle-shaped ends. However, prisms can be made in many forms and shapes. People use prisms to bend or refract light. When light passes through a prism, the light bends. As a result, the different colors that make up white light become separated. This happens because each color has a particular wavelength and each wavelength bends at a different angle.

Background:

Rainbows appear when raindrops (similar to a prism) refract, or bend, sunlight, thus breaking white sunlight into colors. To see a rainbow, an observer must have her back to the sun and rain must be falling in front of her. Since each raindrop is lit by the white light of the sun, a spectrum of colors, similar to how a prism makes rainbows, is produced. We do not expect girls to walk out of the meeting able to recite definitions of light, refraction, reflection, etc., although some may be able to do so. It is important to be introduced to the terms and understand the properties of light. Most of all, it's important to have fun while doing science!

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Directions:

ASK: Do you remember a time when you have seen a rainbow? What was the weather like? (Allow time for the girls to answer and tell their stories.)

ASK: Do these stories have anything in common? (Allow time for the girls to answer. Try and lead girls toward talking about water and light.)

SAY: What they have in common is water and light! Did you know you can only see a rainbow when you have the sun to your back and the water is in front of you? Also, no two people see the same rainbow. Even if you're standing right next to another person, you both see a completely different rainbow. The rainbow you see is just for you and nobody else. That's how you know you're special. The next time you see a rainbow, try doing this: look at the rainbow you see by closing one eye and look at it with just the other eye. After a few seconds, close that eye and look at it with the other one. You'll see two different rainbows.

(Grab the flashlight and the prism.)

SAY: I'm going to make a rainbow right now using this (hold up the prism) device. It's called a prism, and it can bend light so a rainbow appears.

(Demonstrate by shining the light on the prism.)

SAY: The prism is bending the light so that it looks like different colors.

ASK: Did you know that light that we see is really the color white and that it's made up of all the colors in the world? That's not like our crayons or paint, is it? What happens when we mix all of our crayons or all our paints together? (Wait for an answer.)

SAY: It turns black, you're right. But light is different. When you mix all the colors together with light, it turns white, not black. When I pass this light through the prism, it refracts the light. Refract means it bends the light.

(Put the pencil, straw, or spoon in the glass.)

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Directions:

ASK: What do you see? What does the straw look like when it's in the water? (Allow girls to answer.) Have you ever had that happen to you in a pool?

SAY: The water is bending the light so the straw looks like it's in two different pieces. This is because water is bending the light. When water slows light down, it takes it a little longer to pass through, so it makes it look different. This bending of the light is called refraction. It sounds like reflection, I know, and they are related. Reflection--like when you look in a mirror--bounces the light straight back to your eyes, and you see a copy of yourself in reverse.

ASK: Have you ever listened to a radio station and, when you turn the tuning knob, you hear something else?

SAY: When you're turning the knob and changing stations on the radio, you're changing frequencies. Light works the same way. Each color has a different frequency. So when light goes through the prism, it bends the light so we can see each color and its frequency.

ASK: Now, we know there aren't lots of prisms hanging in the sky, so what acts like a prism to bend the light into its different colors? (Wait for answers.)

SAY: It's water drops! The light from the sun passes through the front of the raindrop and bends it through the other side. This is just like our prism. That's how our rainbow is made.

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Directions:

SAY: Now, we've made a rainbow with our prism. What do you say we try another way?

(Take out the glass and place the mirror in the glass, then place the mirror on the floor or on a low table.)

ASK: Now, who wants to make a rainbow? (Wait for responses.)

SAY: Let's all stand around the glass and watch [NAME] shine the light into the water. (The girl doing the experiment will need to move the flashlight around until a rainbow appears.)

(After everybody has had a turn, gather them into a circle again.)

ASK: Have you ever made a rainbow with a garden hose?

SAY: All you need to do is point the hose up into the sky, but not straight up. Make sure the sun is behind you and pinch the hose with your fingers so it sprays. Ta-da, you will have a rainbow.

ASK: Can you name the colors of the rainbow? Make sure you put them in the right order! (Give every girl a chance to respond. If any girls leave out a color, teach them ROY G BIV, a fun name for remembering all the colors. In case you've forgotten: R=Red, O=Orange, Y=Yellow, G=Green, B=Blue, I=Indigo, V=Violet.)

ASK: Have you ever made a rainbow before? What did you learn today? How does it feel to learn something new? Now that you know how to make a rainbow, who might you teach to make a rainbow? (Allow girls to answer.)