Year 2 Lessons

Visit 1

Redistributing the wide-brimmed hats

- To expedite the process, it would be helpful to obtain a school roster before visiting the schools, that way the hats can be separated so that first year students can be matched up with their second year teachers so that they receive the correct hat.
- Redistribution is similar to distribution because some students will need new hats.
    - Refer to visit 1, year 1
- Hats will be stored in the same fashion as the previous year.

Child's Assent Statement

Dr./Mr./Ms._____ has explained to me the research study called:

Sun Protection for Florida School Children

I agree to be in this study.

_____	_____	_____
Signature of Child	Printed Name of Child	Date
_____	_____	_____
Signature of Investigator	Printed Name of Investigator	Date
_____	_____	_____
Signature of Witness	Printed Name of Witness	Date

IRB#_____

Year 2 Lessons

Visit 2

THE SKIN I'M IN

Overview:
The students will learn about the layers of the skin and the effects of sunburn on the skin. The lesson will also reinforce ways students can protect their skin from harmful UV rays while outside.

Objectives
Students will:
- Have the ability to identify the skin layers.
- Learn about skin cancer.
- Identify 5 ways to protect their skin from UV rays.

Key Concepts:
Layers of the Skin:
- Epidermis
- Dermis
- Hypodermis or Fatty (Subcutaneous)

Melanin
Sunburn

- Who has ever had sunburn?
- Where on your body did it happen?
- What did it look like?

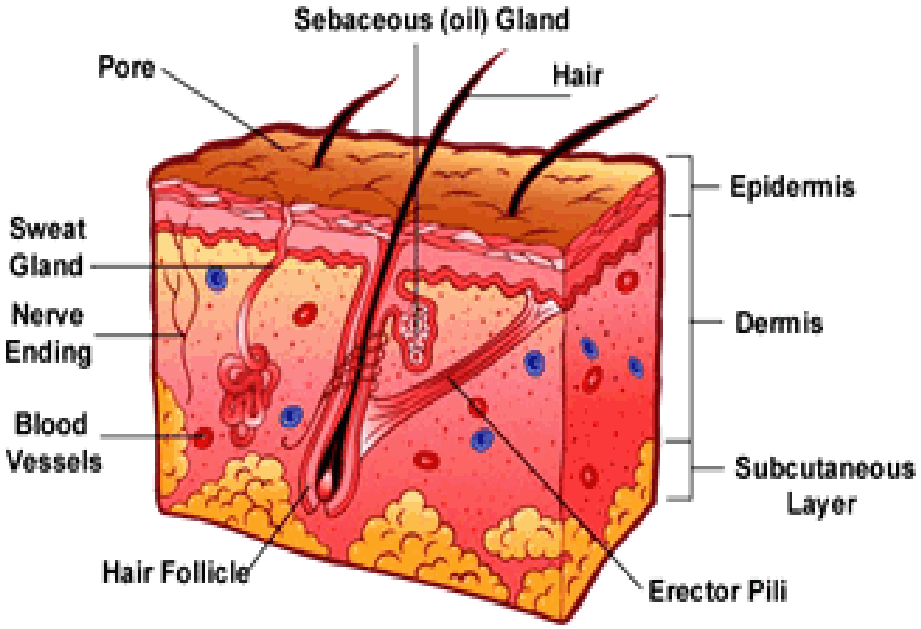
Skin and its Functions

- The skin is the body's largest organ.
- An organ is a group of tissues that work together to do a specific job.
  - The heart is an organ because the muscles work together to make the heart beat.

Skin's 3 Main Functions:

1. **Protects**
2. **Senses**
3. **Regulates**

1. Your skin is **protects** (Bodyguard) – your skin's main job is to insulate and protect the body against invasion by bacteria and other foreign things and **most importantly the sun's UV rays**.
   - **Quick Fact:** After a sunburn, the skin breaks down and can increase your chances of infection (**let or help bacteria and other nasty germs get under your skin**).
2. Your skin has **senses** (Feeler) – the skin can sense or feel 5 different kinds of stimulation: **touch**, **pressure**, **heat**, **cold**, and **pain**.
3. Your skin **regulates** (Controller) – the skin control's your body's temperature by distributing or spreading heat through the skin and by preventing dehydration.



The skin has 3 layers:

1. **Epidermis**
2. **Dermis**
3. **Hypodermis**

1. <u>Epidermis</u>

- *This is the layer of the skin that you can see*. Look down at your hands for a minute. Even though you can't see anything happening, your epidermis is hard at work. As your skin grows, new skin cells start moving toward the top of your epidermis. This trip takes about 2 weeks to a month. As newer cells continue to move up, older cells near the top die and rise to the surface of your skin. So that means what you see on your hands (and everywhere else on your body) are really dead skin cells.

- These old cells are tough and strong, just right for covering your body and protecting it. But they only stick around for a little while and then start to flake off. Although you can't see it happening, every minute we lose about 30,000 to 40,000 dead skin cells off the surface of our skin.

- Most of the cells in your epidermis (95%) work to make new skin cells.

- And the other 5%…, well, they make a substance called **<u>melanin</u>**. Who can tell me what that is? **<u>Melanin</u>** is a substance that gives skin its color. The darker your skin is, the more melanin you have. When you go out into the sun, these cells make extra melanin to try to protect your skin from getting burned by the sun's ultraviolet, or UV, rays. That's why your skin gets tan if you spend a lot of time in the sun.

Even though melanin is mighty and works hard it doesn't completely keep your skin safe from the sun's rays. Therefore <u>it's really important that you wear sunscreen and protective clothing, such as a hat, to prevent painful sunburns.</u> <u>Protecting your skin now also can help prevent skin cancer when you get older.</u>

2. <u>Dermis</u>

- The next skin layer is the dermis. You can't see your dermis because it's hidden under your epidermis. The dermis has nerve endings, blood vessels and sweat and oil glands.

- The nerve endings in the dermis allow us to feel and touch objects. If you touch something hot, the nerve endings in your dermis respond right away: "Ouch! That's hot!" The nerves quickly send this message to your brain which then immediately commands the muscles to take your hand

away. This all happens in a split second, without you ever thinking about it.

- (Tiny) blood vessels- These keep your skin cells healthy by bringing them the oxygen and nutrients they need and by taking away waste. Oil glands. These are also called **sebaceous glands**, and they are always producing **sebum**. Sebum is your skin's own natural oil. It rises to the surface of your epidermis to keep your skin lubricated and protected. It also makes your skin waterproof so that your skin won't absorb water and get soggy.

- As the dermis or 2nd layer gets old, it gets thinner and easier to see through.

3. **The Hypodermis (Subcutaneous Fat Layer)**

    - The third and bottom layer of the skin.
    - It is made mostly of fat and helps your body stay warm and absorb shocks if you bang into something or fall down.
    - This is also where your hair begins to form.

UV rays & Sunburns

- Did you know that the heat from the sun gives off enormous quantities of ultraviolet (UV) rays?
- These UV rays can damage the layers of your skin and cause skin cancer. If all of the UV rays coming towards the earth reached its surface, most plants and animals would die.
- However, the upper atmosphere (stratosphere) contains enough ozone to filter out most but not all of the damaging UV rays.

Tanning/Sunburn

There is no such thing as a healthy tan; the golden color that you see is actually results of injury to the epidermis. A tan is your skin's way of protecting it from the UV rays of the sun. Too much sun can cause damage.

A sunburn is a burn! A burn by the sun can have the same effect of a burn from the stove or an iron.

First degree burns affect the outer layer of the skin (the epidermis), causing pain, redness, and swelling.

2nd degree burns affect both the outer and underlying layer of the skin, causing pain, redness, swelling, and blistering.

Third-degree burns extend into deeper tissues, causing brown or blackened skin that may be numb.

How is the skin damaged in the sun?
Sunburns result when the skin is over-exposed to the sun's ultraviolet rays and is not able to produce enough melanin to protect it from damage.

An afternoon out in the sun without sun protection:

11 am		**Arrive at the beach without wide brimmed hat, sunscreen, protective clothing, sunglasses, and no shade anywhere; lay towel out and begin reading**
11:15-11:30		**The sun's rays start to damage the 1st layer of skin cells**
12:00-1:00		**Skin starts to turn red and painful to the touch – a sunburn has occurred!**
1:15		**Pack up and go home**
3:00		**Skin begins to swell and blisters form**
Next day		**Epidermis begins to peel and skin may have discoloration and abnormal patterns**
3-4 weeks later		**Healing process will be nearing its final stages – serious sunburns take several weeks to heal**

Remember the damage to your skin has already been done so now you have to take steps to protect your skin from future sun burn and sun damage.

Things to remember

Sunburn can occur in less than 15 minutes and can take a few days or weeks to heal depending on how serious the damage is. A **sunburn** develops when the amount of UV exposure is greater than what can be protected against by the skin's melanin.

- There is no cure for sunburn except time and patience.
- Mild sunburn can be treated at home, but severe and blistered burns need prompt medical attention.
- Lots of exposure to UV rays damage the skin permanently and may cause skin cancer.

You should always protect your skin when outside!

1. Wear a <u>wide brimmed hat</u>

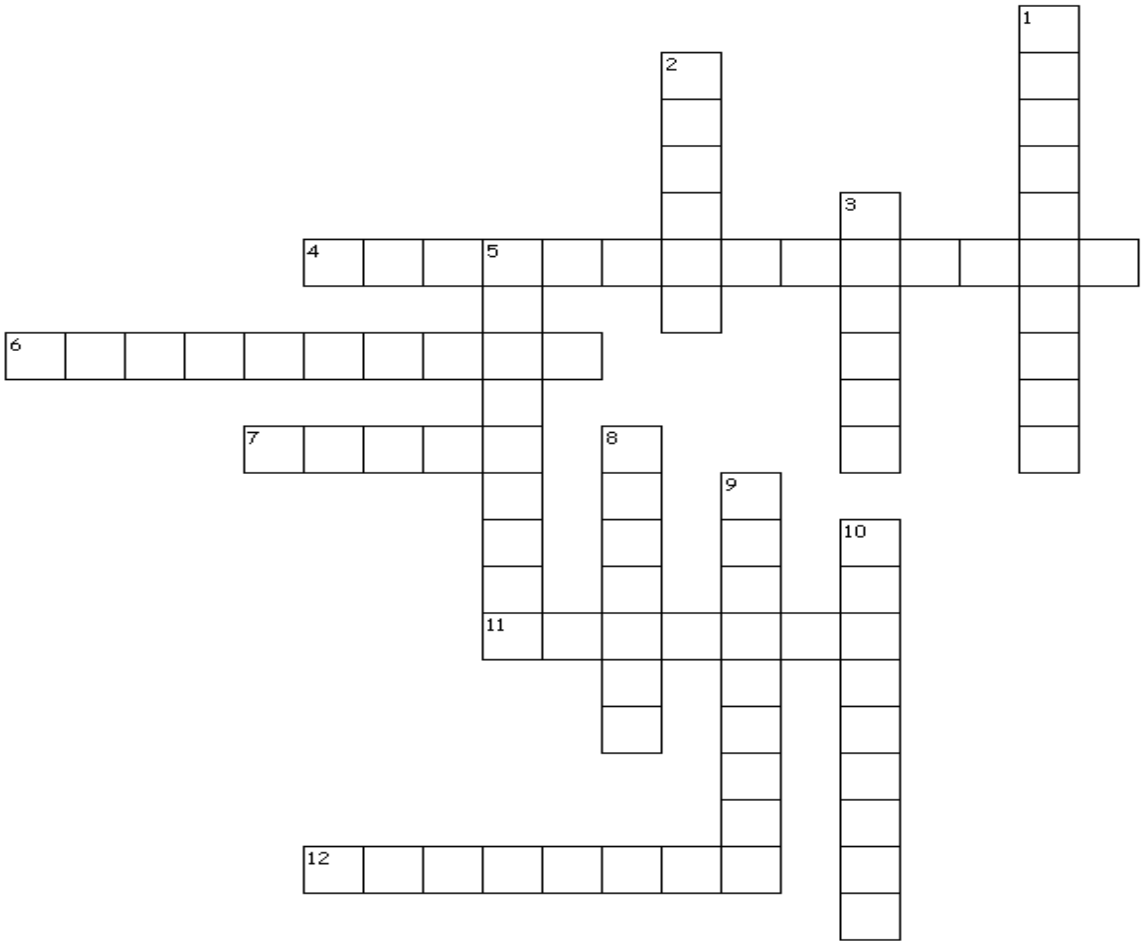
2. Wear <u>sun protective clothing</u>

3. Use <u>sunscreen</u> with SPF 15 or higher

4. Wear <u>sunglasses</u>

5. Seek <u>shade</u>

The Skin I'm In



Across

4. The type of hat you wear that protects your head, face, ears, and back of your neck

6. This layer is made of mostly fat and helps your body stay warm

7. Seek this to protect your skin from the sun

11. A burn by thes sun that can have the same effect of a burn from the stove or an iron

12. one of the jobs of your skin; known as the bodyguard

Down

1. Use these to protect your eyes from the sun's rays

2. Nerve endings in this layer allows us to feel and touch objects

3. There are 5 different kinds of these stimulations than your skin can recognize. Can you name them?

5. Layer of the skin that you can see

8. substance that gives skin its color

9. a job of your skin that controls your body's temperature

10. This should have a sun protection factor of 15 or higher

12 of 12 words were placed into the puzzle.

The Skin I'm In

The skin is the body's largest organ. An organ is a group of tissues that work together to do a specific job. Your skin's main function is to protect the rest of your body from the world around us.

LAYERS OF THE SKIN

1. **Epidermis**- This is the layer of the skin that you can see. Look down at your hands for a minute. Although you can't see it happening, every minute we lose about 30,000 to 40,000 dead skin cells off the surface of our skin.
2. **Dermis**- The next skin layer is the dermis. You can't see your dermis because it's hidden under your epidermis. The dermis has nerve endings, blood vessels and sweat and oil glands that allow us to feel things like hot and cold.
3. **The Hypodermis (Subcutaneous Fat Layer) -** this is the third layer of the skin. It is made-up of fat that helps the body to stay warm, it absorb shocks, and hold your skin together.

An afternoon out in the sun without sun protection:

11 am		**Arrive at the beach without wide brimmed hat, sunscreen, protective clothing, sunglasses, and no shade anywhere; lay towel out and begin reading**
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3-4 weeks later		**Healing process will be nearing its final stages – serious sunburns take several weeks to heal**

Remember the damage to your skin has already been done so now you have to take steps to protect your skin from future sun burn and sun damage.

Year 2 Lessons

Visit 3

UV & Me!

Overview:
The students will conduct an experiment using UV beads and various UV protective and non-UV protective items to demonstrate the usefulness of each item. The students will use discussion to find the UV index readings from various sources. The students will learn to interpret the index number and to determine the various exposure levels of UV radiation.

Objectives
Students will be able to:

- See the effects UV radiation and the effects of different materials used to block out UV radiation.
- Describe at least 5 ways they can protect themselves against harmful UV radiation.

Key Concepts:

- Ozone layer
- UV radiation
  - UVA rays
  - UVB rays
- UV index

Materials:

- UV Beads
- Sunscreen – lotion, SPF 15, & SPF 30
- Glasses
- Sunglasses with UV protective coating on lenses
- Fabric to represent wide brimmed hat and protective clothing
- Styrofoam board
- Hair pins/paperclips
- Marker

The Ozone Layer and Ultraviolet rays

Ozone Layer is a naturally occurring gas found in the Earth's atmosphere. The ozone layer acts like a shield that protects against the harmful effects of UV radiation on human beings; known as *Earth's giant umbrella.*

- Thinning ozone layer increases levels of UV radiation on Earth.

The sun emits light and warmth but also UV radiation. ***UV radiation*** cannot be seen or felt – UV radiation levels are independent of temperature and can still be high even when it is cloudy.

- **Two types of UV *(UltraViolet)* rays are *UVA & UV B.***

UV A

- Not absorbed by ozone layer
- Penetrate deep into skin and heavily contributes to premature aging
- Up to 90% of visible skin changes commonly attributed to aging are caused by sun exposure

UV B

- Partially absorbed by the ozone layer
- Mostly impact the surface of skin and primary cause of sunburn
- UVB rays will pose an increased threat b/c of thinning ozone layer

- Too much UV radiation can contribute to:
  - Adverse health effects – sunburn and skin cancer
  - Skin ageing
  - Eye diseases – inflammation and cataract
  - Weak immune system

(see appendix for more facts on UV rays)

Today's lesson is going to test out some protective items that you mentioned earlier with an experiment. We're going to test all the things we tell you to wear to make sure it's effective.

- **How many of you have heard of an *UV index*? Do you know what the UV index does and where to find it?**

  The UV index can be found in the weather report on the news, in the newspaper, or on the internet so that you know your risks before participating in outdoor activities.

Experiment Procedure:

1. Distribute the UV Index handout and UV Bead experiment handout to each student.

   Explain the UV index to the students and tell them the index for the day and ask for a volunteer to read the protective actions for the day. Inform the students on where the UV index can be found – news reports on television, radio, newspaper, & internet.

2. Have the students make predictions about what will happen to the beads when each item is applied to it on their experiment handout. (*See attached handout)*

   * *What do you predict will happen to the bead when sunscreen is applied to it? Sunglasses? Etc.*
   * *Predict the amount of time it will take the bead to change color once it is exposed to outdoor light.*

3. Take out the beads and other protective items.

   Have the beads labeled on Styrofoam board before class session to save time.

4. Attached the beads to Styrofoam board using paperclips or pins

5. Observe the plain beads while still inside the classroom.

6. Apply a small amount of sunscreen (all SPF levels) beside the label on the surface of bead.

7. Attach a lens of each of the different sunglasses to the beads.

8. Place fabric or a wide brimmed hat over the beads.

9. Cover the bead with newspaper (or anything) and go outside.

10. Uncover the bead and begin timing.

    The undisturbed area of the UV bead will change color. The beads with SPF 0 will change color, but SPF 15 and higher will probably slightly change color. The UV blocking lenses will not change or change slightly

depending on the placement, but the non-UV blocking should change completely.

11. Let the students know when 1 minute, 3 minutes, and 5 minutes have passed so that they can record their observations.

12. After 5 minutes, lead the students back to the classroom (or have the students go back to their seats) to record their conclusion and answer the questions on the handout.

Review & Conclusion:

- Now that we have done this experiment, which of the items used would be the most effective UV blocker?
  Sunscreen SPF 15+, wide brimmed hat, & UV blocking sunglasses

- You and your family are planning a trip to the beach, but before you go, your mom wants you to check the UV index. Where could you look to find the UV index?
  Newspaper, television, internet, or radio – usually whatever medium the weather is reported.

- After seeing the effects of the UV radiation to the Bead, does this make you rethink the behaviors you described earlier? Which items will you use before heading outside?

- Sunscreen as a means of sun protection has many limitations: it can easily wear off and most people do not apply sufficient amounts. Therefore, sunscreen should not be used as the primary means of sun protection but only in combination with other "sun safe" measures and behaviors.

- **Encouraging "sun safe" behaviors as part of the school policy and practicing them throughout the school day helps children develop these life skills.**

Appendix

UV facts

- Over 90% of UV can penetrate light cloud
- Clean snow reflects up to 80% of sun burning UV
- 60% of UV is received between 10 am and 2pm daily
- UV increases by 4% for each 300 meter increase in altitude
- Indoor workers receive 10% to 20% of outdoor workers' yearly UV exposure
- Shade can reduce UV by 50% or more
- At half a meter depth UV is still 40% as intense as at the surface
- Sand reflects up to 25% of UV

How to apply sunscreen:

Because most sunscreens provide a water-resistant base and therefore will not adhere to wet surfaces, it is extremely important to apply to dry skin before going outdoors.

An average adult should use the equivalent of 1 fluid ounce per full-body application. It's recommended that all sunscreen is reapplied every two hours. Also remember to reapply after vigorous activity or toweling off.

Did you know? More than 90 percent of skin cancer cases are caused by sun exposure. That means you can prevent it. And no, you don't have to stay out of the sun to be safe. You just have to protect yourself.

- More than 1.5 million new cases of skin cancer are diagnosed each year in the United States.
- One in five Americans and one in three Caucasians will develop skin cancer in the course of a lifetime.
- Nationally, there are more new cases of skin cancer each year than the combined incidence of cancers of the breast, prostate, lung, and colon.
- More than 90 percent of all skin cancers are caused by sun exposure, yet fewer than 33 percent of adults, adolescents, and children routinely use sun protection.
- The incidence of melanoma, the deadliest form of skin cancer, is rising faster than that of any other cancer. There are now nearly 8,000 melanoma deaths every year.
- One person dies every hour from skin cancer, primarily melanoma.
- By 2010, melanoma is projected to rise to one in 50 Americans.
- While melanoma is uncommon in African-Americans, Latinos, and Asians, it is most deadly for these populations.
- The majority of people diagnosed with melanoma are white men older than age 50.
- Skin cancer is the No. 1 cancer in men 50 and older, ahead of prostate, lung and colon cancer.
- Middle-aged and older men have the poorest track record for performing monthly skin self exams or regularly visiting a dermatologist. They are the least likely individuals to detect melanoma in its early stages.
- Men over age 40 spend the most time outdoors and have the highest annual exposure to ultraviolet radiation.
- In the past 30 years, skin cancer has tripled in women younger than 40.
- Melanoma is the second most common cancer in women aged 20-29.
- One blistering sunburn in childhood more than doubles a person's chances of developing melanoma later in life.

- Regular sun protection throughout childhood can reduce the risk of skin cancer by 80 percent.
- It is estimated that 2.3 million teens visit a tanning salon at least once a year.
- In the past 20 years there has been more than a 100 percent increase in the cases of pediatric melanoma.
- Less than half of all teenagers use sunscreen.
- The effects of photoaging (skin aging caused by the sun or tanning machines) can be seen as early as in one's 20s.

Information courtesy of The Skin Cancer Foundation, New York, NY

UV Index Scale

Extreme

- **TAKE FULL PRECAUTIONS**
- Unprotected skin will be damaged and can burn in minutes
- Avoid the sun between 10 am and 2 pm

Very High

- **Extra precautions required - unprotected skin will be damaged and can burn quickly**
- Avoid the sun between 10 am and 2 pm
- Take full precaution - seek shade, cover up, wear a wide brim hat, sunglasses, and sunscreen

High

- **Take full precautions - seek shade, cover up, wear a wide brim hat, sunglasses, and sunscreen**
- **Protection required**
- Reduce time in the sun between 11 am and 2 pm

Moderate

- **Take precautions - cover up, wear a wide brim hat, sunglasses, and sunscreen** especially if outside for 30 minutes or more
- Look for shade near mid-day when sun is strongest

Low

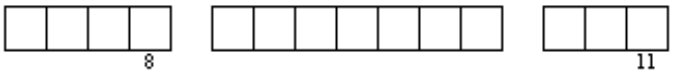
- Minimal sun protection required for normal activity
- If outside for more than an hour, cover up and use sunscreen

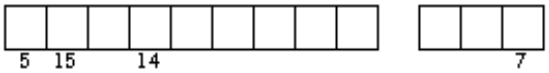
*Information provided by EPA SunWise Kids: http://www.epa.gov/sunwise/kids/kids_uvindex.html

You can check the UV idex in the local paper, watching the local news, or by visiting http://www.skincancerprevention.org/UVReport.aspx.

Sun Protection for Florida's Children

Unscramble each of the clue words.
Copy the letters in the numbered cells to other cells with the same number.

IEDW REBDIMM TAH 

NUSRESNEC FPS 15+ 

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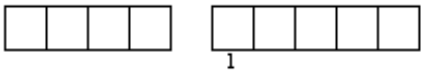
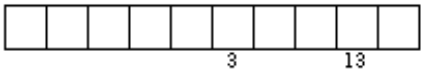
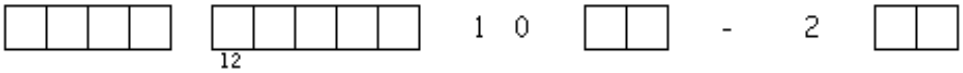
SEKE DASHE 

SESNAGSUSL 

AEPK ROHSU 10 AM - 2 PM 

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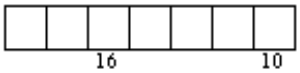
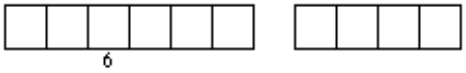
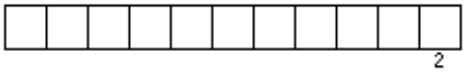
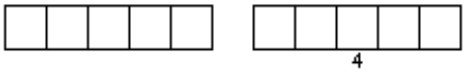
NURNSBU 

HASWOD RLUE 

AOVIELTLRTU 

ZEONO RAELY 

!

UV Beads Experiment

Directions: Observe the UV beads as a variety of materials is applied to it. Use the chart below to record your observations as each material is applied to the bead. Use this information to answer the questions below.

	Bead Predictions	Color of the UV beads after: 5 SECONDS	5 minutes	Conclusion
Indoors				
Control nothing				
Group 1 SPF 30				
Group 2 Sunglasses w/ UV				
Group 3 fabric				

What happened to the UV beads when first exposed to sunlight? After 5 minutes?

_____

_____

What did you note about the surface area of the UV beads that was covered with the items? Did one item make the beads stay white longer than the other? Which do you think is the least effective? Most effective?

_____

_____

_____

What items will you used to protect your skin from the sun's UV rays?

_____

_____

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UNIVERSITY OF SOUTH FLORIDA

UV INDEX CHART

UV Index	Exposure Level	SUN PROTECTION ACTIONS
0 - 2	Low	• Minimal sun protection required for normal activity • Wear sunglasses on bright days. If outside for more than one hour, cover up and use sunscreen • Reflection off snow can nearly double UV strength. Wear sunglasses and apply sunscreen
3 - 5	Moderate	• Take precautions - cover up, wear a hat, sunglasses and sunscreen especially if you will be outside for 30 minutes or more • Look for shade near mid-day when the sun is strongest
6 - 7	High	• Protection required - UV damages the skin and can cause sunburn • Reduce time in the sun between 11 a.m. and 4 p.m. and take full precautions - seek shade, cover up, wear a hat, sunglasses and sunscreen.
8 – 10	Very High	• Extra precautions required - unprotected skin will be damaged and can burn quickly • Avoid the sun between 10 a.m. and 4 p.m. and take full precautions - seek shade, cover up, wear a hat, sunglasses and sunscreen .
11+	Extreme	• Take full precautions. Unprotected skin will be damaged and can burn in minutes. Avoid the sun between 10 a.m. and 4 p.m., cover up, wear a hat, sunglasses and sunscreen • White sand and other bright surfaces reflect UV and increase UV exposure.

Year 2 Lessons

Visit 4

White Light and It's Colors

Overview:
The students will use the scientific method in order to discover how a prism separates light into the different colors that it is comprised of. They will have the opportunity to see the reaction of different types of light. Therefore, the students will formulate their personal hypothesis through the experiment and observe the results in order to form the conclusion.

Key Concepts:
Light from the Sun contains the colors of the rainbow. White light contains all the colors of the rainbow. A prism separates all the colors that are contained in a white light.

Standards Addressed: SC.B. 1.2.3, SC.H.1.2.1, SC.H. 1.2.2

Objectives: SWBAT

- Obtain knowledge and understanding of the scientific method and know how to apply it when conducting an experiment.
- Understand that white light is comprised of different components of color.
- Observe and understand that a prism separates light into the different component of color of which it is comprised.

Materials:

- 1 prism (can be constructed)
- Light sources (sun, flashlight, lamp, or projector)
- Spectroscope handouts
- CD wedges
- Tape
- Scissors
- Scientific Method worksheet

Introduction:

1. We have been getting together and talking about the Sun. Who can remind everyone what the sun is? *(a star)* What does the light give us here on Earth? *(heat and light).*
2. Today we are going to be looking at the light that we get from the Sun. In order to study the Sun's light carefully we are going to conduct a small experiment using the scientific method.

Procedure:

1. Ask the class if anyone knows what the scientific method is. Write their responses on the board.

2. When a scientist wants to solve a problem he or she thinks of a possible solution and designs an experiment around that solution. He or She will make a prediction about what will happen in the experiment. This prediction is the hypothesis.

3. The scientist will them conduct the experiment being very careful about two extremely important things. First they want to control as many variables as possible. Does anyone remember/know what a variable is? *(things that could change, effecting the result of the experiment)* If a scientist wanted to know if drinking Kool-Aid makes kids dizzy he or she will give kids only Kool-Aid to drink because if the kids were drinking both Kool-Aid and Coke the scientist would not know if it was the Kool-Aid or the Coke making the kids dizzy. The scientist will control what the kids drink so that the only thing that could be making them dizzy is the Kool-Aid.

4. The second thing scientists need to be very careful about is documenting how they conduct their experiments. Other scientists need to be able to repeat the experiment to make sure the findings are true. Think about what might happen if you found a light switch in your house and you didn't know what light would go on when you switched it. If you were standing in the kitchen and flipped the switch on and your mum happened to flip a different switch and turn on a light in the kitchen at the same time, you might conclude, incorrectly, that your switch turned on the kitchen light. Scientists need to keep very detailed records so that they can double check each other to make sure there were not variables that the original experimenter had not considered.

5. Once the scientist has conducted the experiment and taken careful notes regarding the procedure. He or she will carefully observe and record the findings of the experiment.

6. After the experiment has been conducted and the findings recorded the scientist will draw conclusions based on what he or she found and what other scientists have found previously. For this reason it is extremely important to document everything and to share it with the public and with other scientists because scientists rely on the work of those before them to help them learn new things.

7. Hand out experiment worksheets. Today we are going to take notes and document our activities like real scientists as we try to learn about the color of light. We are going to use a tool that separates the colors in light to find out what color the sun's light is and how that compares to light from other sources.

8. Let's begin by identifying our problem, or as a scientist would put it, let's record our research question. Can anyone state the research question? *(what color or colors are/is in the sun's light?)* Write this on the board and instruct the students to write it on their worksheets.

9. Next we need to design an experiment to answer our question. Now we know that if we shine light through a prism the colors in the light will separate. Can anyone think of a way to use this prism to find out what colors are in the sun's light? *(Hold the prism up so the sunlight shines through it put a white piece of paper where the light lands so that we can see the colors more easily.)* Instruct the students to write this on the worksheets under "Experimental design," and write it on the board.

10. Now we are ready to conduct the experiment. Instruct the students to write down each step of the experiment under the procedures. Make sure you say each step out loud as you do it. *(1. take prism to classroom window. 2. hold prism up to sun. 3. place large white paper on desk/table/floor where the light from the sun through the prism falls. 4. record the colors you observe.)*

11. Instruct the students to write down their observations under "Findings." What conclusions can we draw from what we have found? What colors are in sunlight?

Conclusion

Ask the students what they think might happen if they use the prism to look at light from sources other than the sun. Make a few spectroscopes and let the students use them to look at light from other sources. After they have a chance to use the spectrometers ask if they have any ideas about other experiments they could do to find out more about light.

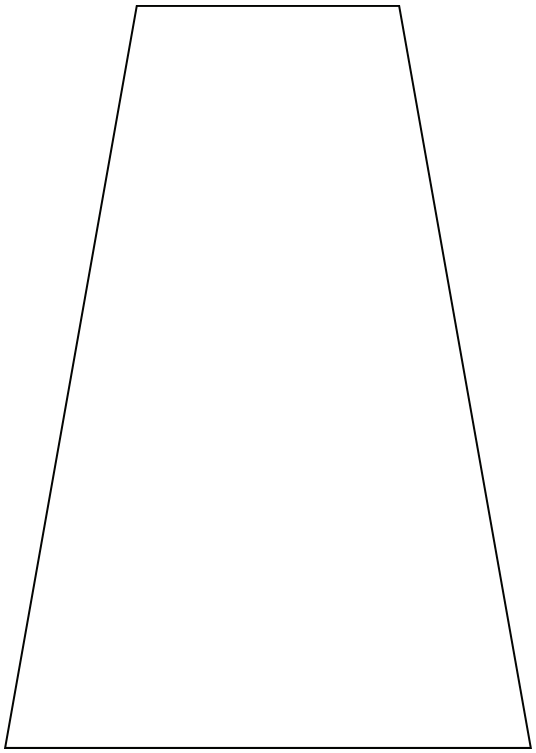
Sunlight Exploration
Team Report

Team name _____

Spectroscope_____ Spectroscope_____
Reporter _____ Presenter _____
Captain _____

Directions: Point your spectroscope so that the side with the slit is aimed at the sun. Look down through the view hole and record what you see.

Observations: Color the diagram below to match what your team saw with your Spectroscope.



Conclusions: Use the space below to record your team's explanation for what you saw when you looked at the sun's light through the Spectroscope.

_____

_____

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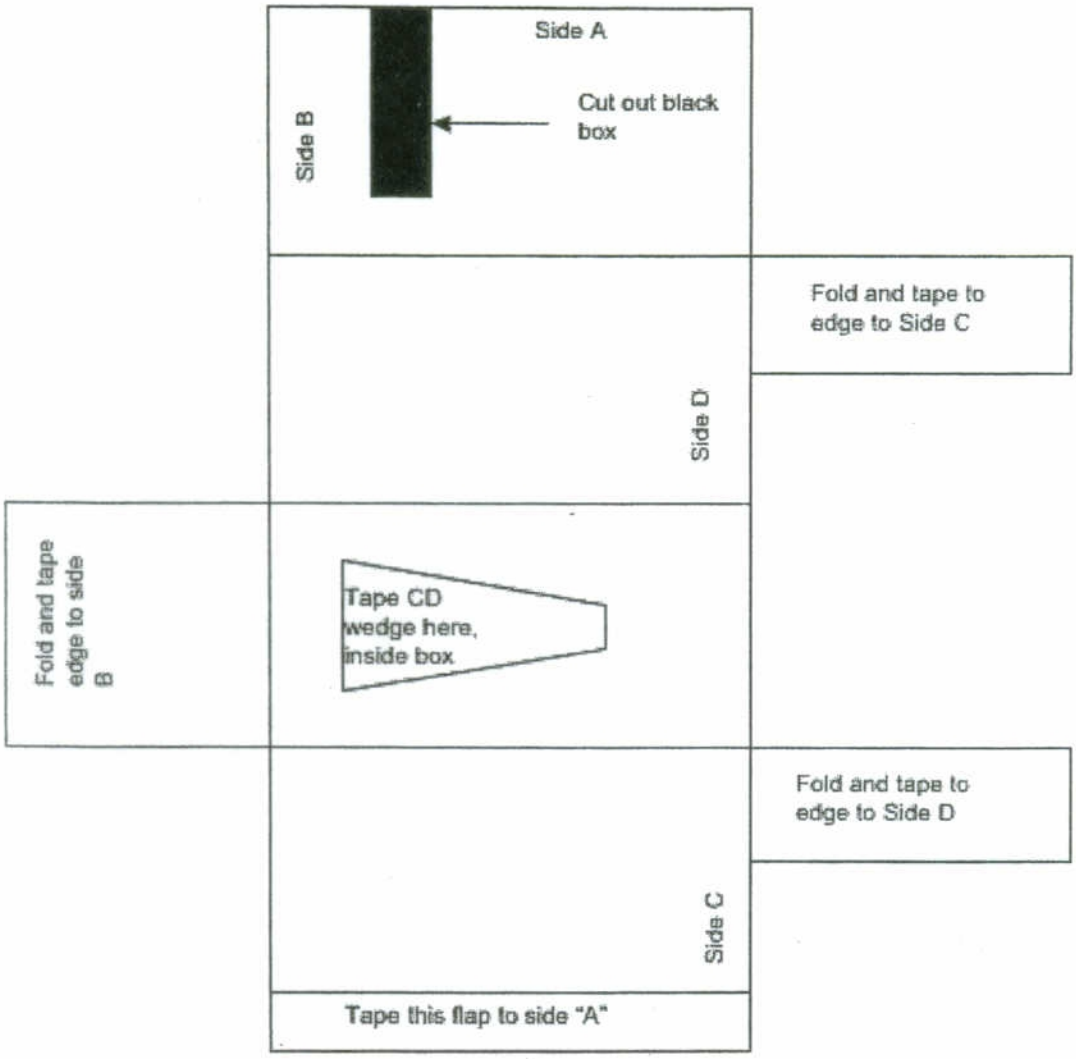
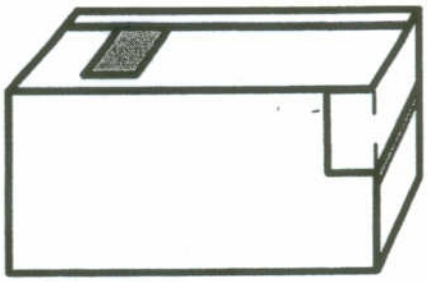
SPECTROSCOPE PATTERN 1



Directions for Participants :

1. Carefully cut out the pattern. Don't forget to cut out the black box on side B. This is your viewing hole.
2. Glue or tape the CD wedge inside where shown on the pattern. Cover the narrow end of the CD with tape or scribble over it with black marker. Otherwise it acts like a mirror and your spectroscope won't work well.
3. Fold the pattern on all the heavy black lines.
4. Tape the flap of side C to side A.
5. Tape the solid end flap to side B.
6. The last side of the box is the tricky one. It has two strips, and you will need to leave a narrow space in the middle, between the two flaps for light to enter. Tape one strip of the end flap to side C. Now be very careful to leave a small space for light to enter when you tape down the last end flap to side D.
7. You may need to add more tape here and there to make your spectroscope hold together well.



Year 2 Lessons

Visit 5

Sun Protection for Florida's Children

Design a Sunscreen Bottle Contest

Rules:

- Students must design their own sunscreen bottle with a personalized logo and slogan.
- The more colorful, the better! Students can use crayons, markers, or colored pencils only. No glitter, paint, or anything messy.

(Hint: make sure the sunscreen bottles meet sun safety requirements!)

There will be two (2) winners from your school.

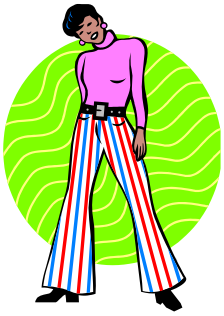
- The winning artwork will be featured in our end of the year newsletter that goes to all schools in the project.
- The winning artwork will also be displayed in your school!

USF
UNIVERSITY OF SOUTH FLORIDA

You should always protect your skin when outside!

1. Wear a <u>wide brimmed hat</u>

2. Wear <u>sun protective clothing</u>



3. Use <u>sunscreen</u> with SPF 15 or higher

4. Wear <u>sunglasses</u>

5. Seek <u>shade</u>

Design Your Own Sunscreen Bottle

Name _____

School _____

Teacher _____

Year 2 Lessons

Visit 6

Visit 6

- During this session, the winner of the sunscreen bottle design contest is announced.
- The facilitators will go over the 5 ways to protect your skin from the sun one last time, and then thank the students and teachers for their participation in the project.

Optional Year 2 Lessons

Visit 6

Plants, soil, and Nutrients, Oh My!

Overview:

- Using "Scientific Method" to discover why plants feed, grows & produces oxygen.
- Design a "Color Absorption" experiment

Key Concepts:

- Absorption
- Photosynthesis
- Scientific Method

Objective:

- Illustrate the process of "**color absorption"** and basic understanding of **"photosynthesis"**
- Use of the 'Scientific Method' in explaining the process of "**color absorption"**

Materials:

- Colored markers (Red, Yellow, Green)
- Pencil
- Coffee Filter paper
- Clear cups
- Water

Activities:

1. Inform students that you will be talking about 3 Topics: **Scientific Method, Photosynthesis,** and **Color absorption.**
2. Hand out the Scientific Method Sheet.
3. Discuss the Scientific Method.
4. Discuss the Photosynthesis.
5. Discuss Color Absorption referring to the photosynthesis as your example.
6. Explain the experiment.
7. Discuss the procedure for the experiment and have the students record the steps on the handout.
8. Conduct the experiment.
9. Guide students through recording their findings.
10. Discuss and record conclusions and possible extensions for their findings.
11. Re-cap on what is learned and leave 'fun fact' sheet.

I. Introduction:

- We will be talking about 3 Topics: **Scientific Method, Photosynthesis,** and **Color absorption**
- Lets go back in time and try to remember what a **Scientific Method** is and what it is used for!!!!!!

II. What are the Scientific Method Steps?

The scientific method is a systematic way of carrying out an experiment that allows others to repeat the experiment at another time.

1. Step1 **"Question":** ask a question about the world around you
2. Step 2 **"Hypothesis":** make an educated guess about what will happen
3. Step 3 **"Experimental Design ":** design an experiment to answer your question and record the exact steps you take as you conduct your experiment
4. Step 4 **"Observe and Record":** conduct your experiment and carefully watch what happens, don't forget to write down everything you observe
5. Step 5 **"Conclusion":** explain what happened and why

*Now that we are experts on what **'the scientific method'** is, let's use it today to help us understand how color is absorbed and understand the process of photosynthesis!!!!!!!!*

III. What is Photosynthesis?

- Who knows what the word **'Photosynthesis'** means?
- Let's break the word down! **PHOTO?** Comes from the word **'COLOR'**, & **'LIGHT'** and synthesis – means **'PUTTING TOGETHER'**
- It is some kind of process, or putting together!!!! That involves color/light
- **Photosynthesis**: Every living thing depends on sunlight. Plant has a very clever way of using the energy from the sunlight to make their food. This is called Photosynthesis

IV. Why Photosynthesis is important?

- **Plants are the only living things that can make their own food, we eat the plants, or we eat the animals that eat the plants for us to survive!!!!!!!**
- Now that we know what **Photosynthesis** is, who can give me an educated guess about "How plants absorb water and nutrients from the ground"?

V. What is Absorption? (Handout!)

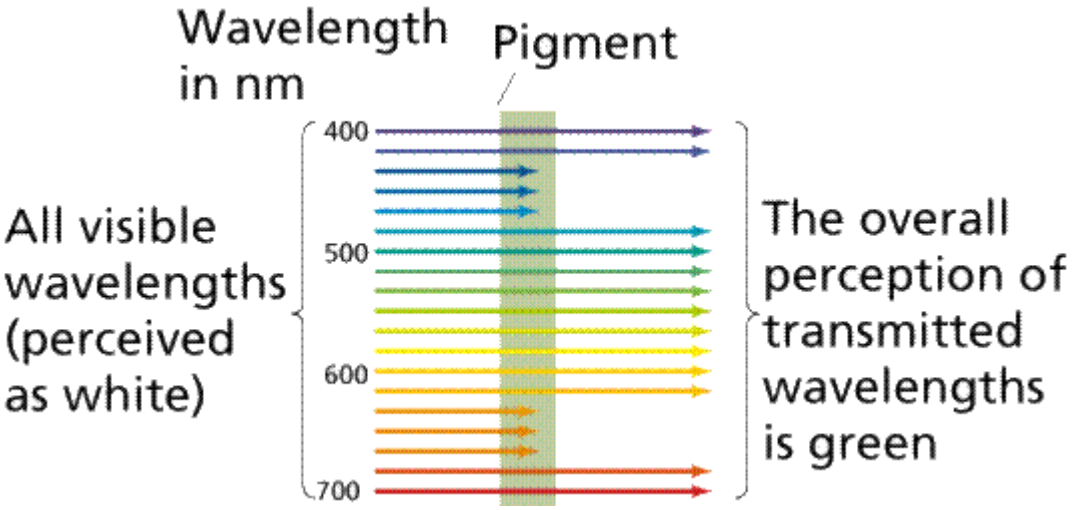
- Plants actually have small hairs at the end of their roots which absorb water and other small things like nutrients from the ground!
- The water and nutrients pass from the roots and enter the plant.

- **Plants Absorb:**
    1. **Nutrients**
    2. **Water**
    3. **Color (a wavelength of light)**

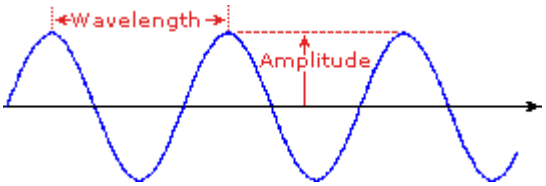
VI. How Plants Absorb color?

How do different colors get absorbed by the plants?

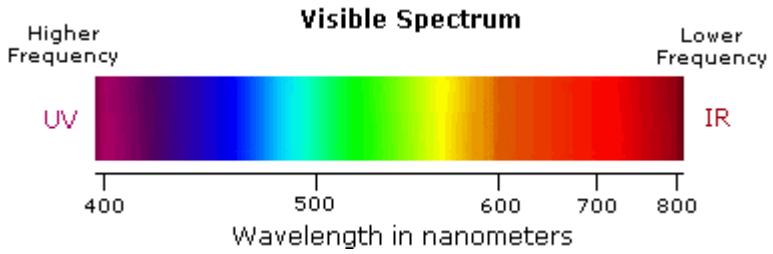
- Color is any substance that absorbs light
- The color of a plant (or any object) is actually a wavelength of light, in other words it is the color that it does not absorb
- For example, Chlorophyll (the green color of the plant) absorbs all colors of visible light except green, which it reflects and is detected by our eyes.
- Different colors have different absorption strengths → different wavelengths.
- We are going to see today: **Which colors get absorbed faster than others and why!**
- Use Handout for illustration
- Photosynthesis: is a process that the plant uses to change the energy that they receive from the sunlight and changes it to sugar!!!
- This sugar is changed to fuel for the plant to grow!!!
- This is all done by the actions of the green color of the plant, which is also known as **"Chlorophyll".**
- This photosynthesis process uses water and releases the oxygen that we absolutely must have to stay alive.



Wavelength;



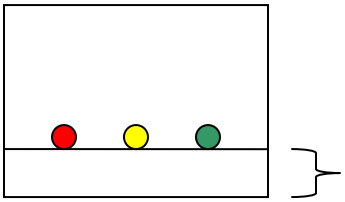
- **Violet:** 400 - 420 nm
- **Indigo:** 420 - 440 nm
- **Blue:** 440 - 490 nm
- **Green:** 490 - 570 nm
- **Yellow:** 570 - 585 nm
- **Orange:** 585 - 620 nm
- **Red:** 620 - 780 nm



VII. Experiment: (using the Scientific Method)

Procedure:

- Lets get in groups of 4-6 per table (count off students)
- Information will be recorded on your own Scientific Method Sheets
- Hand the Scientific Method Sheet
- Place water, cups, markers, and filters on their tables
- Coffee filters should be cut into strips about 1 inch wide and 8 – 10 inches long (long enough that the filter paper can drape over the top of the cup)
- At about 2 inches from the tip of the filter paper, draw a line at the bottom of the filter paper
- On the line, place a red dot, a yellow dot and a green dot on the filter using the markers



- Put the shorter end of the filter paper in the cup filled with about 1 ½ inches of water, but do not submerge the line with the marker dots – this should be dry at the start of the experiment
- Wait a few minutes

- **Ask the students to record their findings on their scientific method sheet**
- Discuss reasons of their findings**:** "What happened to the filter paper? Which color was absorbed the fastest and why? Why different colors were absorbed differently?'
- Talk about the process of absorption and photosynthesis

VIII. Conclusion

- What we saw in this experiment is how colors are absorbed
- Different colors have different wavelengths therefore absorbing color at different rate
- This shows the process of absorption which is the same in plants and how they absorb both water , nutrients from the ground → which is all part of the Photosynthesis process
- The color of a plant (or any object) is a wavelength of light, in other words it is the color that it does not absorb

IV. Review:

1. The scientific method is a way to record our experiments like real scientists
- The 5 steps of the scientific method:
- Step 1: Question
- Step 2: Hypothesis
- Step 3: Experimental design
- Step 4: Observe and Record
- Step 5: Conclusion

2. Photosynthesis: Plant has a very clever way of using the energy from the sunlight to make their food…. This is what photosynthesis is all about

3. Last, different colors are absorbed differently depending on the color's 'wavelength' the green has the shortest wavelength so it picked the color faster than the red or the yellow!!!!

Experimenter's name: _____ Date: _____

The Scientific Method Data Sheet

1. **Question**: (what is a good question?)

☐ Which color will be absorbed the quickest by the filter paper?

2. **Hypothesis**: (an educated guess of what you think is going to happen)

☐ No color will be absorbed

☐ Green color will be absorbed the fastest

☐ Red color will be absorbed the fastest

☐ Yellow color will be absorbed the fastest

☐ All the color markers will be absorbed at the same rate/speed!

3. **Experiment Design**: (steps of what you are going to be doing)

Step 1: Bring empty cups to your table
Step 2: Add water to each cup (1/4)
Step 3: Draw a line at the bottom of the filter paper with a pencil
Step 4: Place a dot with different color marker in a straight line
Step 5: Place filter paper in the cup and observe what happens

4. **Observe and Record**: (what is going to happen to the filter paper?)

☐ The filter paper with the dots on it stayed the same

☐ The filter paper absorbed the Green color the fastest

☐ The filter paper absorbed the Yellow color the fastest

☐ The filter paper absorbed the Red color the fastest

☐ The filter paper absorbed all the colors at the same rate

5. **Conclusion**: (explain why you think the data supports your hypothesis or why it does not):

_____

_____

_____

The Scientific Method

STEP 1. Question

Ask a question about the world around you.

STEP 2. Hypothesis

Make an educated guess about what will happen.

Step 3. Experimental Design

Design an experiment to answer your question.

Record the exact steps you take as you conduct your experiment.

Step 4. Observe and Record

Conduct your experiment and carefully watch what happens.

Write down everything you observe.

Step 5. Conclusion

Explain what happened and why.

The Shadow Rule

Overview:
The students will use observation to help understand the formation and shape of shadows. The students will also be able to determine how a shadow's appearance changes and when the sun it at its peak.

Objectives
Students will be able to:

- Explain why it is possible for shadows to be different sizes.
- Use their shadows to determine when the sun is at its peak.

Key Concepts

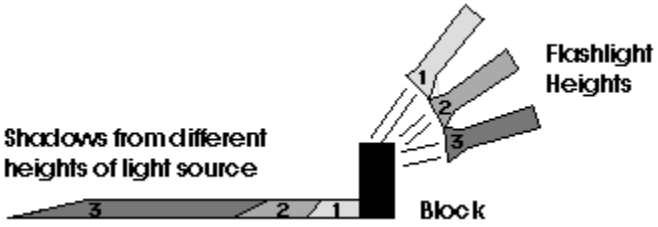
- Shadow
- Light source
- Peak Hours

The Sun Is a Star!

- *The sun gives us heat and light.*
- The sun is at its peak from *10 am and 2 pm.*
- Use these to protect yourself from the sun's UV rays: *shade, wide brimmed hat, sunglasses, long sleeves, and sunscreen (SPF 15+)*
- Of the two important things we get from the sun, we are going to focus on **LIGHT**.

To demonstrate the placement of the sun during key moments of the day, we will use a flashlight and any type of stationary item.

- Point the flashlight towards the item.
- With the light still pointing towards the item, move the flashlight to different heights. (see figure below)



  - **Flashlight 1** represents intense peak hours of the day: 11 am – 1 pm
  - **Flashlight 2** represents near or early peak hours of the day: 9 am – 11 am/2 pm – 5 pm
  - **Flashlight 3** represents non peak hours of the day: dawn until 8 am/ 7 pm – dusk

- **What happened to the shadow when the flashlight was moved higher and lower along the object?**

  The higher the light source above the object, the less light lines get blocked by the object and hence the less shadow. Thus, the lower the light source is aimed at the object, the more the object blocks the lines, or rays, of light.
  Also, shadows grow when you are close to a light source and shrink the further away you are from a light source.

- **If the light source (the sun), were directly above the top of the object (you). Would there be a shadow?**

No, not one that would be visible around the object. You wouldn't be able to see your shadow if the Sun was directly overhead because, you would be standing on your shadow.

- **The sun is your light source. Will the sun ever cause a shadow to move because it moved?**

  Yes, our shadows will move because the position of the sun moved and they also move when the object in front of the light moves. ***(Remind the students that, yes the sun may appear to move but, it was really the earth spinning around the sun and not the sun moving. Rotating and orbiting explanation is below.)***

The earth spins (or rotates) while circling (or orbiting) the sun. While it does this, the sun only shines on one side of the earth. Therefore, we only get light on one side of the world (earth) at any given time. It takes 24 hours for the earth to spin all the way around and that is what causes day and night. When the sun shines on our side of the earth we are able to see our shadow.

Review & Conclusion

- *A shadow is made when the object blocks the light; the object casts a shadow on a surface.*
- *A shadow starts where the light is blocked, so your shadow starts at your feet*
- *As the sun rises, our shadows start off taller than we are, then gets shorter than us by the middle of the day. As the sun starts to set, our shadow grows taller than us again.*
- *When the sun is directly above you there is little to no shadow because the light from the sun is hitting all the areas around you.* ***If you cannot see your shadow or if your shadow is shorter than you are, you should seek shade. The sun is normally at its highest peak around midday.***

The Shadow Rule

When shadows are **twice the length** of objects, you are out during **non-peak hours.**

When shadows and object are of **equal length**, limit sun exposure. You are out during the **beginning of peak hours***.

When shadows are **shorter** than objects or **not seen**, you are out during **PEAK HOURS***!

*Peak Hours are between 10 AM and 4 PM