

Photo Description



This image shows a beautiful rainbow stretching across a rainy sky above a divided highway with green grass, trees, and street lights on both sides. After rain, sunlight and water droplets in the air work together to create this colorful arc. You can see how the rainbow appears when the sun shines from behind the observer through millions of tiny water drops.

Scientific Phenomena

Anchoring Phenomenon: Light refraction and dispersion creating a rainbow.

Why it happens: Rainbows occur when three conditions align: sunlight, water droplets in the air, and the observer positioned correctly. Sunlight enters each water droplet, bends (refracts) as it enters, reflects off the back of the droplet like a mirror, and bends again as it exits. Different colors of light bend at slightly different angles, which separates white sunlight into its component colors: red, orange, yellow, green, blue, indigo, and violet. The observer always sees the rainbow at approximately a 42-degree angle from the antisolar point (the point directly opposite the sun).

Core Science Concepts

1. Light travels in straight lines but can bend: When light passes through water droplets, it changes direction. This bending of light is called refraction. Students can observe this by looking at a pencil in a glass of water—it appears bent because light bends as it moves from water to air.
2. White light is made of many colors: Sunlight appears white, but it actually contains all the colors of the rainbow mixed together. When light bends and separates in water droplets, we see these colors individually.
3. Rainbows require specific conditions: Three things must happen together for a rainbow to appear: the sun must shine, there must be water droplets in the air (from rain, mist, or a sprinkler), and the observer must be positioned between the sun and the water droplets.
4. Colors always appear in the same order: The colors of a rainbow always appear in the same sequence because each color bends at a slightly different angle. Red bends the least and appears on the outside; violet bends the most and appears on the inside.

Pedagogical Tip:

Build prior knowledge by asking students to recall times they've seen rainbows before discussing this image. Third graders learn best through personal connection and observation. Consider showing the rainbow photo first without explanation, asking "What do you wonder about?" before introducing scientific vocabulary. This activates curiosity and engagement.

UDL Suggestions:

Multiple Means of Representation: Provide a simplified diagram showing how light bends through a water droplet alongside the photograph. Use different colored arrows to show light paths. Multiple Means of Action & Expression: Allow students to demonstrate understanding by drawing their own rainbows, creating a rainbow with a prism or water spray, or explaining the phenomenon using manipulatives (colored beads, mirrors, water droplets). Multiple Means of Engagement: Connect rainbows to cultural significance, mythology, or student artwork to increase relevance and motivation.

Discussion Questions

1. Why do you think a rainbow only appears when it's raining and sunny at the same time? (Bloom's: Analyze | DOK: 2)
2. If you tried to walk toward a rainbow, do you think you could catch it or touch it? Why or why not? (Bloom's: Evaluate | DOK: 3)
3. What would happen to the rainbow if there were no water droplets in the air? (Bloom's: Understand | DOK: 2)
4. Can you think of other times you might see a rainbow besides during rain? (Bloom's: Create | DOK: 3)

Extension Activities

1. Create a Rainbow with a Prism or Water Spray: On a sunny day, take students outside with a clear prism or create a rainbow using a spray bottle. Have them observe the colors and order them from outside to inside. Ask: "How is this rainbow like the one in the photo? How is it different?" This hands-on experience makes the concept concrete and memorable.
2. Rainbow Color Ordering Game: Provide students with colored strips of paper (red, orange, yellow, green, blue, indigo, violet) and have them arrange the colors in the correct rainbow order. Mix them up and repeat. Then show pictures of rainbows and have students identify if the colors are in the correct order. This reinforces the pattern concept.
3. Design a Rainbow Experiment: Challenge students to predict where a rainbow would appear if they stood in different positions relative to the sun and water droplets. Have them test their predictions during a field trip or on a day when a sprinkler is available. Record observations with drawings and words: "Did the rainbow appear where we predicted?"

NGSS Connections

Relevant Performance Expectation:

- 3-PS2-1: Plan and conduct an investigation to provide evidence that pushes, pulls, and some other forces can change the speed or direction of an object's motion. (Note: While light behavior connects to force concepts, the primary standard is below.)
- K-PS3-1 and 3-PS4-2: Develop models of waves and properties of light are addressed through Grade 2-3 extensions.

Disciplinary Core Ideas:

- 3-PS4.A: Light can travel in straight lines and can bend (refract) when it passes through different materials.
- 3-PS4.B: Objects can be seen when light is available to illuminate them.

Crosscutting Concepts:

- Patterns: The colors of a rainbow always appear in the same order due to the predictable pattern of light refraction.
- Cause and Effect: Specific conditions (sun, water droplets, observer position) cause rainbows to form.

Science Vocabulary

- * Rainbow: A colorful arc in the sky made when sunlight shines through water droplets after rain.
- * Refraction: The bending of light as it passes through water or other materials.
- * Light: Energy that helps us see; it travels very fast in straight lines from the sun or light bulbs.
- * Water droplet: A tiny drop of water in the air or on a surface.
- * Sunlight: The light that comes from the sun, which is actually made of all the colors mixed together.
- * Prism: A clear object (like a triangular glass) that can bend light and separate it into rainbow colors.

External Resources

Children's Books:

- A Rainbow of My Own by Don Freeman — A child pursues and plays with a rainbow, perfect for introducing the phenomenon in a story context.
- The Rainbow by Manya Stojic — A beautifully illustrated picture book explaining how a rainbow forms after rain.
- Rainbows: A Book About Light (Let's Read and Find Out Science) by Franklyn M. Branley — A classic easy-reader with clear explanations and diagrams.

YouTube Videos:

- "How Rainbows Are Made" by National Geographic Kids (3:15 minutes) — An engaging, animated explanation perfect for third graders. https://www.youtube.com/watch?v=5wz_aVk7XRE
- "Rainbows Explained" by SciShow Kids (4:48 minutes) — A friendly, hands-on explanation with real-world visuals and demonstrations. <https://www.youtube.com/watch?v=nzxYGaRKL-o>