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Optical Phenomena

What are optical phenomena?

Optical phenomena¹ are what we see when light interacts with things. These things can be clouds, water, dust, gases, or even gradients (like temperature changes). There are three kinds of interactions that cause optical phenomena. They are **reflection**, **refraction**, and **diffraction**. **Reflection**² happens when light rays hit a smooth surface and come back at the same angle. **Refraction**³ happens when light bends as it passes through two clear surfaces (like air and water). **Diffraction**⁴ is light rays passing near or around an object, like when water bends around a rock in a stream. While light looks white to our eyes, it is made up of many colors. We see these colors as the colors of the rainbow. Reflection, refraction, and diffraction can cause white light to separate into these colors. Optical phenomena are usually seen in the sky. We will look at **apparent depth**, **coronas**, **rainbows**, **twinkling stars**, and **scattered light**.

Did You Know?

The Northern Lights (Aurora borealis) are caused by tiny particles from the Sun reacting with gas in our atmosphere.

Apparent Depth

Ecobottle Sample



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¹ **Optical phenomena:** what we see when light interacts with clouds, water, dust, gases, or gradients.

² **Reflection:** an interaction that occurs when light rays hit a smooth surface and come back at the same angle.

³ **Refraction:** an interaction that occurs when light bends as it passes through two clear surfaces.

⁴ **Diffraction:** an interaction that occurs when light rays pass near or around an object.

Coronas

Coronas⁵ happen when white light diffracts through water, dust, or ash in the atmosphere. As the light diffracts, it is scattered and divided into all of its colors. Coronas are colorful rings around the sun or moon. Usually, though, people don't see them around the sun because it is too bright.



Rainbows are the result of refraction and reflection.

Rainbows

Rainbows⁶ are the familiar arches of color seen in the sky when the sun is shining during a rain shower. They are caused by both refraction and reflection. First, white light passes through raindrops and is refracted, dividing into its many colors. This refraction is only partial. It then reflects off the back inner surface of the drop and back out of the front surface. As the rays pass through the surface, they are refracted again. This second refraction causes more distinct division of color. This happens many times in many droplets, and the rainbow appears.

Twinkling Stars

Ecobottle Sample



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Scattered Light



The sky appears blue because of scattered light.

Have you ever wondered why the sky is blue? That's another optical phenomenon. When light is **scattered** by bouncing off many small particles in the air, some colors are scattered more than others. These more scattered colors are blue, green, indigo, and violet. When they scatter, they are easier to see. This phenomenon causes the sky to appear blue.

⁵ **Coronas:** the effect of white light diffracting through water, dust, or ash in the atmosphere.

⁶ **Rainbows:** the effect of white light refracting through and reflecting off raindrops in the air.

Reading Comprehension Questions:

1. What are optical phenomena?
2. What
3. What is apparent depth?
4. What are
5. What
6. Why
7. Why is the sky blue?

Extension Questions:

8. Research optical phenomena. List three not included in this reading.
9. Pick

Reading Comprehension Questions:

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TWFSAM

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