

Name: _____ Date: _____

Answer Key: Bending Light Like a Galactic Goalie 4th Grade Optics Quiz

Students predict how light maneuvers through periscopes and space-age prisms using engineering-based reflection and refraction models.

1. An astronaut is using a periscope to see around a moon rock. If two mirrors are placed parallel to each other at 45-degree angles, what is the primary behavior of light being utilized?

Answer: A) Specular reflection

A periscope uses the law of reflection to bounce light off smooth, polished surfaces (specular reflection) to change the light's path.

2. When a beam of light travels from the air into a thick block of transparent gelatin, the light _____ and changes direction.

Answer: C) slows down

Refraction occurs because light travels at different speeds through different materials; it slows down when entering a denser medium like gelatin.

3. A magnifying glass uses a concave lens to converge light rays to a single focal point.

Answer: B) False

False. A magnifying glass uses a convex lens (thicker in the middle) to converge light; concave lenses cause light to spread out (diverge).

4. Why does a deep swimming pool appear shallower than it actually is when you look straight down into the water?

Answer: B) Light rays bend away from the normal as they exit the water

This is a classic example of refraction. Light bending at the water-air boundary creates a 'virtual' image of the bottom that is higher than the floor actually is.

5. A laser pointer hits a flat mirror at a 20-degree angle. According to the Law of Reflection, the light will bounce off at an angle of _____.

Answer: C) 20 degrees

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The Law of Reflection states that the angle of incidence (incoming light) is always equal to the angle of reflection (outgoing light).

6. Opaque objects like a wooden door allow most light to pass through them via refraction.

Answer: B) False

False. Opaque objects block light by absorbing or reflecting it; only transparent or translucent materials allow refraction to occur.

7. If you are designing a solar oven to melt chocolate using only sunlight, which tool would be most effective for gathering and focusing the light rays?

Answer: C) A concave mirror

Concave mirrors are curved inward like a bowl, which allows them to collect parallel light rays and reflect them toward a single high-heat focal point.

8. The tool used by scientists to split white light into a rainbow by slowing down different colors at different rates is called a _____.

Answer: B) Prism

Prisms use refraction to separate white light into its component colors (dispersion) because each color bends at a slightly different angle.

9. Imagine you are standing in front of a mirror at a funhouse. Your reflection looks much taller and thinner than you actually are. This is likely a _____ mirror.

Answer: A) Convex

Convex mirrors (curved outward) can distort images by stretching or shrinking the reflection depending on the curve and your distance from it.

10. Refraction can only occur when light moves from one medium into a different medium, such as from air into glass.

Answer: A) True

True. Refraction relies on the change in density between two substances to cause the change in light speed and direction.