Name: _____ **Date:** _____

Answer Key: Shatter the Illusion: A 5th Grade Optics Challenge Quiz

Why does a pencil look broken in a glass of water? Analyze how light bends and bounces through complex scenarios involving prisms and periscopes.

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1. An deep-sea explorer uses a periscope to see above the waves. If the top mirror is angled at 45 degrees to catch the sunlight, what must be true about the bottom mirror for the image to reach the explorer's eye correctly?

Answer: B) It must be parallel to the first mirror to reflect light at the same angle.

In a periscope, two parallel mirrors allow light to reflect twice at the same angle, directing the final image into the viewer's eye.

2. Light travels at the exact same speed through a diamond as it does through a vacuum like outer space.

Answer: B) False

Light slows down when it enters denser mediums like diamonds or glass; this change in speed is what causes refraction (bending).

3. A desert mirage happens because light _____ as it moves from cool air into the very hot air right above the sand.

Answer: B) refracts

Refraction occurs when light passes between air layers of different temperatures because the density of the air changes, causing the light to bend.

4. If you are designing a solar oven to melt chocolate, which type of surface would be most effective at concentrating the light into a single hot spot?

Answer: C) A concave mirror (curved inward)

Concave mirrors are 'converging' surfaces, meaning they reflect light rays toward a single focal point, which increases heat.

5. White light is actually a mixture of many colors. When white light passes through a glass prism, it separates into a spectrum because each color _____ at a slightly different angle.

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Answer: B) bends

Different wavelengths of light (colors) slow down by different amounts in glass, causing them to refract, or bend, at different angles.

6. A magnifying glass uses a diverging lens to make an object look much larger than it actually is.

Answer: B) False

Magnifying glasses use convex (converging) lenses. Diverging lenses spread light out and typically make objects appear smaller.

7. Imagine you are trying to spear a fish from a boat. Because of light refraction, where should you aim compared to where you 'see' the fish in the water?

Answer: C) Slightly below the fish

Light bending at the water's surface makes the fish appear higher in the water than it actually is. To hit it, you must aim lower.

8. Smooth, shiny surfaces like polished metal produce _____ reflection, while rough surfaces like a brick wall produce diffuse reflection.

Answer: C) specular

Specular reflection occurs when light bounces off a perfectly smooth surface in one direction, creating a sharp image like a mirror.

9. If a red laser beam hits a flat mirror at a 20-degree angle, it will bounce off the mirror at exactly a 20-degree angle.

Answer: A) True

According to the Law of Reflection, the angle of incidence is always equal to the angle of reflection on a flat surface.

10. Which of these objects works by both refracting light and then focusing it to a specific point on a digital sensor or film?

Answer: B) A high-speed camera lens

Camera lenses use the property of refraction to bend light rays so they converge (meet) perfectly on the sensor to form a clear image.