Name: _____ **Date:** _____

Answer Key: Bending Reality: An Optics Lab Quest for 5th Grade

Engineers solve vision problems by manipulating photons. Students synthesize knowledge of Snell's Law and focal points in this advanced light challenge.

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1. An underwater photographer notices that a fish looks larger and closer than it actually is. This optical illusion occurs because light changes _____ as it moves from water into the air of the camera housing.

Answer: B) speed

Refraction is caused by the change in the speed of light as it passes from one medium (water) to another (air), causing the light path to bend.

2. You are designing a high-tech solar cooker. Which type of mirror would be most effective at concentrating parallel rays of sunlight into a single, high-heat focal point?

Answer: C) A concave mirror

Concave mirrors curve inward like a bowl, which causes incoming parallel light rays to reflect and converge at a specific focal point.

3. True or False: A total internal reflection occurs only when light attempts to move from a more dense medium (like glass) to a less dense medium (like air) at a steep angle.

Answer: A) True

Total internal reflection happens when light hits a boundary at a high angle while trying to exit a denser medium, preventing it from refracting out.

4. A scientist uses a biconvex lens to study a microscopic crystal. If the crystal is placed exactly at the focal point of the lens, what will happen to the light rays emerging on the other side?

Answer: B) They will travel out in parallel lines

When a light source is placed at the focal point of a converging lens, the refracted rays emerge parallel to each other.

5. Fiber optic cables transmit internet data over long distances by using the principle of _____ to keep light trapped inside a glass thread.

Answer: C) Reflection

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Light bounces off the internal walls of the fiber optic cable through continuous reflection, allowing the signal to travel across continents.

6. True or False: If you shine a red laser through a triangular glass prism, the light will emerge as a full multi-colored rainbow.

Answer: B) False

A prism separates white light into its component colors. Since a red laser is monochromatic (one color), it will only bend; it won't split into other colors.

7. Imagine a periscope used in a submarine. To see an object that is above the water while the submarine is submerged, how must the two internal mirrors be positioned?

Answer: A) Parallel to each other at 45-degree angles

Placing two mirrors parallel at 45-degree angles allows light to reflect down the tube and then reflect again toward the viewer's eye.

8. In a human eye, the _____ acts as a biological lens that changes shape to help you focus on objects at different distances.

Answer: B) Crystalline lens

The lens in our eye is flexible; it thickens to see close objects and thins to see distant objects through a process called accommodation.

9. True or False: Light travels faster through a diamond than it does through empty outer space.

Answer: B) False

Light reaches its maximum speed in a vacuum (space). When it enters a dense material like diamond, the photons interact with atoms, significantly slowing down.

10. If you are standing 2 meters away from a large plane mirror, what is the total distance between you and your virtual reflection?

Answer: C) 4 meters

In a plane mirror, the image appears as far behind the mirror as the object is in front of it. 2m (you to mirror) + 2m (mirror to image) = 4m.