Effects of Reaction LR

Effects of refraction. Objective, to understand the effects of refraction. Objects in water usually appear to be at a different depth than they actually are.

This happens due to the refraction of light rays as they travel from an optically dense medium, which is water, into the optically rare medium, which is air. Let's take a detailed look at the real and apparent positions of the fish swimming in the water. When observed from the bank of the lake, the fish appears to be close to the surface of the lake, when in truth it's further below.

The light ray coming from the fish, which is at point A in the water, passes from the water into the air and is refracted away from the normal, because the light ray has traveled from the water, which is a denser medium, into air, which is a rarer medium, before entering our eyes. However, we perceive the light ray entering our eyes as if it were originating from point B, which is slightly above point A. The real position of the fish is at A, and the apparent position of the fish is at B, so it seems closer than it really is. If a fisherman aims his harpoon at the apparent eye of a fish, the harpoon will miss the fish.

That's the reason why he targets the tail of the fish, because by doing so, the harpoon definitely enters the upper body of the fish. To summarize, real depth is the actual distance of an object underneath water or any other optical medium. Apparent depth is the depth that the object appears to be at when submerged in water or any other transparent medium.

Objects seen in water usually appear to be at a different depth than they actually are.

Summary of Effects of Refraction

Understanding Refraction

✔ **Refraction** is the bending of light as it moves from one medium to another.
✔ **Example:** When we see objects in water, they appear **closer than they actually are** due to the bending of light.

Effects of Refraction

✔ **1. Objects in Water Appear at a Different Depth**

- Light travels from **water (denser medium) to air (rarer medium)** and bends **away from the normal**.
- A fish in water appears **closer to the surface** than its actual position.

✔ **2. Apparent vs. Real Depth**

- **Real depth** = The actual depth of an object in water.
- **Apparent depth** = The depth at which the object **appears** due to refraction.

✔ **3. The Fisherman’s Dilemma**

- If a fisherman aims **directly at the fish's eye**, the harpoon **misses** because the fish is **deeper than it appears**.
- The fisherman **aims at the tail** to **hit the fish accurately**.

Key Takeaways

✔ **Objects in water appear closer than they actually are due to refraction.**
✔ **Light bends when moving from a denser to a rarer medium.**
✔ **The real depth is always greater than the apparent depth.**
✔ **Fishermen adjust their aim to compensate for the refraction effect.**

Quiz on Effects of Refraction

1. Why does a fish in water appear closer to the surface than it actually is?
✅ **Because light bends away from the normal when moving from water to air.**
❌ Because the fish moves quickly.
❌ Because water is transparent.
❌ Because of reflection, not refraction.

2. What is the real depth of an object in water?
✅ **The actual distance of the object underwater.**
❌ The depth at which the object appears.
❌ The depth of the water body.
❌ The distance between the observer and the object.

3. Why do fishermen aim at the tail of the fish instead of its eye?
✅ **Because refraction makes the fish appear closer than it really is.**
❌ Because the tail is bigger.
❌ Because the fish moves fast.
❌ Because the fisherman cannot see properly.

4. What happens to light when it moves from water (denser) to air (rarer)?
✅ **It bends away from the normal.**
❌ It bends towards the normal.
❌ It travels in a straight line.
❌ It stops moving.