

1. Mirages

- a. Hot air near ground compared to cool air aloft causes light speed to be fast near ground and slow several feet in the air where it's cooler
- b. Changes in light speed make light bend
- c. Rays come from "the palm tree" in all directions, the ray that would normally reach your eye bends in a curve upward, you think it traveled in a straight line
- d. Of course light rays reach you directly too, so you see the real tree
- e. Since you see a real tree and a "mirror-like" tree, your brain processes that as a pool of water – a mirage!

2. Rainbows

- a. Rain drops are spheres
- b. The sun is at your back
- c. Sunlight strikes the rain drop sphere and DISPERSION takes place (color separation)
- d. Total internal reflection takes place in each raindrop
- e. Different colors of light reflect at predictable angles
- f. You are really just seeing the reflection of the sun...it's like the sheet of rain is a mirror with a built-in prism, so sunlight enters white and reflected in all colors!

3. Green flash

- a. Very, very brief...really is a flash!
- b. Tiny, tiny, tiny amount of dispersion (separation angle is tiny) always takes place when the sun strikes our atmosphere at an angle, it's such a tiny angle and the sun is so bright, we can't see it
- c. At instant the red part of sun disappears below the horizon, the blue part of the DISPERSION is gone (from scatter in air, that's why sky is blue)
- d. Red is out of sight, blue has been scattered away, green is left, for an instant
- e. Kind of a rare event that requires a perfect view of west horizon and great view conditions

4. Total internal reflection

- a. Whenever light speeds up, it refracts away from the normal
- b. It can't refract by more than 90° , or it won't escape from slow medium
- c. If it doesn't escape, it reflects TOTALLY (a perfect mirror)
- d. Fiber optics uses "TIR"

5. Vision correction (distant objects give off horizontal light rays, length of eye should be focal point
 - a. Single point of light entering pupil should converge to single point in retina, or blur
 - b. Eye is a convex lens
 - c. Length of eye is focal distance
 - d. Near objects' light rays don't arrive horizontally, they need more bending
 - e. Far-sighted people or those that need reading glasses need help bending light enough, they need a convex lens in front to compensate
 - f. Near sighted people see near objects fine, so their eyes are powerful convex lenses, so they need a concave lens to compensate – their eyes work better when light rays come in at a diverging angle, an concave lens does this!