

POLARIZATION OF LIGHT WAVES

You have probably seen sunglasses with polarized lenses that reduce glare without blocking the light entirely. There is a property of light that allows some of the light to be filtered by certain materials in the lenses.

In an electromagnetic wave, the electric field is at right angles to both the magnetic field and the direction of propagation. Light from a typical source consists of waves that have electric fields oscillating in random directions, as shown in **Figure 21**. Light of this sort is said to be *unpolarized*.

Electric-field oscillations of unpolarized light waves can be treated as combinations of vertical and horizontal electric-field oscillations. There are certain processes that separate waves with electric-field oscillations in the vertical direction from those in the horizontal direction, producing a beam of light with electric field waves oriented in the same direction, as shown in **Figure 22**. These waves are said to have **linear polarization**.

linear polarization

the alignment of electromagnetic waves in such a way that the vibrations of the electric fields in each of the waves are parallel to each other

Light can be linearly polarized through transmission

Certain transparent crystals cause unpolarized light that passes through them to become linearly polarized. The direction in which the electric fields are polarized is determined by the arrangement of the atoms or molecules in the

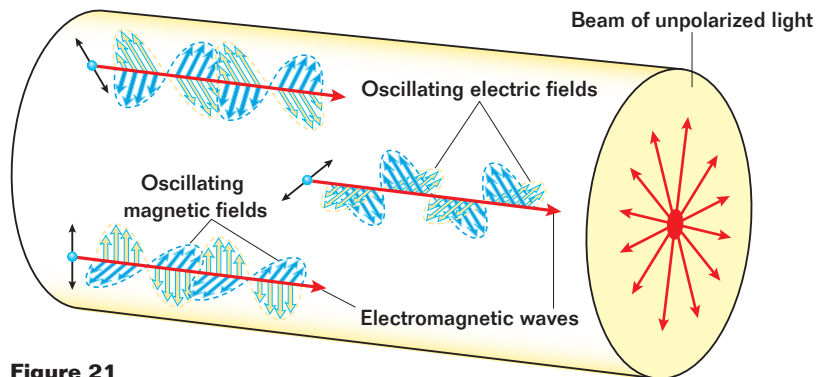


Figure 21
Randomly oscillating electric fields produce unpolarized light.

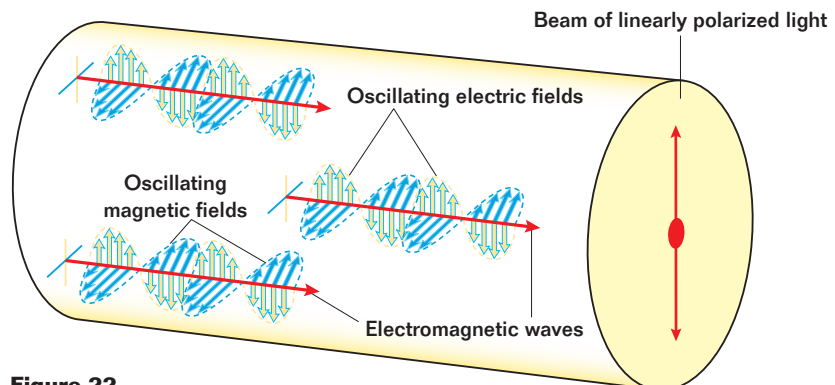


Figure 22
Light waves with aligned electric fields are linearly polarized.