Light has a polarization, which indicates a direction that electric and magnetic fields oscillate. We can think of this as an arrow pointing in a particular direction perpendicular to the way the light is traveling. Light coming from a laser is polarized, only oscillating in one direction. Light coming from an incandescent light is not polarized.

A polarizing film is a material which only lets light oscillating in one direction pass through it. If the direction of oscillation matches the direction of the polarizer, then the light will get through and the light will be bright. If the polarizer is perpendicular to the polarization of the light, then no light should pass through the polarizer. If unpolarized light hits, then some of the light will pass through the polarizer no matter what the direction is. This is because some of the unpolarized light will have a component that is oriented in the same direction as the polarized sheet.

Examples:

1) Incoming unpolarized light hits a vertically polarized sheet. The vertical component of the incoming unpolarized light gets through.

*Draw example*

2) If we now rotate the polarized sheet, from vertical to horizontal, will the emerging light be brighter or dimmer or the same? Explain with a drawing.

3) We now add a second sheet after the first polarized sheet in the 1st example. We orient both sheets vertically. The first sheet allows only vertically vibrating light to get through, so the light that comes out of the first polarizer is vertically polarized. The second sheet is also oriented vertically, so all the light gets through.

*Draw example*

4) If we now slowly rotate the second sheet less and less light gets through the second sheet. Explain using a drawing why less light gets through the second sheet when it is rotated a little and no light gets through when it is rotated 90 degrees.
5) There are also other ways to produce polarized light than using a polarized sheet. Laser light for example is also polarized. Light that is reflected from a surface at large angles (from the vertical) is also polarized. The amount that the reflected light is polarized depends on the angle of reflection. The reflected light will be polarized parallel to the surface of the reflecting object. For example, sunlight is not polarized. If the sun light reflects off a lake, the road, or a pool surface, the reflected light will be polarized horizontally.

Would you want polarized sun glasses to be polarized horizontally or vertically? Illustrate with a drawing.

If you were driving down the road during the evening into the sun, you will get a nasty glare off of the road. Why not just put on a very dark pair of sun glasses?