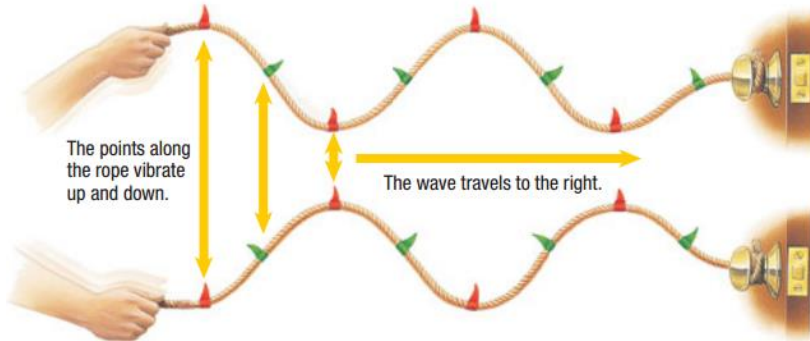


Polarization

IB PHYSICS | WAVES - LIGHT

Light is a Transverse Wave

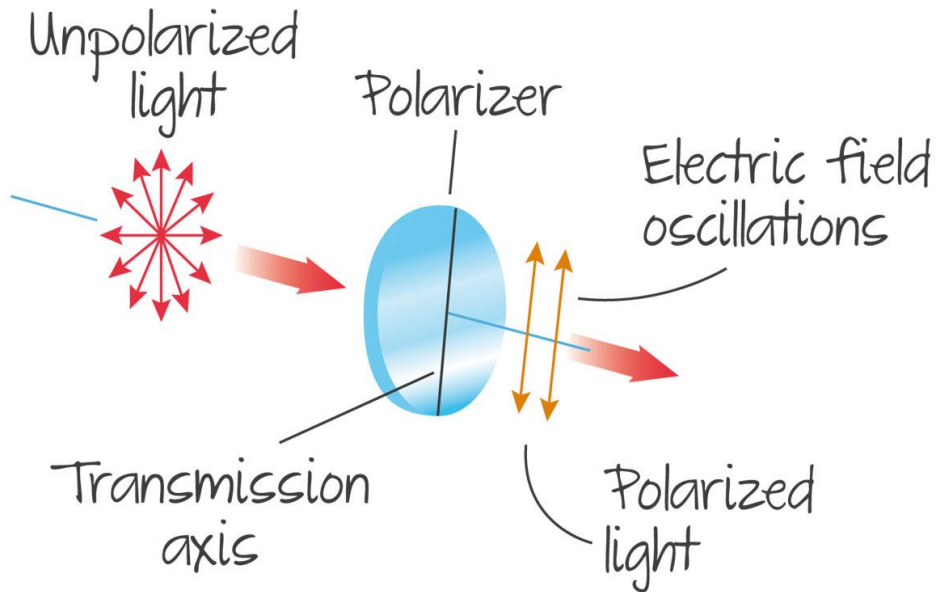


This isn't the whole story though...

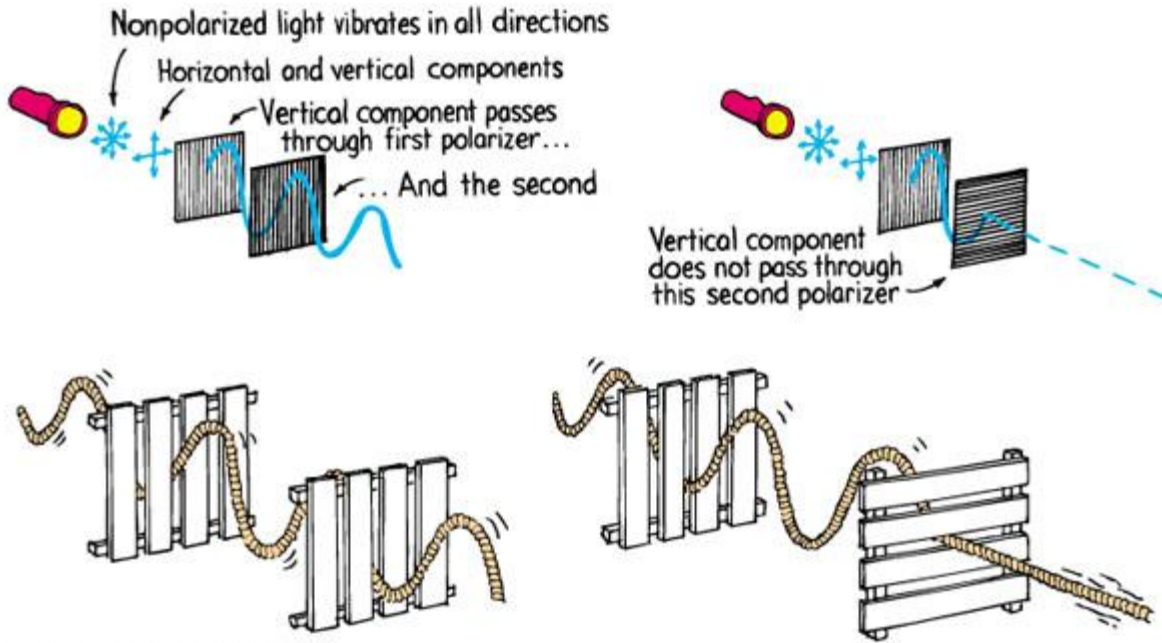


Diagram of a light ray
coming out of the page

Polarizers



Polarized Light



Hewitt, *Conceptual Physics*, Ninth Edition.
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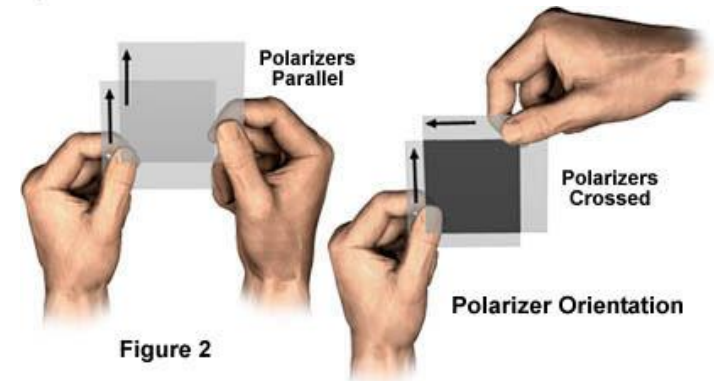
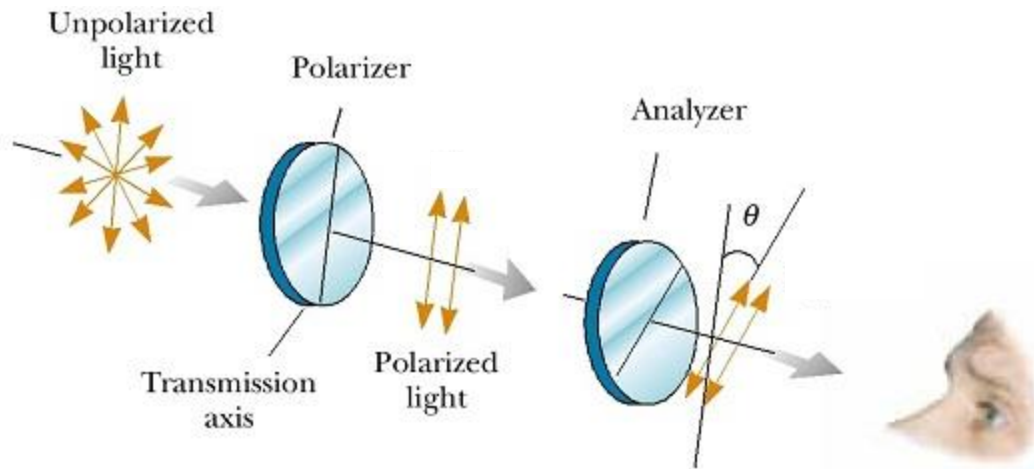


Figure 2

Malus' Law

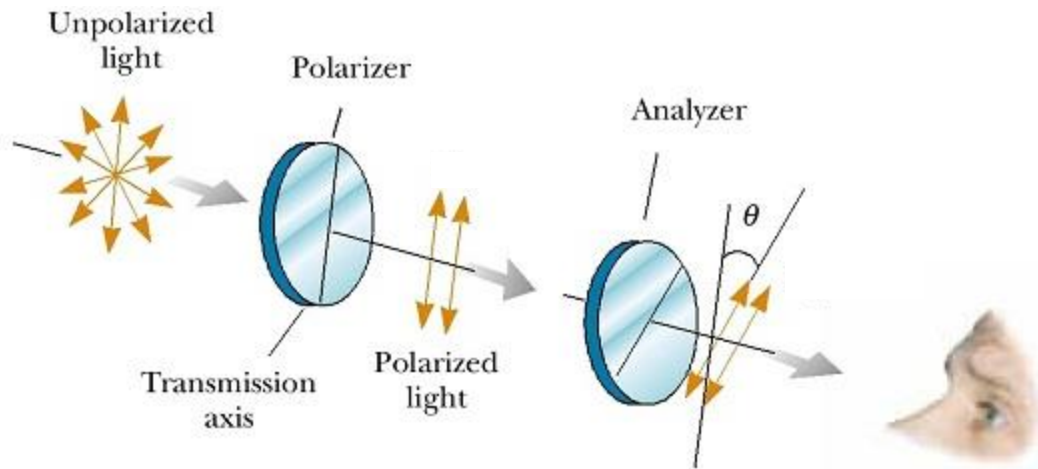


$$I = I_0 \cos^2 \theta$$

IB Physics Data Booklet

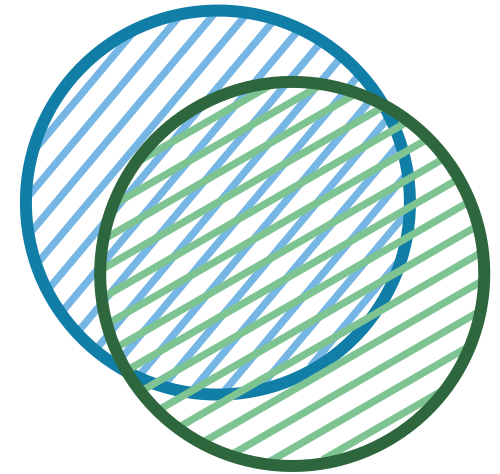
Sub-topic 4.1 – Oscillations	Sub-topic 4.4 – Wave behaviour
$T = \frac{1}{f}$	$\frac{n_1}{n_2} = \frac{\sin \theta_2}{\sin \theta_1} = \frac{v_2}{v_1}$
Sub-topic 4.2 – Travelling waves	$s = \frac{\lambda D}{d}$
$c = f\lambda$	Constructive interference: path difference = $n\lambda$
Sub-topic 4.3 – Wave characteristics	Destructive interference: path difference = $(n + \frac{1}{2})\lambda$
$I \propto A^2$	
$I \propto x^{-2}$	
$I = I_0 \cos^2 \theta$	

Loses Intensity Twice



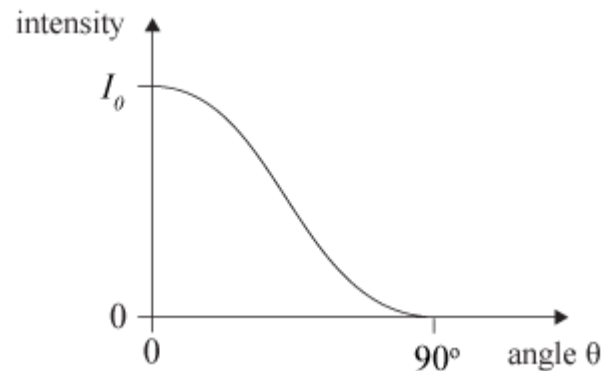
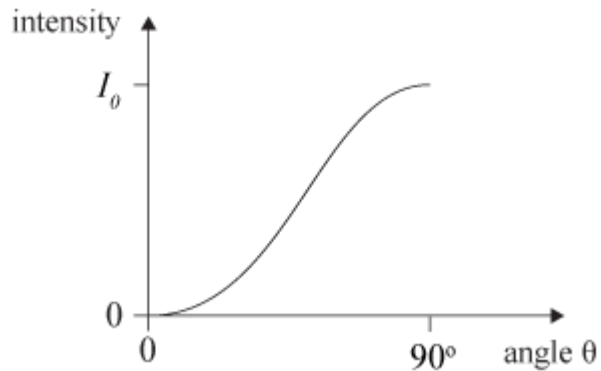
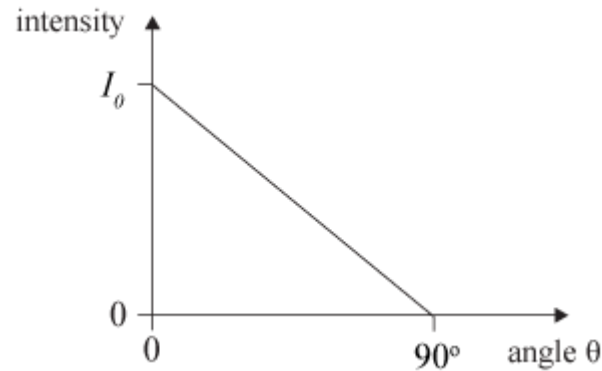
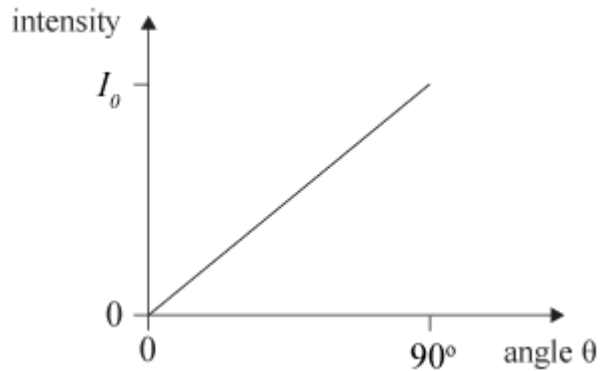
Angle Difference

The intensity of plane polarized light, at 40° to the vertical is I_0 . After passing through an analyzer at 60° to the vertical, what is the intensity measured?



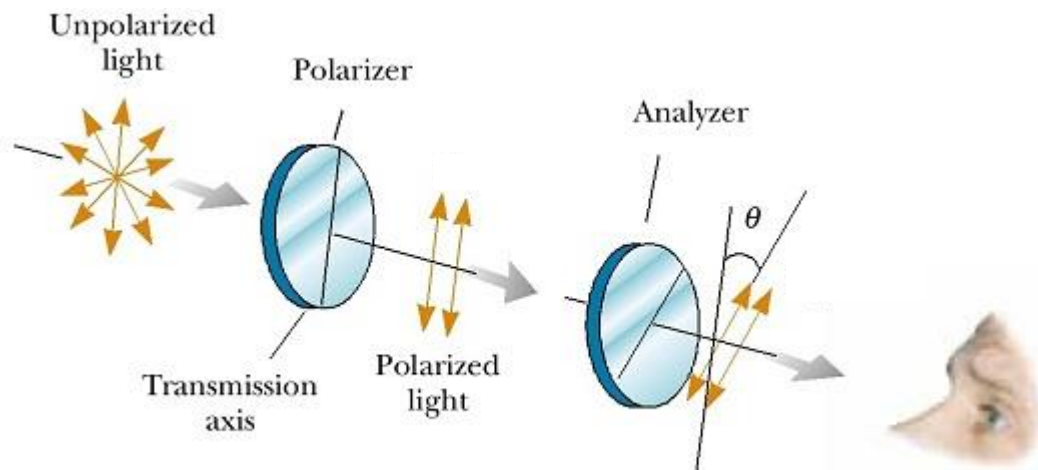
Sample IB Question

Polarized light of intensity I_0 is incident on a polarizing filter. The angle between the plane of polarization of the incident light and the transmission plane of the polarizer is θ . Which graph shows how the intensity I of the light transmitted through the polarizer varies with θ ?



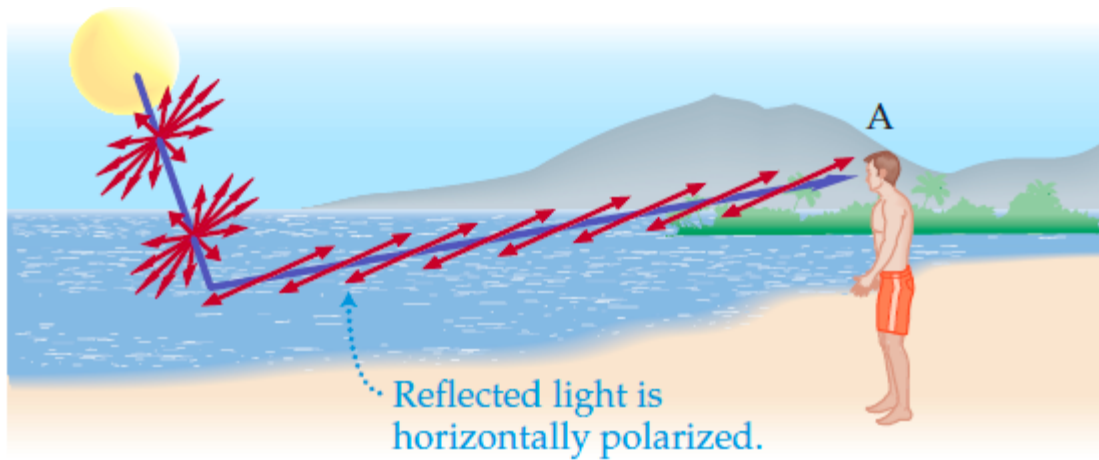
Try this Calculation

After passing through one polarized filter, the intensity of vertically polarized light is 60 W m^{-2} . What is the angle of the analyzer relative to the vertical if the intensity observed is 20 W m^{-2} ?

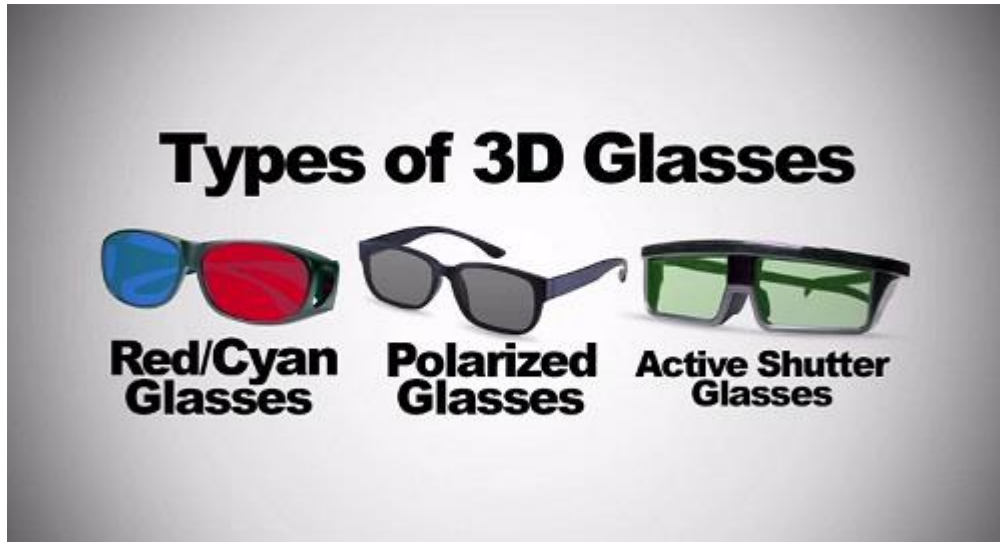


What was the intensity of the unpolarized light?

This isn't the only way



What about 3D Movies?



Each lens blocks a different image, so each eye gets a different image which the brain interprets as 3D

Lesson Takeaways

- ❑ I can describe the transformation that takes place when unpolarized light is polarized
- ❑ I can describe the interaction between two polarized filters at different orientations
- ❑ I can use Malus's Law to calculate the change in intensity when passing through polarized filters