Polarization of transverse waves

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Lesson Objectives

1. To fully understand polarization of trasverse waves.
2. To know some applications of polarization.
3. To practise using the concepts on questions.
4. (Possibly) to discover a hidden gift...

Textbook p. 175

REMINDER: Office hours are week 2 Tuesdays 3.45–5.0 p.m. in room 19.
Next office hours: Tuesday 31 January 2012

Specification Requirement

Longitudinal and transverse waves
Polarisation as evidence for the nature of transverse waves; applications e.g. Polaroid sunglasses, aerial alignment for transmitter and receiver.

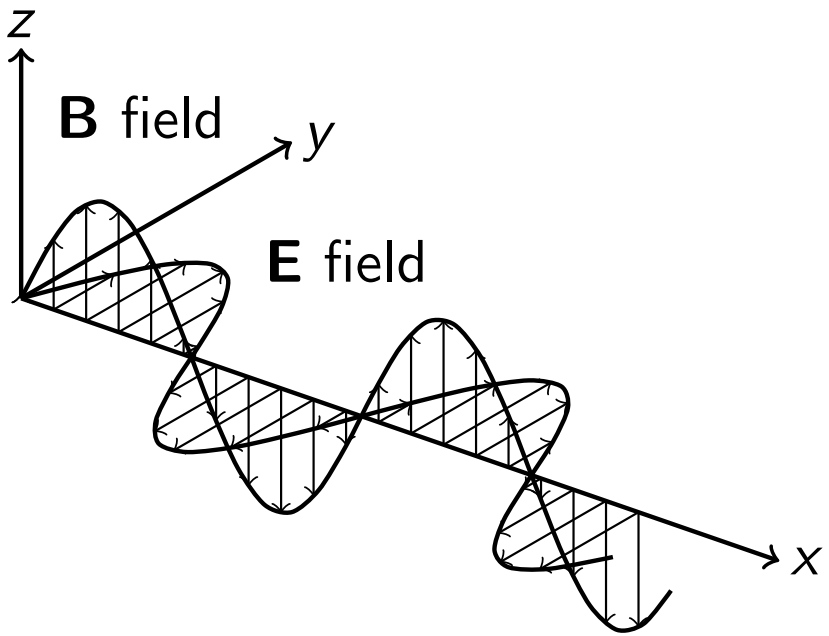
[AQA GCE AS and A Level Specification Physics A, 2009/10 onwards]

Homework

1. Reading memo for next time (NB Friday will be a practical, so next time is next Thursday)
2. Investigation on Polarization (E:HEBER)

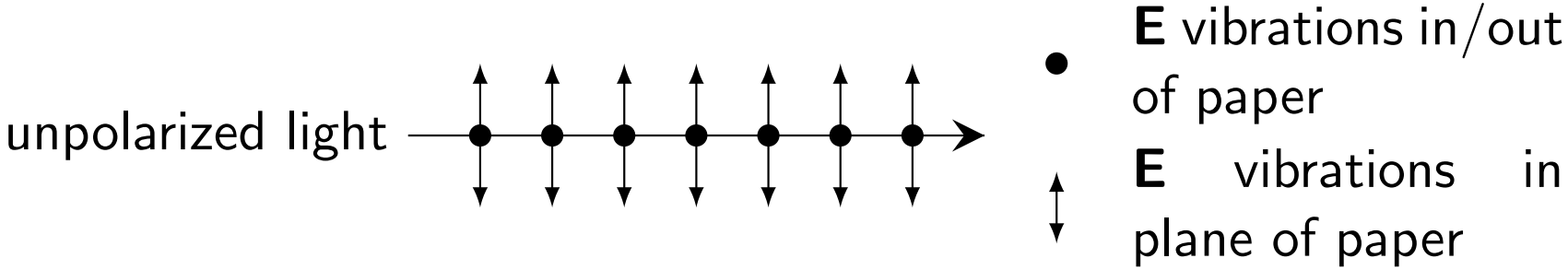
Reading memos. . .

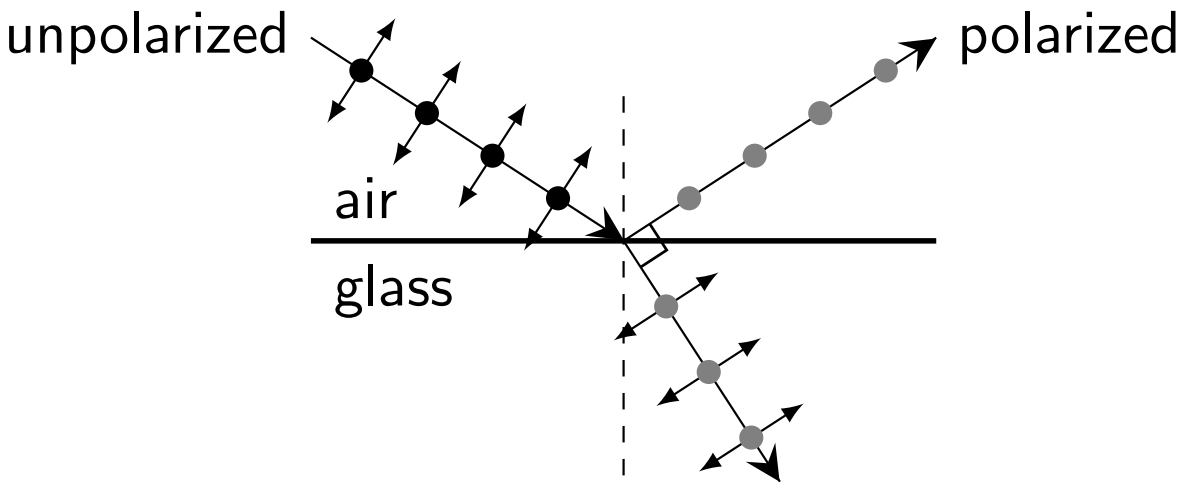
Electomagnetic wave



Polaroid investigations

Brewster Reflexion





Quick questions

1. Light which is vibrating in a single plane is referred to as . . . light.
   electromagnetic transverse unpolarized polarized
2. Light which is vibrating in a variety of planes is referred to as . . . light.
   electromagnetic transverse unpolarized polarized
3. Light usually vibrates in multiple vibrational planes. It can be transformed into light vibrating in a single plane of vibration. The process of doing this is known as . . . .
   translation interference polarization refraction

4 Light is passed through a Polaroid filter whose transmission axis is aligned horizontally. This will have the effect of . . . .

(a) making the light one-half as intense and aligning the vibrations into a single plane.

(b) aligning the vibrations into a single plane without any effect on its intensity.

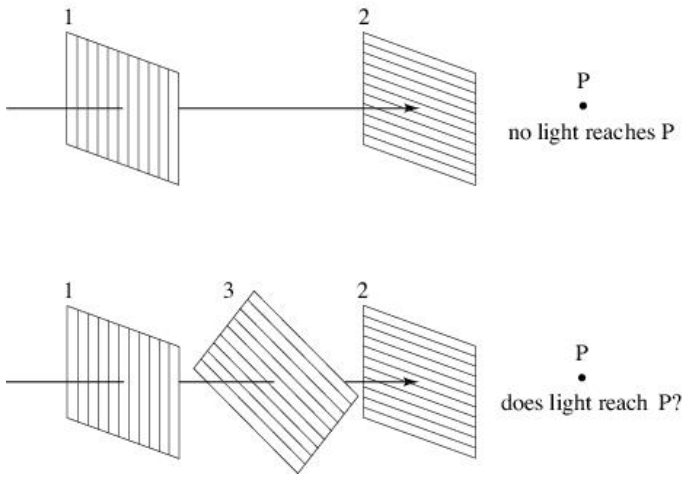
(c) merely making the light one-half as intense; the vibrations would be in every direction.

(d) . . . nonsense! This will have no effect on the light itself; only the filter would be affected.

5 Light is passed through a Polaroid filter whose transmission axis is aligned horizontally. It then passes through a second filter whose transmission axis is aligned vertically. After passing through both filters, the light will be . . . .

(a) polarized
(b) unpolarized
(c) entirely blocked
(d) returned to its original state

6 When a ray of light is incident on two polarizers with their polarization axes perpendicular, no light is transmitted. If a third polarizer is inserted between these two with its polarization axis at 45° to that of the other two, does any light get through to point P?



(a) yes
(b) no

7 When a third polarizer is inserted at 45° between two orthogonal polarizers, some light is transmitted. If, instead of a single polarizer at 45°, we insert a large number N of polarizers, each time rotating the axis of polarization over an angle $90°/N$,

(a) no light
(b) less light
(c) the same amount of light
(d) more light

gets through.

Sunglasses

8 Consider the three pairs of sunglasses shown below. Which pair of glasses is capable of eliminating the glare from a road surface? (The transmission axes are shown by the straight lines.)