

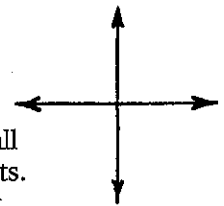
Concept-Development Practice Page

27-2

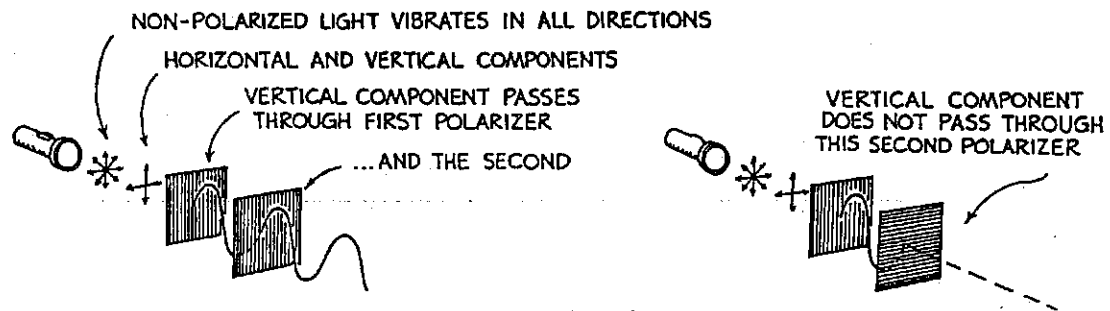
Polarization



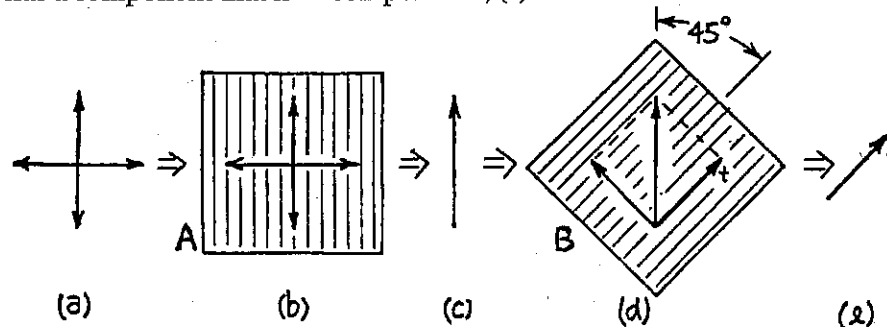
The amplitude of a light wave has magnitude and direction, and can be represented by a vector. Polarized light vibrates in a single direction and is represented by a single vector. To the left the single vector represents vertically polarized light. The vibrations of non-polarized light are equal in all directions. There are as many vertical components as horizontal components. The pair of perpendicular vectors to the right represents non-polarized light.



1. In the sketch below non-polarized light from a flashlight strikes a pair of Polaroid filters.



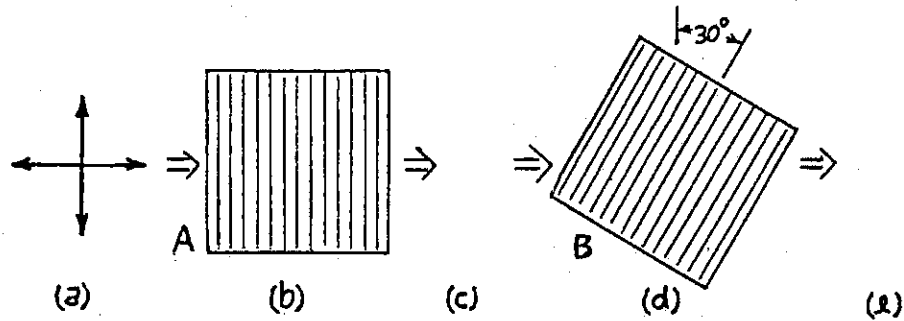
- a. Light is transmitted by a pair of Polaroids when their axes are
(aligned) (crossed at right angles)
- and light is blocked when their axes are
(aligned) (crossed at right angles)
- b. Transmitted light is polarized in a direction
(the same as) (different than) the polarization axis of the filter.
2. Consider the transmission of light through a pair of Polaroids with polarization axes at 45° to each other. Although in practice the Polaroids are one atop the other, we show them spread out side by side below. From left to right: (a) Nonpolarized light is represented by its horizontal and vertical components. (b) These components strike filter A. (c) The vertical component is transmitted, and (d) falls upon filter B. This vertical component is not aligned with the polarization axis of filter B, but it has a component that is — component t ; (e) which is transmitted.



- a. The amount of light that gets through Filter B, compared to the amount that gets through Filter A is
(more) (less) (the same)
- b. The component perpendicular to t that falls on Filter B is
(also transmitted) (absorbed)

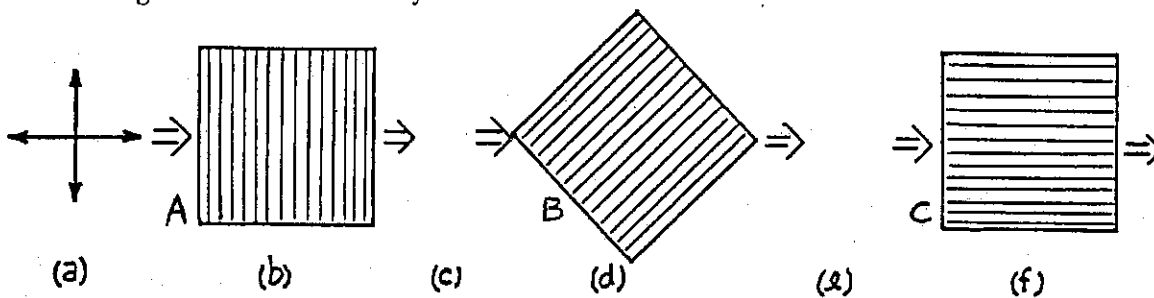
Conceptual PHYSICS

3. Below are a pair of Polaroids with polarization axes at 30° to each other. Carefully draw vectors and appropriate components (as in Question 2) to show the vector that emerges at *e*.



- a. The amount of light that gets through the Polaroids at 30° , compared to the amount that gets through the 45° Polaroids is
 (less) (more) (the same)

4. Figure 27.19 in your textbook shows the smile of Ludmila Hewitt emerging through three Polaroids. Use vector diagrams to complete steps *b* through *g* below to show how light gets through the three-Polaroid system.



5. A novel use of polarization is shown below. How do the polarized side windows in these next-to-each-other houses provide privacy for the occupants? (Who can see what?)

