Physics 30 – Lesson 10
Dispersion, Scattering, Color, Polarization

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1) /1 Since the atmosphere does not disperse sun light into its colors, this indicates that the speed of light is the same for all colors.

2) /1 Diamonds sparkle with different colors indicating that different colors (ie. frequencies) have different speeds in diamond.

3) /1 The shorter the wavelength used the more definition there is. Therefore, use blue light for higher definition.

4) /1 Light clothes tend to reflect light and heat. Dark clothes absorb light

5) /1 Red has longer wavelength (lower frequency) than orange

6) /2 To make a blue color appear black, shine red or green light on it. Since it absorbs red and green, it will appear black. It is not possible to make it appear red since it does not reflect red light.

7) /1 Light does not appear to be dispersed since it spends so little time in the glass it does not have a chance to disperse to any great extent.

8) /3
a) magenta = red + blue $\rightarrow$ object appears black
b) cyan = blue + green $\rightarrow$ object appears green
c) pure blue $\rightarrow$ object appears black

9) /1 Cats do not have the cone cells that human eyes have that are sensitive to color.

10) /1 Moonlight is not intense enough / bright enough to stimulate the cones cells in our eyes.

Polarization

1) When ordinary light is directed at a polarizing disk, only those transverse waves vibrating in the same plane as the alignment of the polarizing molecules are sable to pass through the filter. This plane-polarized light will pass through a second filter only if that filter's
/3 orientation matches that of the first. If, however, the second filter is turned 90 degrees, virtually no light can pass through the crossed polarizers.

2) Observations:

- the words are seen double
- rotating the polarizer blocks one image and transmits the other

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When a beam of light is refracted by a calcite crystal, the light is divided into two parts, each part containing about half the energy of the original beam. The image that is nearly stationary is formed by the ordinary ray. The image that revolves around it is formed by the extra-ordinary ray. Calcite has two different indexes of refraction: the resulting behavior is known as double refraction. The two emergent beams of light contain light vibrating in single planes at right angles to each other. This is confirmed when the polarizer screens out one of the images when their orientations are perpendicular.

3) The LCD was observed to become blacked out for certain orientations of the polarizer. Obviously, LCD light is polarized in one direction.

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4) For certain orientations of the filter (vertical) the glare was greatly reduced. (horizontally polarized)

/3

5) The beautiful color patterns that are visible when the mica and benzoic acid crystals are viewed between two polarizers are caused when light passing through the crystals is broken into two rays. Each ray is plane polarized perpendicular and out of phase with
/2 respect to the other, producing interference. Which colors are seen depends on the thickness of the crystal at a given point, the angle between the two rays in the crystal, and the orientation of the two polarizers. The colors seen between crossed and parallel polarizers are complementary. For example, if a section of the crystal appears magenta, turning one polarizer 90 degrees will then cause that same section to appear green.