Name: __________________________ Partner(s): __________________________

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Homework Questions for Investigation #13

1. Based on your observations from **Station #1**, what color of light is perceived when BLUE light and RED light of equal intensities are added? How does your observation compare with what your textbook says is the result?

2. In terms of absorption and transmission, describe why a piece of blue glass appears blue when held up to white light. Use your observations from **Station #2**.

3. In terms of absorption and reflection, describe why an object painted red appears red in white light. Use your observations from **Station #2**.

4. According to your textbook, what are the respective complementary colors of cyan, yellow, and green? How do these colors compare with your observed results from **Station #3**?

5. If you were to see an afterimage of an American flag in its proper colors (red, white and blue), then what would the respective colors of the original image have been according to your textbook?

6. Light is passed through three consecutive Polaroid filters labeled A, B, and C. (Polaroid B is the middle filter.) Using your observations at **Station #5**, determine whether or not any appreciable amount of light penetrates the three filters under the following conditions described on the next page by placing a check in correct space.

1) A and B are aligned, and B and C are crossed. ______ Yes ______ No

2) A and B are crossed, and B and C are aligned. ______ Yes ______ No

3) A and C are crossed, while A and B are neither aligned nor crossed. ______ Yes ______ No

4) A and B are aligned, while B and C are neither aligned nor crossed. ______ Yes ______ No

7. Referring to your ray diagrams for the mirrors, would a larger radius of curvature produce a longer focal length or a shorter focal length? Defend you answer.

8. As seen from your results of **Station #6 (Prism)**, the degree to which a light beam refracts depends on the index of refraction of the prism and lens material. To create a shorter focal length should you use a lens of higher refractive index or smaller refractive index? Defend your answer.

Extra Credit:
For each of the nonzero data points in Table 4.1, use Snell's law to calculate the measured index of refraction for the Acrylic hemi-cylindrical lens. Then calculate an average value for the index of refraction and compute a % error. Put your results in an organized table. (Use n = 1.50 as the accepted value of the refractive index for the hemi-cylindrical lens.)

$$\%\,Error = \frac{|\text{Accepted value} - \text{Measured value}|}{\text{Accepted value}} \times 100\%$$

(Hint: Snell's law states: $n_1 \sin\theta_1 = n_2 \sin\theta_2$, where n_1 is the refractive index of the material that the light is coming from, θ_1 is the angle of incidence, n_2 is the refractive index of the material that the light is entering, and θ_2 is the angle of refraction. Since the medium of the incoming ray is air, n_1 is the refractive index of air which is very nearly the same as that of vacuum. Therefore, take $n_1 = 1$. Note: you don't need to know trigonometry to do this! Just use the "SIN" button on your calculator.)