Virtual Laboratory

Topic 12 – Color

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Use the link provided in Canvas. or you can use this http://phet.colorado.edu/en/simulation/color-vision . Click on Run Now. The only color choices you can use as answers for this assignment are Red. Blue. Green. Magenta. Yellow. Cyan. White. and Black. Answering using colors of orange. purple. pink. etc… will result in a lower grade.

Part I – Use the RGB Bulbs Tab

1) Each light has a color gradient. For the best results. slide the bar to the very top of each color. **Each color should be observed individually** for this first part. To stop the color. return the bar to the black location.
   a) What color is seen when the red light is on? _____
   b) What color is seen when the green light is on? _____
   c) What color is seen when the blue light is on? _____

2) For the next part we will investigate the effects of mixing two colors. Before you begin each part **be sure to make a hypothesis.**
   a) What color *do you think* the man will see when **red and green** are mixed together?
      _____
   b) Turn on the red and green. both to the very top of the color scale. What does the man *actually see*?
      _____
   c) Experiment with the degree of color. While doing this. make sure that both colors are in equal locations on the scale. What colors are observed? Do they still fit into the same color family as the color observed in 'b'?
      _____

3) Keep the red light on (to the top red location). and turn off the green. We will be looking at red and blue next.
   a) What color *do you think* the man will see when **red and blue** are mixed together?
      _____
   b) Turn on the red and blue. both to the very top of the color scale. What does the man *actually see*?
      _____
   c) While experimenting with the degree of color make sure that both colors are in equal locations on the scale. What colors are observed? Do they still fit into the same color family as the color observed in 'b'?

4) Keep the blue light on (to the top blue location). and turn off the red. We will be looking at green and blue next.
   a) What color *do you think* the man will see when **green and blue** are mixed together?
      _____
   b) Turn on the green and blue. both to the very top of the color scale. What does the man *actually see*?
      _____
   c) Experiment with the degree of color. While doing this. make sure that both colors are in equal locations on the scale. What colors are observed? Do they still fit into the same color family as the color observed in 'b'?
      _____

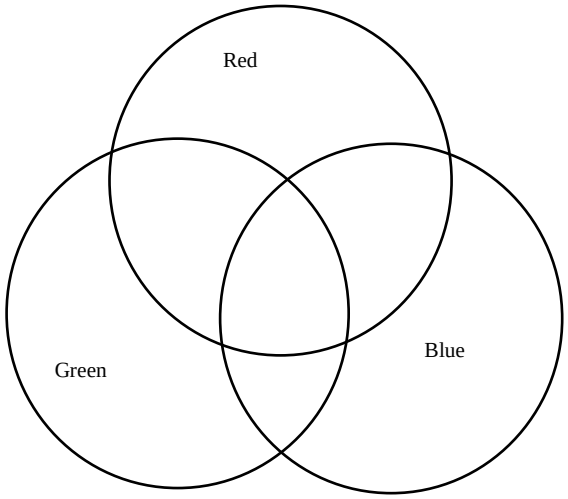
5) Now we will be looking at mixing all three colors.
   a) What color *do you think the man* will see when **red. green and blue** are all mixed together?

      _____

   b) Turn on all three colors. all to the very top of the color scale. What does the man *actually see*?

      _____

6) Fill in the color **addition** diagram below.



II – Use the Single Bulb Tab

7) Set the simulation to the following: **bulb type** – 'white'. **beam** – 'photons'. and **filter color** – 'off'.

   a) What is coming out of the bulb? _____

   b) What color light does the man see? _____

Set the simulation to the following: **bulb type** – 'white'. **beam** – 'solid'. and **filter color** – 'off'.

   a) What is coming out of the bulb? _____

   b) What color light does the man see? _____

8) Set the simulation to the following: **bulb type** – 'white'. **beam** – 'photons'. and **filter color** – 'on'.
   a) Choose any filter color. Record the color

   b) What is coming out of the bulb before the filter (in the area just in front of the filter)?

      _____

   c) What is coming out after the filter? _____

   d) What color light does the man see? _____

   e) Choose another filter color. Record the color. _____

   f) What is coming out of the bulb before the filter (in the area just in front of the filter)?

      _____

g) What is coming out after the filter? _____

h) What color light does the man see? _____

i) What is the filter doing? _____

9) Set the simulation to the following: **bulb type** – 'white'. **beam** – 'solid. and **filter color** – 'on'. a) Choose any filter color. Record the color

b) What is coming out of the bulb before the filter (in the area just in front of the filter)?
_____

c) What is coming out after the filter? _____

d) What color light does the man see? _____ _____

e) Choose another filter color. Record the color. _____

f) What is coming out of the bulb before the filter (in the area just in front of the filter)?
_____

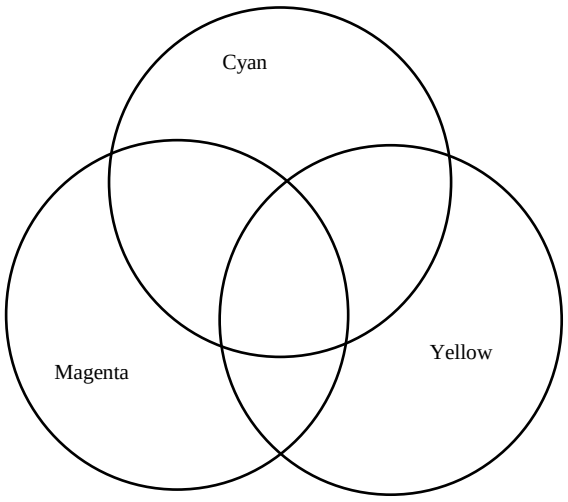
g) What is coming out after the filter? _____

h) What color light does the man see? _____

i) What are the differences between question 7 (photon setting) and question 9 (solid setting)?
_____

j) What are the similarities between question 7 (photon setting) and question 9 (solid setting)?
_____

10) Fill in the color **subtraction** diagram below.



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Part A - Problem: Spectrum

Pre-Lab Prep (1-3 and 5-6.)

1.(1) Diffraction Grating is: _____ _____

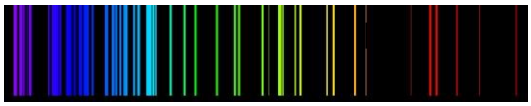
2.(3) Colors are based upon the differences of: _____ _____

3.(3) "Roy G. Biv" stands for: _____ _____

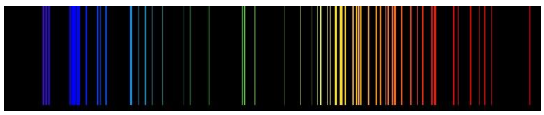
4.(5) Name each the following light sources as seen with a spectroscope:

Spectrum A

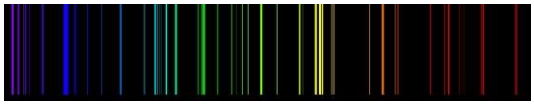
Spectrum B



Spectrum C

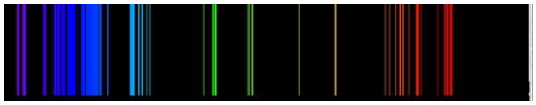


Spectrum D



Spectrum E

Spectrum F



Spectrum G

Name of Spectrum A ___ _____ Name of Spectrum B ____ ____

Name of Spectrum C _____ _____ Name of Spectrum D _____ ____

Name of Spectrum E _____ _____ Name of Spectrum F ___ _____

Name of Spectrum G ___ _____

5.(6) The Three primary colors of light are: ____ ____ ___ _____ ____ ___

6. (7) How are spectral patterns used to identify specific light sources? _____ _____

Part B - Problem: Color Addition

Section 1 - Problem: Color Addition of Light (PreLab Prep 7 – 11)

7.(3) Red light + green light = _____ _____

8.(4) Blue light + green light = _____ _____

9.(5) Red light + blue light = _____ _____

10.(6) How are the secondary colors of light formed? _____ _____

White light and Colored Shadows

11.(7) Red light + blue light + green light =

Light Color on Screen	Number Of Projectors	Slides Used	Color(S) Of Shadow's Produced by Insertion of Object Between Screen and Projectors
Red Light	1	red	
Blue light	1	blue	
Green Light	1	green	
Cyan Light	2	blue + green	
Magenta Light	2	red + Blue	
Yellow Light	2	red + Green	
White Light	3	red + Blue + Green	

12.(8) Components of Primary and Secondary Colors

Light	Observed Color(s) Produced By Diffraction Grating
Red Light	
Blue light	
Green Light	
Cyan Light	
Magenta Light	
Yellow Light	

13.(8) Do the results of this experiment support the color addition facts? _____

14.(9) Complementary Colors (pre-lab prep - predicted column)

Light	Complement Predicted	Actual Complement
Red Light		
Blue light		
Green Light		
Cyan Light		
Magenta Light		
Yellow Light		

Section 2 - Problem: Color Spacing

Color Television Record the brightness of the color dots that make up the main colors.

(Pre-lab prep - predicted columns)

TV Color Wheel	Brightness of individual dots. on TV. magnified 7X					
	Red Pixels		Blue Pixels		Green Pixels	
	Predicted	Actual	Predicted	Actual	Predicted	Actual
Red (circle)	*ON*					
Blue (circle)						
Green (circle)						
Magenta(circle)						
Yellow(circle)						
Cyan (circle)						
Black (circle)						
White (Area)						

Black and White Newsprint

14.(3) Describe how the blacks. dark grays. and light grays. are produced to make the picture.

Black _____ _____

Light Gray _____ _____

Dark Gray _____ _____

Section 3 - Problem: Color Movement

Using the "Spinning Disks" predict and observe their colors.

Pre-lab prep (prediction column)

Original Colors	Prediction	Actual Color
half blue + half red	*magenta*	
half green + half blue		
half green + half red		

Colored Newsprint (See page 259 for descriptions.)

15.(5) Locate printing techniques and describe a part of the comic that uses that technique.

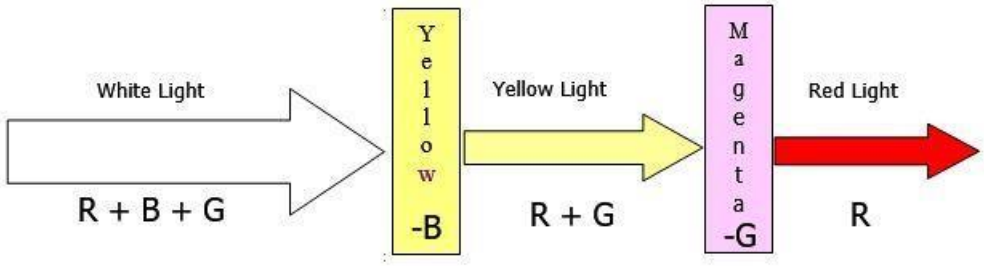
Technique	Description
Blending	
Small Dots	
Small Overlapping Dots	
Dot Density	

Part C - Problem: Color Subtraction

Section 1 - Problem: What Is the Effect of Colored Filters On Viewing?

Look through the indicated filters. at the same time. and determine the subtracted color(s). predict the color and observe the actual color seen when looking at white paper.

Remember to solve the color subtraction problems using the following process.



OR

White Light (R + B + G) — (B) (G) = Red

(Pre-lab prep subtracted and predicted columns)

		Color		
Light Color	Filter Color	Subtracted (pre-lab prep) (use one set of parenthesis for each color)	Predicted	Observed
R + B + G	Red + Blue	( ) (R. G)	Black	
R + B + G	Magenta + Blue	( ) ( )		
R + B + G	Magenta + Red	( ) ( )		
R + B + G	Magenta + Green	( ) ( )		
R + B + G	Magenta + Yellow	(G) (B)	R	
R + B + G	Magenta + Cyan	( ) ( )		
R + B + G	Yellow + Green	( ) ( )		
R + B + G	Yellow + Cyan	(B) ( )		
R + B + G	Cyan + Red	( ) ( )		
R + B + G	Cyan + Blue	(R) (R.G)		
R + B + G	Cyan + Green	( ) ( )		
R + B + G	Cyan + Yellow + Magenta	( ) ( ) ( )		

Section 2 - How do various colors look through colored filters? (Pre-lab prep prediction columns)

Filter	Color Wheel Card as Seen with Colored Light											
	Red		Blue		Green		Magenta		Yellow		Cyan	
	Prediction	Actual	Prediction	Actual	Prediction	Actual	Prediction	Actual	Prediction	Actual	Prediction	Actual
Red												
Blue												
Green												
Magenta	Red		Blue		Black		Magenta		Red		Blue	
Yellow												
Cyan												

16. (5) What is the difference between the primary and secondary colors of light and the colors that they illuminate?

Section 3 - Color Chromatography (pre-lab prep predicted column)

Marker Color	Predicted Color(s)	Actual Color(s)
Black		
Green