Pigments and Paints

Read from **Lesson 2** of the **Light Waves and Color** chapter at **The Physics Classroom:**

http://www.physicsclassroom.com/Class/light/u12l2d.html
http://www.physicsclassroom.com/Class/light/u12l2e.html

MOP Connection: Light and Color: sublevels 6, 7, and 8

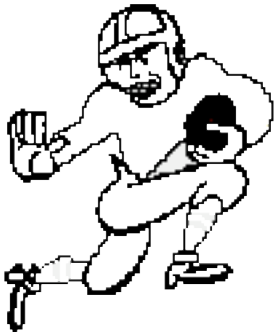
1. A **primary pigment** or paint is a chemical dye which is imparted to an object and is capable of absorbing a single primary color of light. The three primary pigments are cyan (C), magenta (M) and yellow (Y). By mixing these colors an artist can create any color by only having three different colors of paint. List the color of light which is absorbed by each of the primary paints.

   Magenta absorbs _____ Cyan absorbs _____ Yellow absorbs _____

2. What paint colors could be used to paint a boy if he has pink (magenta) skin, blue jeans, a blue and yellow sweater, a black and white baseball cap, cyan socks and red sneakers? (Now that's "styling.")

Colors	Paint Colors
Pink skin	
Blue jeans	
Yellow part of sweater	
Black part of sweater	
Black part of cap	
White part of cap	
Cyan socks	
Red sneakers	

3. Suppose that you and a friend are starting to get a little carried away with your enthusiasm for the physics of color (a very understandable situation). Rather than seeking professional help, you begin discussing the colors of your favorite NFL team's uniforms in terms of the primary pigments which have been imparted to each item. What pigment colors must be imparted to each part of a uniform for it to appear as shown in the table below?



Uniform Part	Color Appearance	Imparted Pigments
Helmet	Yellow	
Shirt	Blue	
Pants	Yellow	
Socks	White	
Shoes	Black	

4. Color printers use the three primary pigments as ink colors in order to produce the range of colors on a colored image. Baxter Nachur recently completed his science report on the Birds of Brazil. The image at the right was included on his cover page. Identify the pigments which were used by the printer to create the ...

   a. ... red wings: _____ b. ... cyan breast: _____

   c. ... blue body: _____ d. ... green tail: _____

5. In a very colorful physics demonstration, Mrs. Claire Voyance uses three colored spotlights - red, green and blue - with equal intensities to illuminate a sheet of paper with different colors of light. Before turning the spotlights on, she paints the paper with various combinations of primary pigments. She then asks her students to predict in advance the color(s) of light that the paper will absorb and the color that the paper will appear. Use your understanding to make the same prediction.

	Spotlights Which Were Turned On	Pigments Applied to Paper	Light Colors Absorbed	Color Appearance
a.	R, G, and B	C		
b.	R, G, and B	C and M		
c.	R and B	C and M		
d.	R and B	C and Y		
e.	R and G	M and Y		
f.	R and G	Y		
g.	G and B	C and M		
h.	G and B	M and Y		
i.	G	C and Y		
j.	B	Y		

6. Opaque objects imparted with pigments selectively absorb light and reflect whatever light colors are not absorbed. Filters are transparent materials which selectively absorb (or block) one or more primary colors of light and allow the remaining colors of light to pass through (or be transmitted). The color of the filter describes which color of light is transmitted by the filter. The following diagrams depict various primary colors of light (**R** for red, **B** for blue, and **G** for green) incident upon a colored filter (**C** for cyan, **M** for magenta, and **Y** for yellow). Determine which primary colors of light will pass through the filters.