TOPIC: RODS, CONES, AND LIGHT

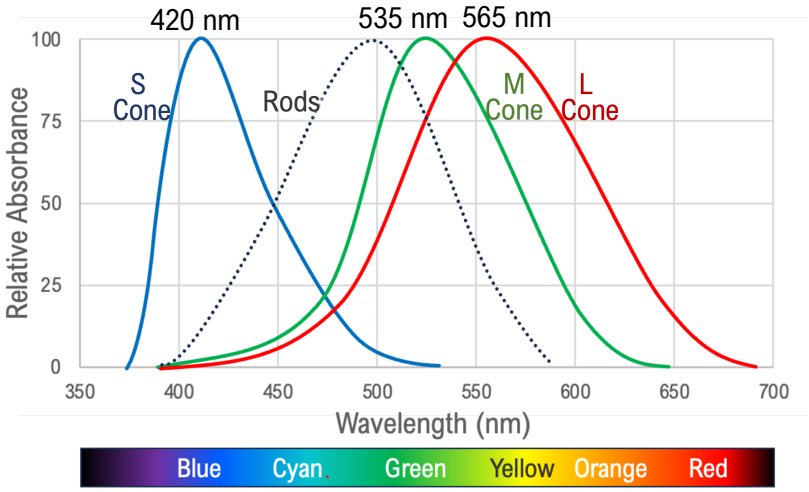
Sensation of Light by Rods and Cones

- Light is electromagnetic radiation with _____ between 380 and 700 nm.
- **Opsin**: protein _____ that absorbs light in eye – different cell types use different opsins.

Rods: do not perceive color; use **rhodopsin.**

Cones: 3 types based on the _____.

- Short wavelength (S or Blue) cone:
  - Responds to 380-540 nm.
- Medium wavelength (M or Green) cone:
  - Responds to 400-650 nm.
- Long wavelength cone (L or Red) cone:
  - Responds to 410-700 nm.

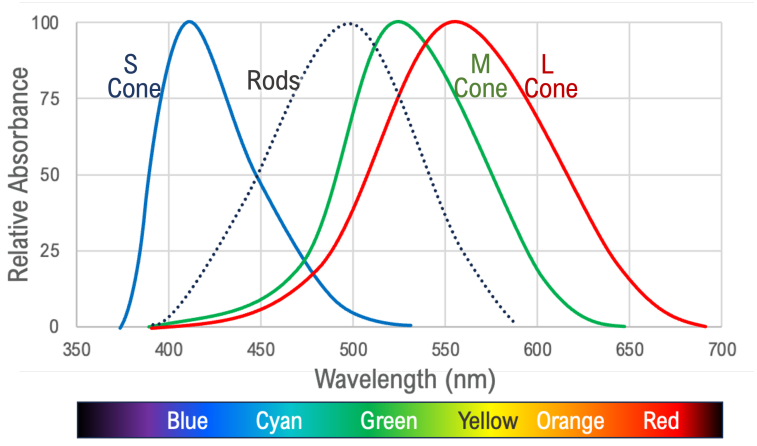


Color is perceived from the _____ signal from each cone.

- White = all three cones excited equally.

EXAMPLE: Using the figure below, estimate what wavelength of light would cause such a reaction and say what color the person would be expected to perceive.

	Response	Possible Wavelength	Perceived Color
Response 1	S: Highly excited, M: No reaction, L: No reaction		
Response 2	S: Low excitement, M: Highly excited, L: Mid excitement		
Response 3	S: Mid excitement, M: Mid excitement, L: Mid excitement		



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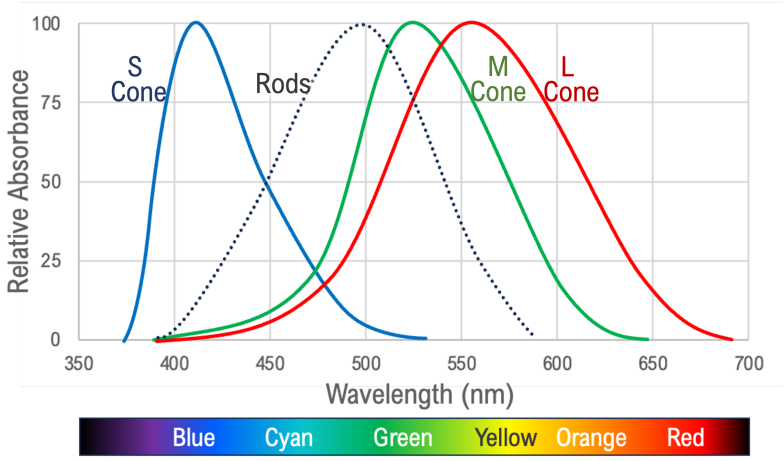
EXAMPLE: Red/green colorblindness is the most common form of color blindness, affecting roughly 8% of men. Mutations to the gene OPN1MW are the most common cause of red/green colorblindness. This gene codes for the MWS (medium wavelength sensitive) opsin. If a person did not produce the MWS opsin, at what wavelenth of light would they no longer be able to distinguish different colors. Use evidence from the image to support your answer.



Wavelength: _____

Evidence: _____

_____

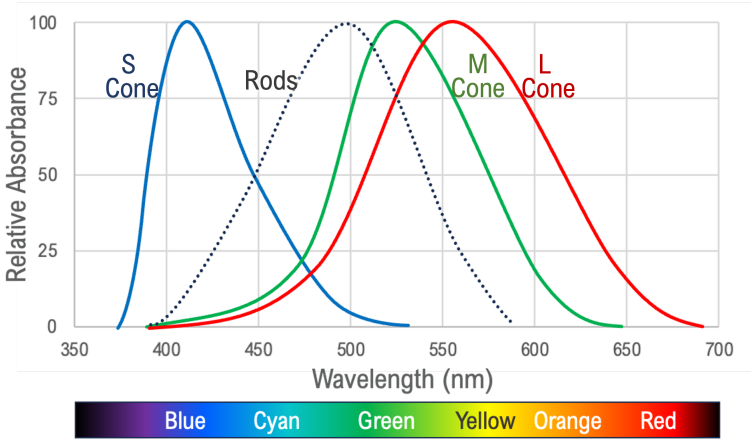
PRACTICE: A light hits your retina with a wavelength of 610 nm. Which cones will be stimulated, and what color will you perceive? Use the figure to help you answer.

a) S cone only; orange.

b) L cone and S cone; green.

c) L cone and M cone; orange.

d) S cone and M cone; green.



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PRACTICE: Imagine that you are walking in the woods at night in very low light. A red flower and a green leaf are both reflecting the same total amount of light. Which would appear brighter to you and why? The image is provided for reference.

a) The red flower. The cones will be most important in low light, and red wavelengths excite multiple cone cells.

b) The red flower. The rods will be most important in low light, and rods are most excited in the red spectrum.

c) The green leaf. The rods will be most important in low light, and rods are most excited in the green spectrum.

d) The green leaf. The cones will be most important in low light, and green wavelengths excite multiple cone cells.