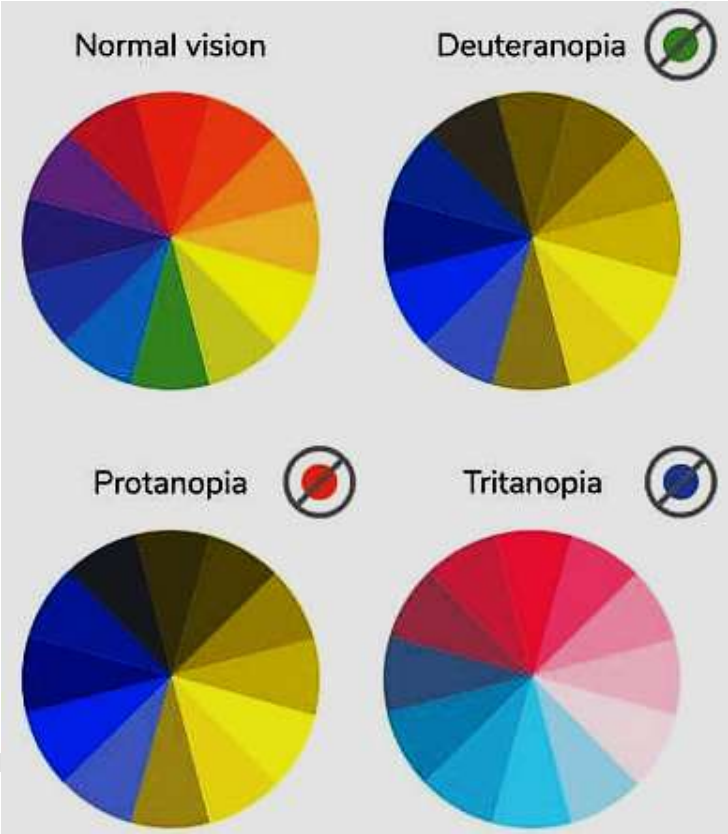
Color Blindness عمى الالوان

Color blindness: also known as color vision deficiency, is a condition characterized by the inability or reduced ability to perceive certain colors.

- ✓ **It is typically inherited and more commonly affects males than females.**
- ✓ **Color blindness is caused by abnormalities or deficiencies in the photopigments present in the cone cells of the retina, which are responsible for detecting and distinguishing different colors.**



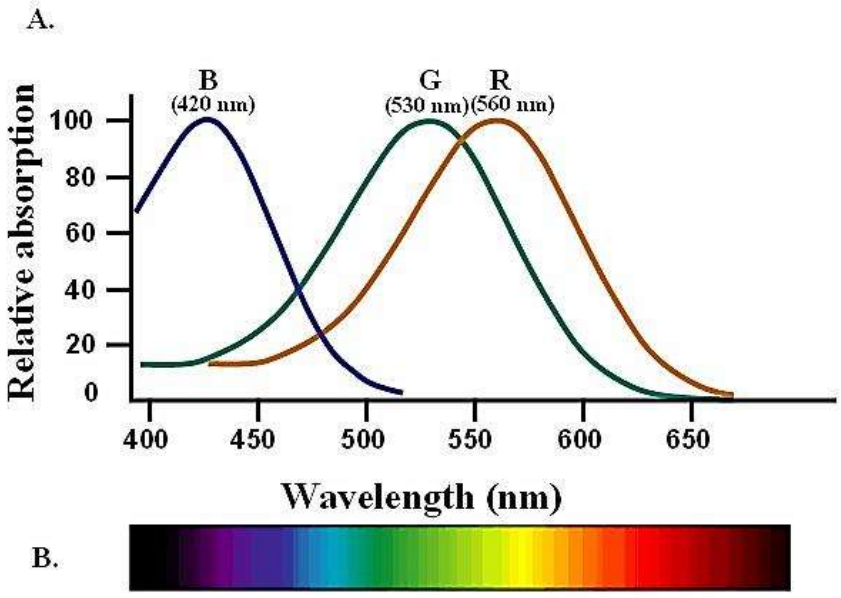
The principle of color vision

Color vision is the function of 3 populations of cones.

Tritan blue at 414 - 424 nm.

Deutran green at 522 - 539 nm.

Protan red at 549 - 570 nm.



Types of Color Vision

There are three main types of color vision in humans:

1. **Normal Trichromatic Vision (Trichromacy):**
   - This is the most common type of color vision, present in the majority of people.
   - It involves the presence of three types of cone cells in the retina, each sensitive to different wavelengths of light: red, green, and blue.

2. **Dichromatic Vision (Dichromacy):**
   - This is a type of color blindness that results from the absence of one of the three cone types.
   - There are two main types of dichromacy:
     a. **Protanopia**: The absence of red cone cells, leading to difficulty distinguishing between red and green colors.
     b. **Deuteranopia**: The absence of green cone cells, also leading to difficulties with distinguishing between red and green colors.
     c. **Tritanopia**: The absence of blue cone cells. also leading to difficulties with distinguishing between blue and yellow.

3. Monochromatic Vision (Monochromacy):

- This is a rare form of complete color blindness, where only one type of cone cell is functional or none are functional.
- People with monochromacy can only perceive shades of gray, black, and white, without the ability to distinguish colors.

Causes of Color Vision Abnormalities

1. Congenital color vision defect خلل في رؤية الألوان الخلقي

- is equal and non-progressive. متساو وغير متفاقم
- more common in males than females.
- X linked and almost red green. مرتبط بكروموسوم اكس وغالباً احمر اخضر اللون

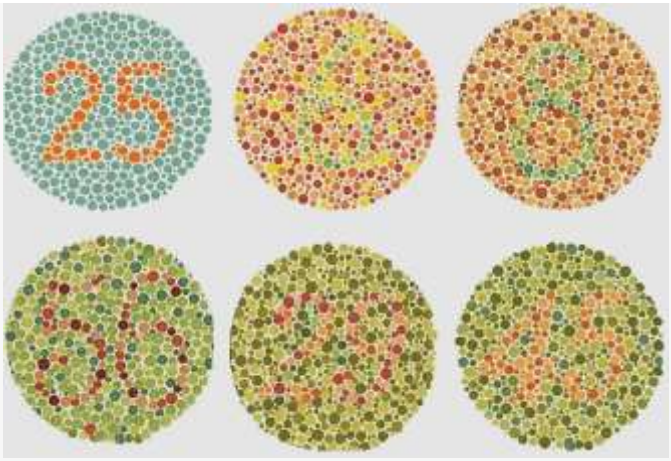
2. Acquired color vision defect خلل في رؤية الالوان المكتسب

- is progressive or regressive. متفاقم او متناقص
- often involves loss of blue sense. غالبًا ما يتضمن فقدان الإحساس باللون الأزرق
- visual acuity is affected.
- common cause is exposure to drugs or toxins as xanthopsia from cardiac glycosides. السبب الشائع هو التعرض للعقاقير أو السموم مثل زانثوبسيا من جليكوسيدات القلب

Types of Color Vision Tests

1. Ishihara Color Plates: The Ishihara test is one of the most widely used tests for color blindness. They were developed by Dr. Shinobu Ishihara, a Japanese ophthalmologist, in the early 20th century.

- It consists of a series of plates containing colored dots arranged in specific patterns. People with normal color vision can identify numbers or shapes embedded in the patterns.



- It consists of a complete group of 25-30 plates:

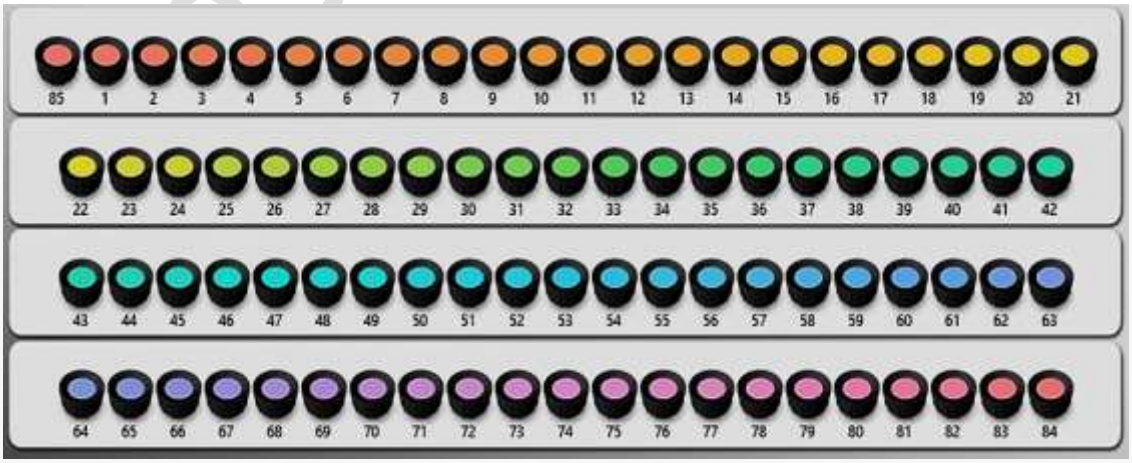
1) Demonstration and malingerers plate (plate 1)
2) Transformation plates (Plates 2-9): These plates are designed to detect red-green color vision deficiencies, specifically protanopia (red color blindness) and deuteranopia (green color blindness).
3) Vanishing plates (Plates 10-17): These plates are used to detect milder forms of red-green color vision deficiencies, known as protanomaly (reduced sensitivity to red) and deuteranomaly (reduced sensitivity to green).
4) Hidden plates (Plates 18-21): These plates are designed to further evaluate the severity of red-green color vision deficiencies.

- **Procedure:**
  - Test is done at 75 cm at day light at right angle of the visual plane.
  - Allow the patient to see just in 3 sec.
- **Interpretations:**
  - Normal color vision: All plates are visible except for the hidden digits (18-21).
  - Red-green color vision defects: Vanishing plates (10-17) are not visible, but transformation plates (2-9) and some hidden plates (18-21) are visible.
  - Deuteranopia (green color blindness): Purple-blue plates (22-25) are not visible.
  - Protanopia (red color blindness): Red-purple plates (22-25) are not visible.

2. **Farnsworth D-15 Test**: This test involves arranging a set of colored caps or discs in a specific order based on their hues. It assesses the ability to accurately discriminate between different shades of colors. The results help identify the type and severity of color vision deficiency.

- **Procedure:**
  - The fixed reference cap is placed in a tray or on a surface.
  - The remaining 14 caps are scrambled and presented to the person being tested.
  - The individual is asked to arrange the caps in order of their hue, starting from the fixed reference cap and proceeding in a sequential order based on their perception of color gradation.
  - The person is allowed to rearrange the caps until they are satisfied with the order.

3. **Farnsworth-Munsell 100 Hue Test**: Similar to the Farnsworth D-15 Test, this test evaluates the ability to arrange colored caps or discs in a specific order.
Consists of 85 hue caps not like named, are in 4 separate racks in each of 2 end caps are fixed while others are loose to be randomized by examiner.



4. **Cambridge Color Test**: This computer-based test assesses color vision across a range of hues. The Cambridge Color Test provides a quantitative measure of color vision deficiencies, known as the Color Confusion Index (CCI), which ranges from 0 (normal color vision) to 3 (severe color vision deficiency).

Treatment of Color Blindness

Currently, there is no cure for inherited color blindness or color vision deficiencies. Color vision is primarily determined by genetics and the functioning of cone cells in the retina, and these factors cannot be altered through treatment.

There are various strategies and assistive tools that can help individuals with color blindness better perceive and distinguish colors in their daily lives:

1. Tinted lenses or glasses
2. Color filters
3. Assistive technology: Specialized devices or tools, such as color-identifying apps or color-detecting devices.
4. Environmental adaptations: Making adjustments to the environment, such as using high-contrast colors, avoiding color combinations that are difficult to distinguish.
5. Educating others: Raising awareness and educating others about color blindness can help create a more inclusive and accommodating environment for individuals with this condition.