
# Visual Acuity
# Visual Field
# Coulor Vision

# Visual Acuity

# Visual Acuity

## Definition

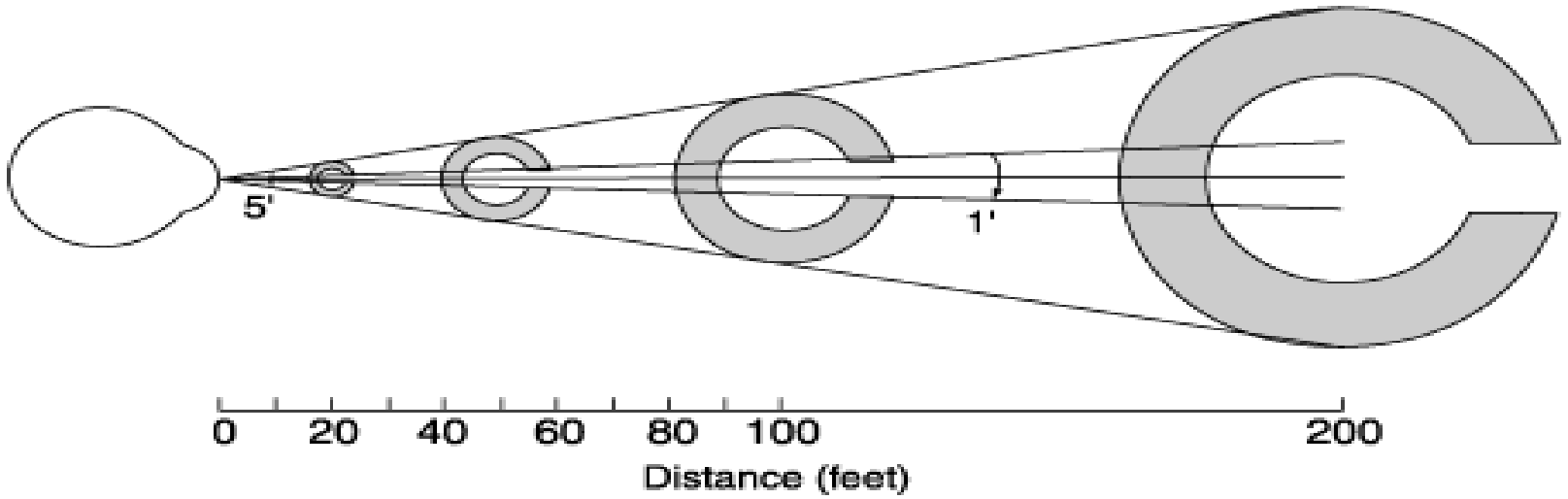
It is the ability of the eye to **see** the **fine details** of the object or to **discriminate** between **2 points** in the visual field.

# Visual Acuity

## Principle of measurement of visual acuity

The eye can **discriminate** between **2 points** when the 2 points stimulate **2 cones** separated by **unstimulated one**.

In this condition the **2 points** form a **visual angle** of about **1 min** (**1/60 of degree**)



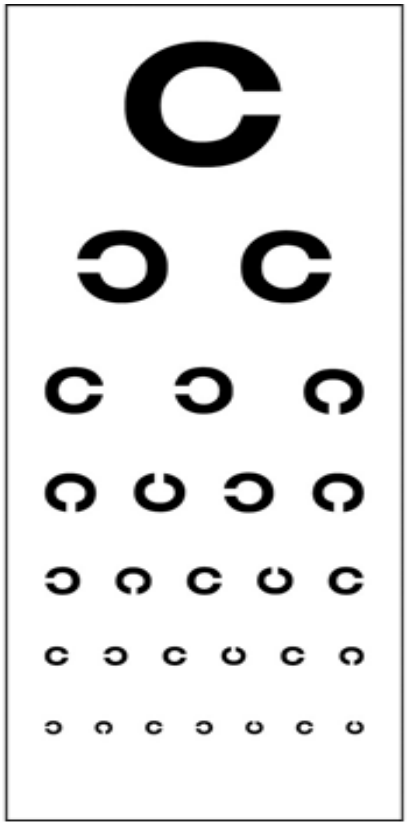
# Measurement of Visual Acuity

There are many clinical methods for stating visual acuity;

1. Charts
2. Counting fingers
3. Hand movement
4. Perception of light

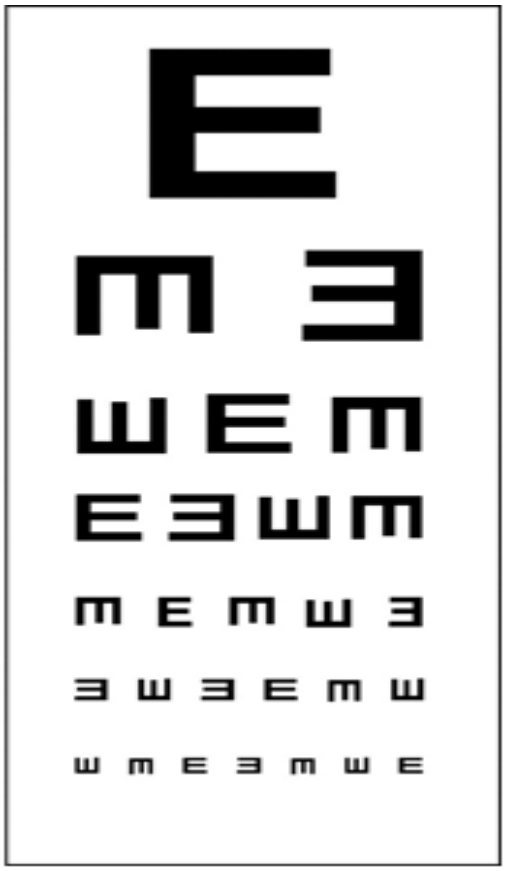
# Clinical Charts

- There are **many charts** that are used in testing VA



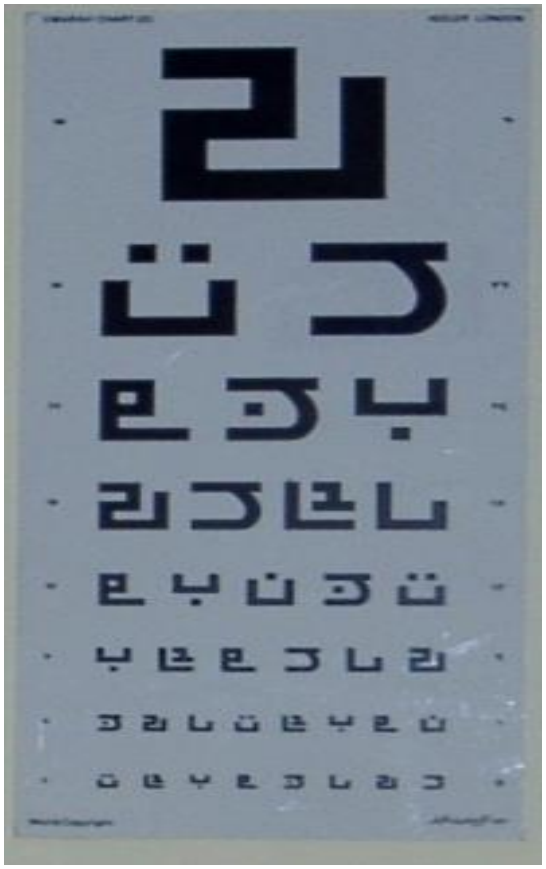
**Landolt's C charts**

**Formed of Broken circle or C**



**Snellen's letter charts**

**Formed of English Letters**



**Emarah arabic chart**

**Formed of arabic letters**

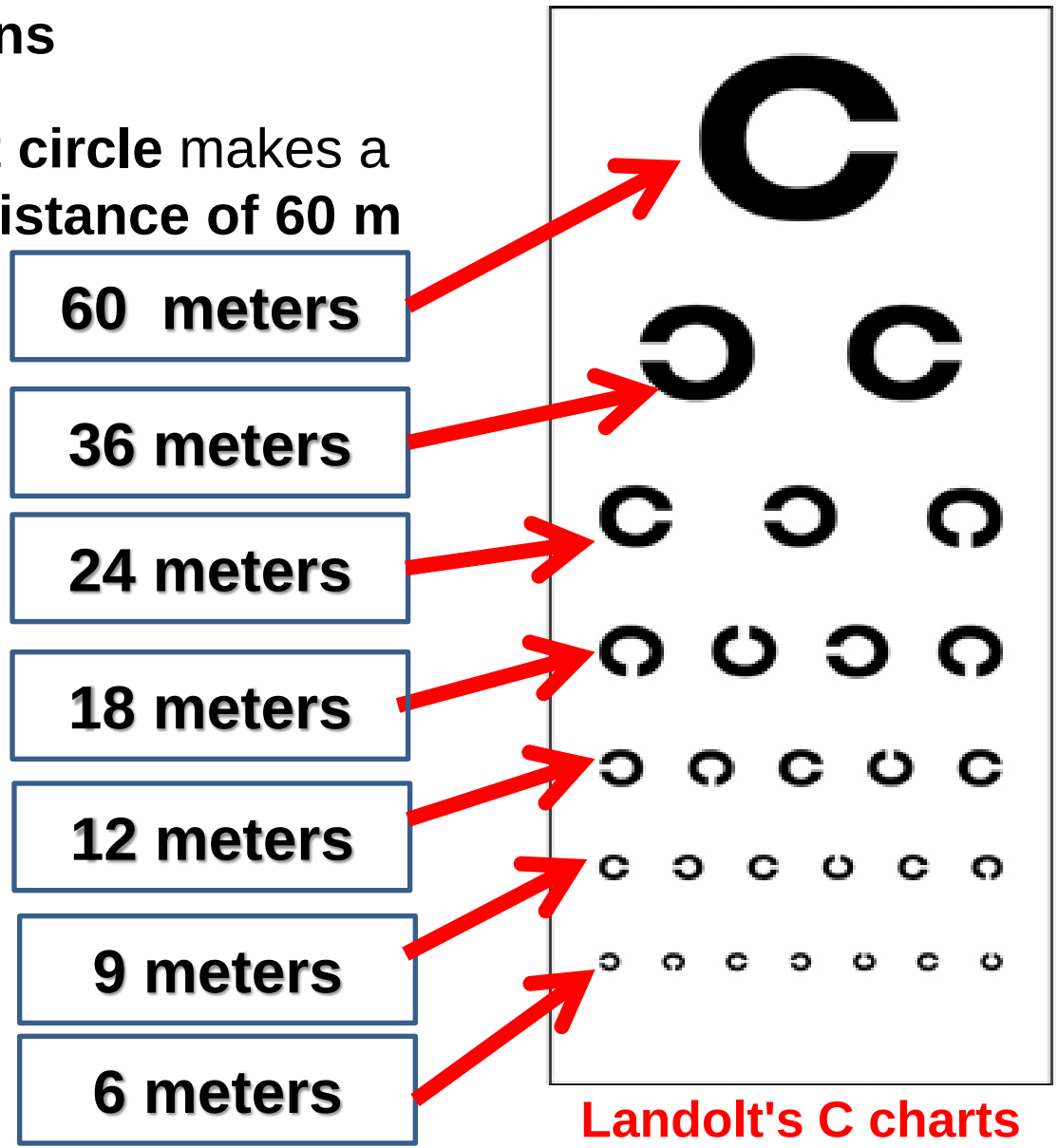

INMAGINE
E
F P
T O Z
L P E D
1
2
3
4
5
6
7
8
9
10
11

# Landolt's Chart

consists of **7 rows of incomplete circles** with the openings of the circles in **different directions**

The opening of the **biggest circle** makes a visual angle of **1 min** at **a distance of 60 m**

The openings in the **lower rows** of circles make the same angle at distances of **36 m, 24m, 18m, 12m, 9m and 6 meters** respectively

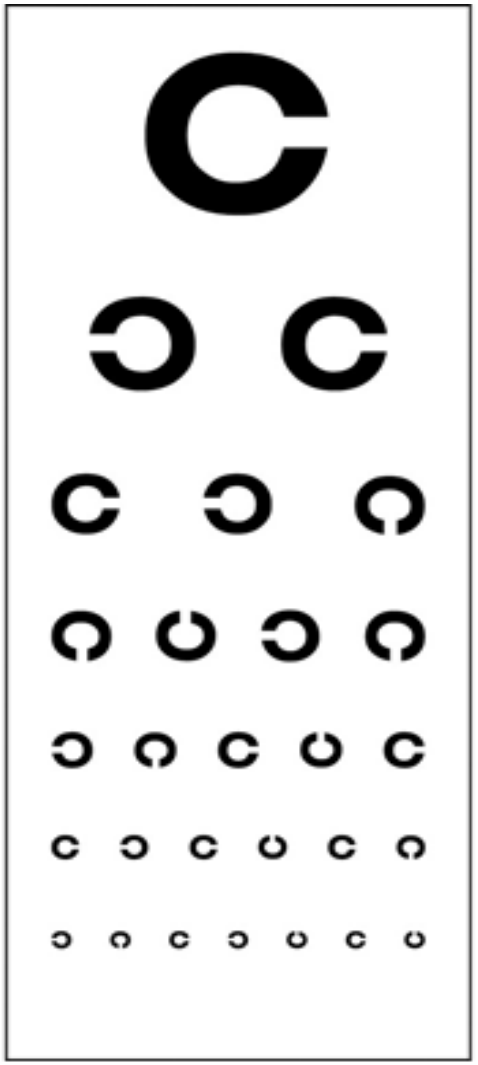



Landolt's C charts

# Landolt's Chart

## Steps of testing

- Good **illumination** for chart
- The chart is placed at a distance of **6 meters** from the tested person ?
- He is asked to **see** the site of **opening** of each circle
- Start with big circle then **move downward** to small ones
- If he **see** the **last** row at **6 meters**, his VA 6/6
- If he cannot see the last row, but he can see row above it, his VA IS 6/9 , then 6/12, 6/18. 6/24, 6/36, and 6/60



Landolt's C charts

# Clinical Expression of Visual Acuity

Visual acuity is a mathematical fraction that expresses the **ratio of two distances**, or the ratio of one's visual acuity to that of a person with normal visual acuity

$$\text{Visual acuity} = \frac{\text{Distance at which the patient sees the chart}}{\text{Distance at which the normal person sees the chart}}$$

- If the patient **cannot see** the **big** row at **6 meters**, he is asked to **move nearer** by one meter in each time i.e. at a distance of 5 meters where his visual acuity equals (5/60)or (4/60)or(3/60)or (2/60) and lastly at one meter (1/60).

- If the patient **cannot see** the **big** row at **1 meter**, shift to the following tests

# Measurement of Visual Acuity

**a) Counting fingers**

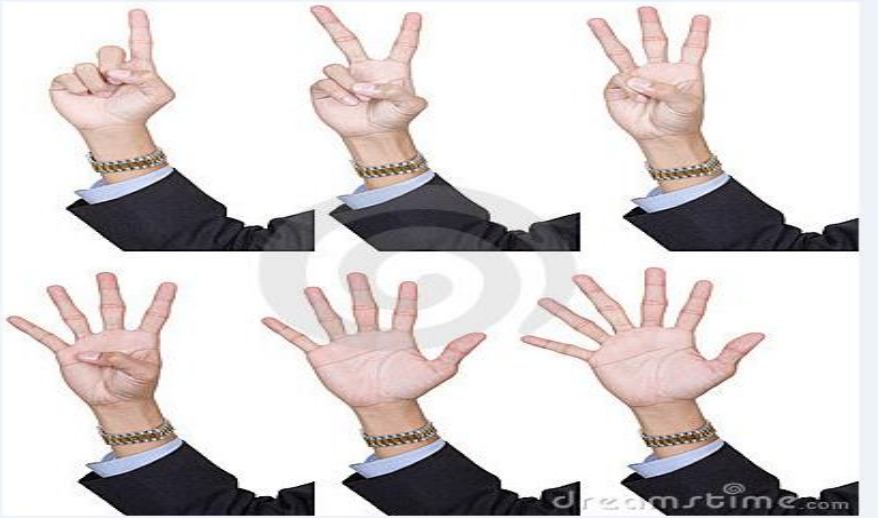
- Ability to count fingers at a given distance

**b) Hand movements**

- Ability to distinguish a hand if it is moving or not in front of the face of the patient

**c) Perception of light**

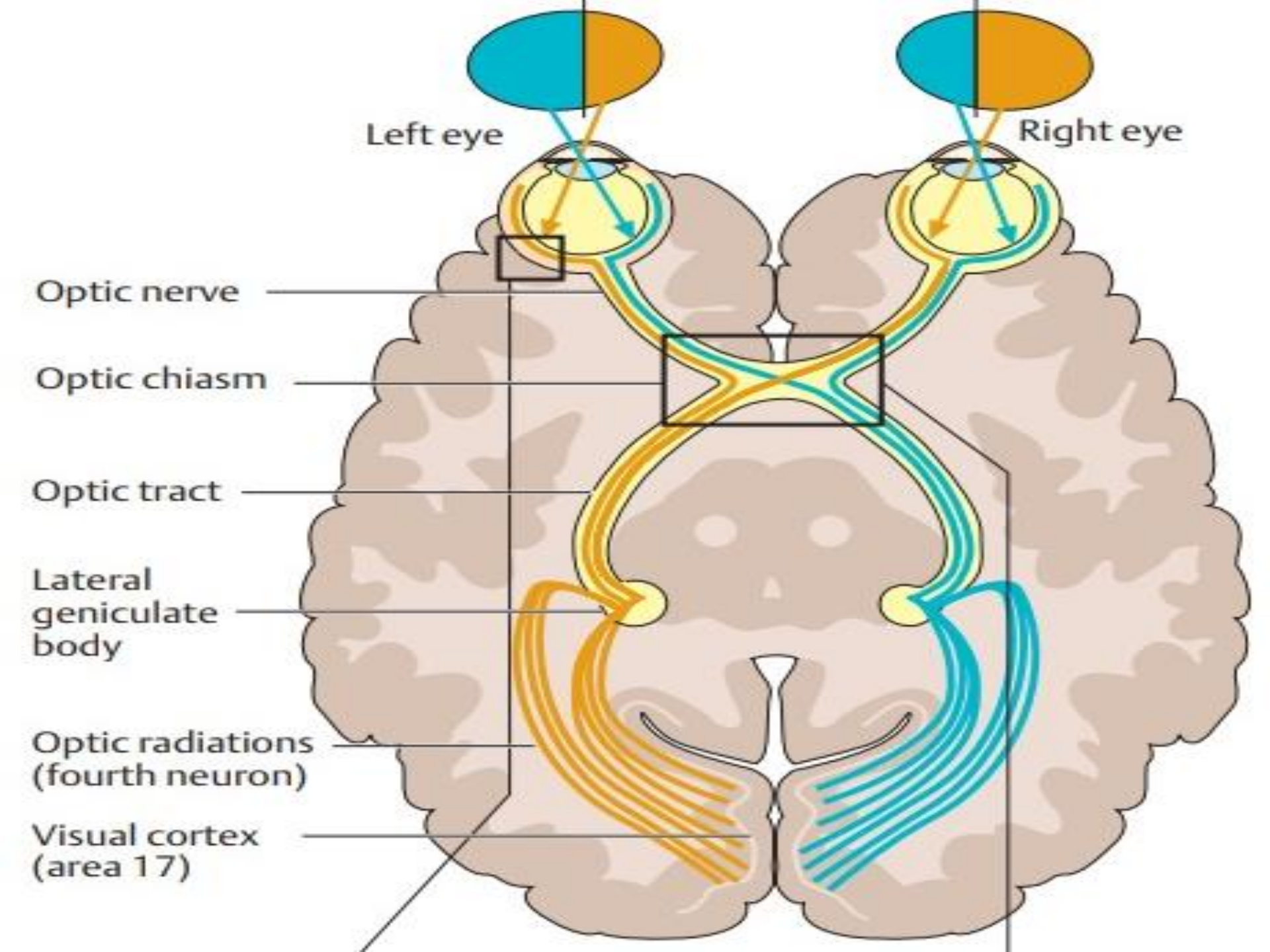
- Ability to distinguish if the eye can perceive any light
- If no perception of light = totally blind



# Factors Affecting Visual Acuity

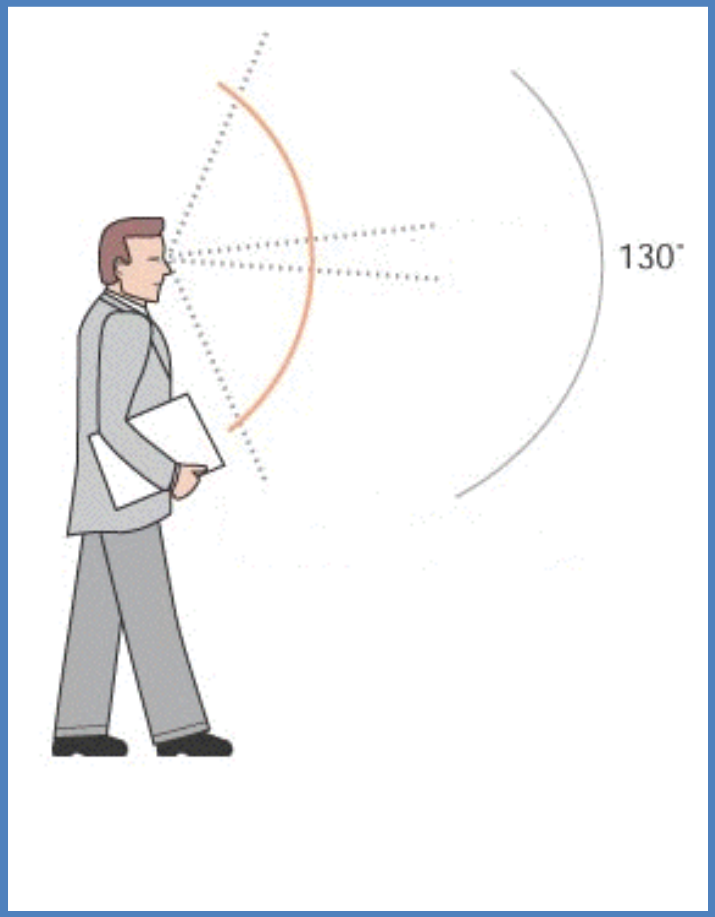
- **Degree of illumination** of the chart; bad illumination impair visual acuity
- **Fovea centralis**: it is the most sensitive point in the retina having the maximal visual acuity.
- **Age:** visual acuity decreases in old age.
- **Spherical and chromatic aberrations** caused by dilated pupil impair visual acuity.
- **Errors of refractions** e.g. myopia, hypermetropia and astigmatism decrease visual acuity.

# Field of Vision


Left eye
Right eye
Optic nerve
Optic chiasm
Optic tract
Lateral geniculate body
Optic radiations (fourth neuron)
Visual cortex (area 17)

# Field of vision:

It is the part of environment around us which can be seen without moving the eye.



# Types of visual field:

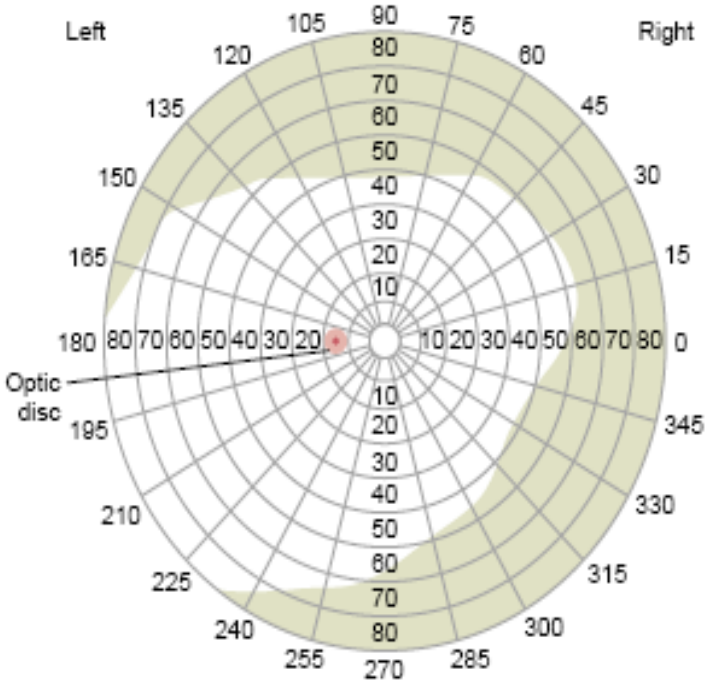
## Monocular

Field of one eye only

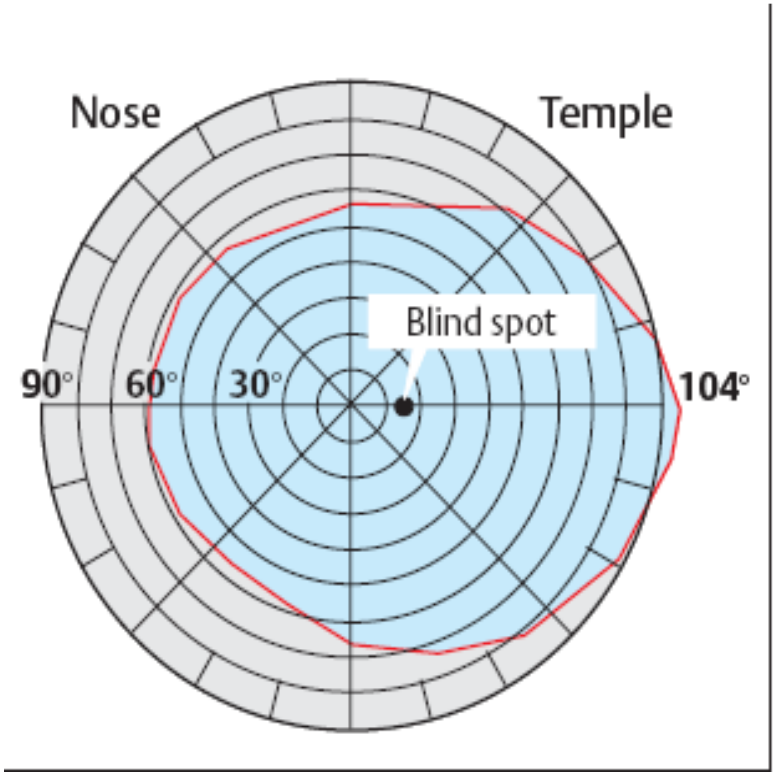
## Binocular

Field of both eyes together

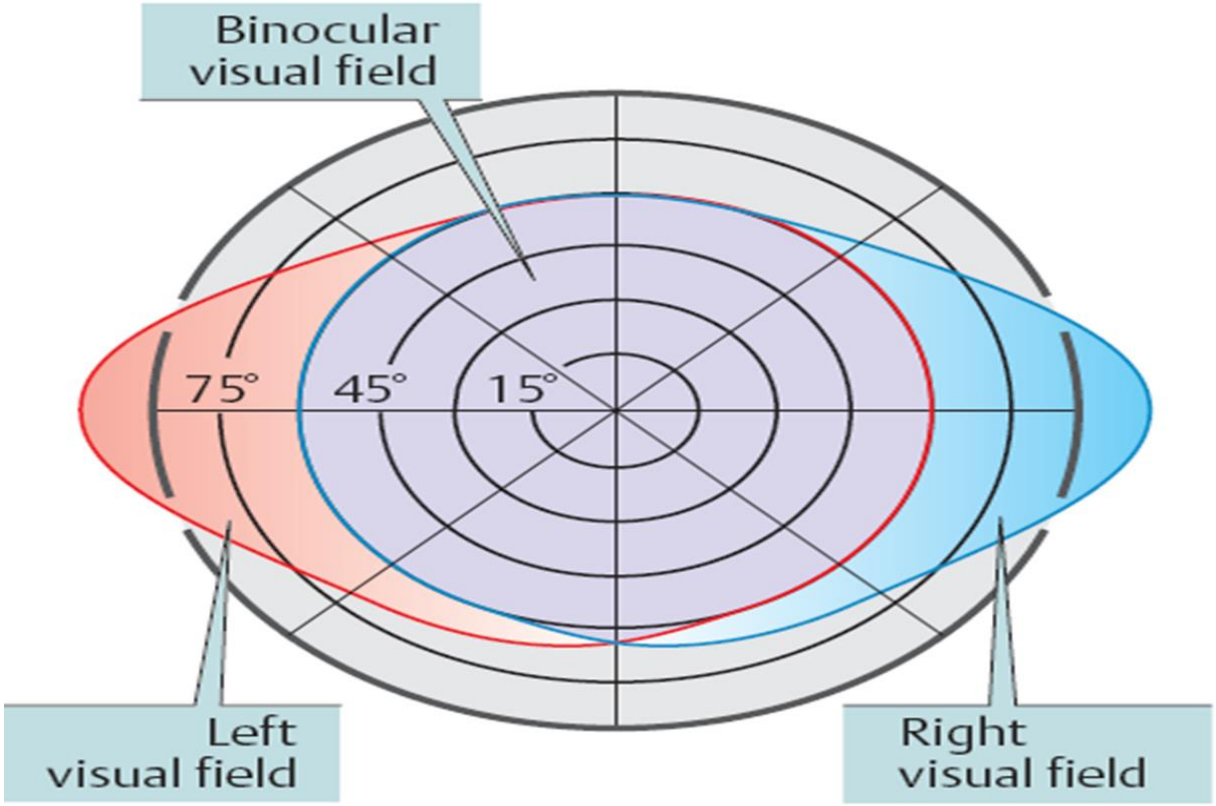
## Field of vision for the left eye




## Field of vision for the right eye




# Field of monocular vision




# Field of binocular vision

# Determination of visual field:

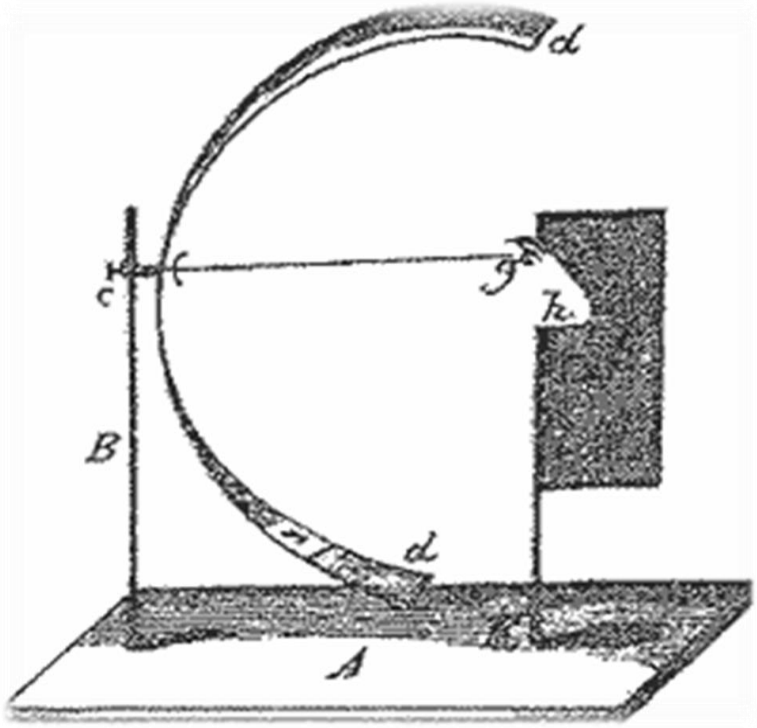
- Confrontation test
- Perimeter

# Confrontation test:

- It is rough clinical test in which the patient's field is compared with that of the examiner (who is supposed to be normal)

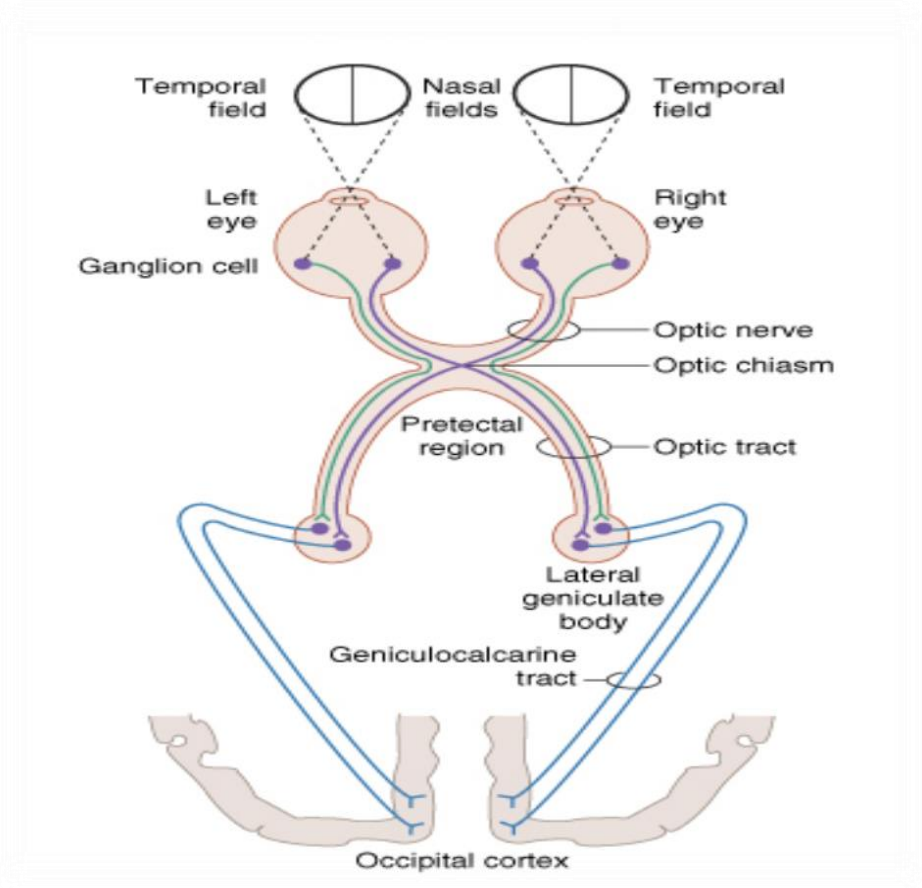
# Perimeter

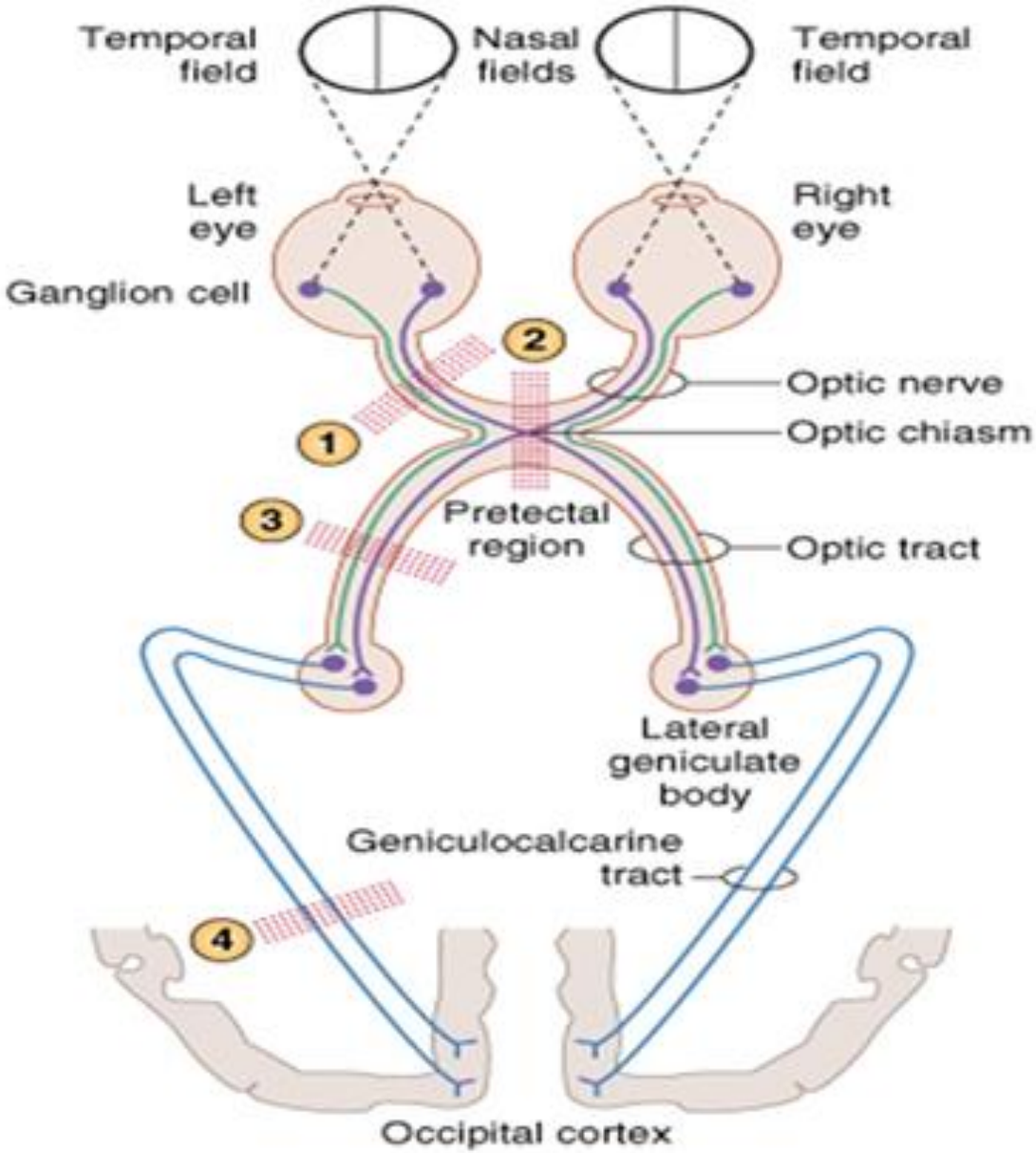
It maps the visual field & detects any defect in the visual field.

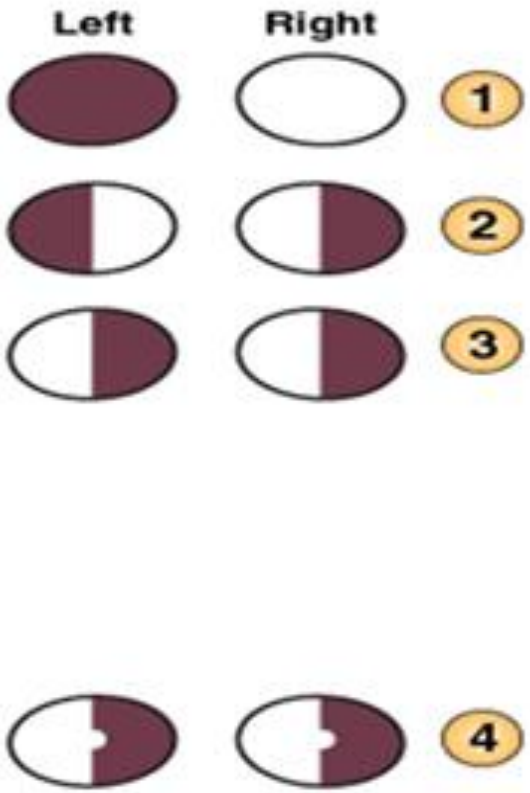



# Importance of determination of visual field:

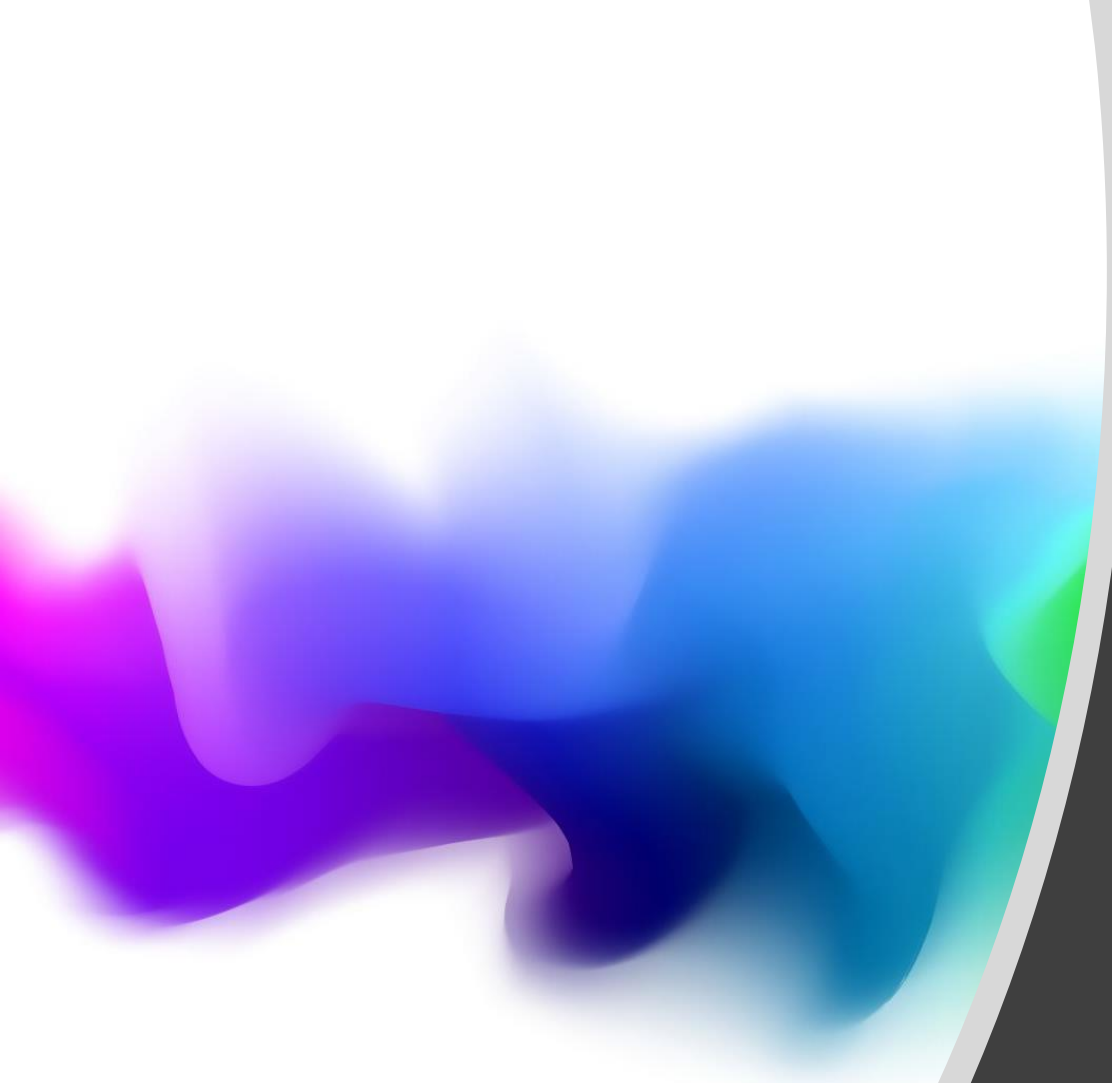
1- Help in localization of the sites of lesions in the visual pathway.






# Lesion in visual pathway



# Colour Vision

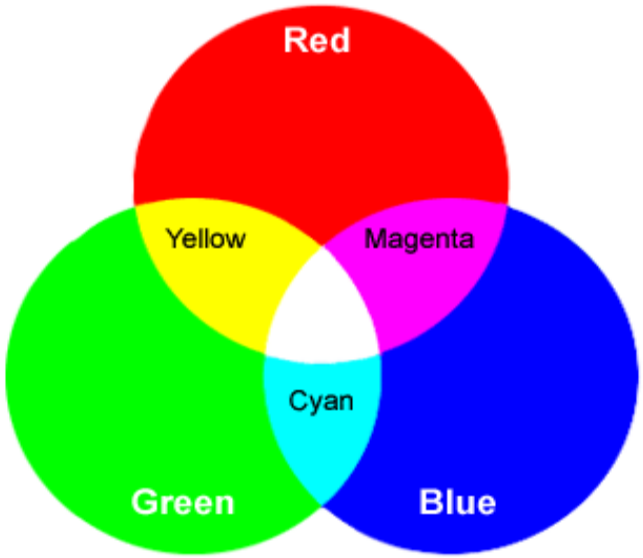
# Colour Vision

- It is the **ability of the eye** to perceive the different types and characters of colours.

## Types of colours:

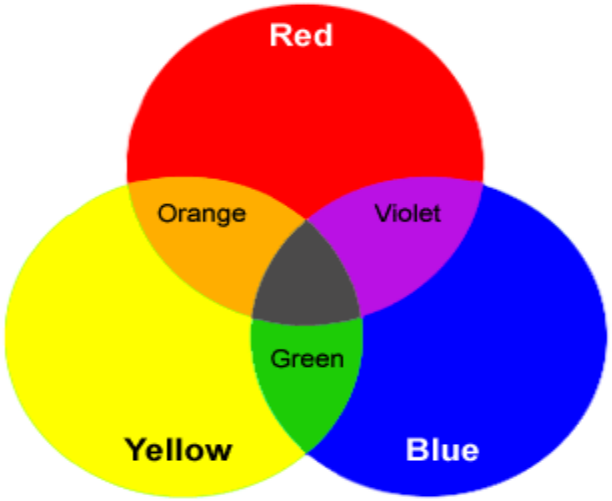
### Primary colours

- They are **red, green, and bl**ue
- When they are mixed together in the same proportion they **give white colour**
- When mixed by **different proportion** they give **other colours**

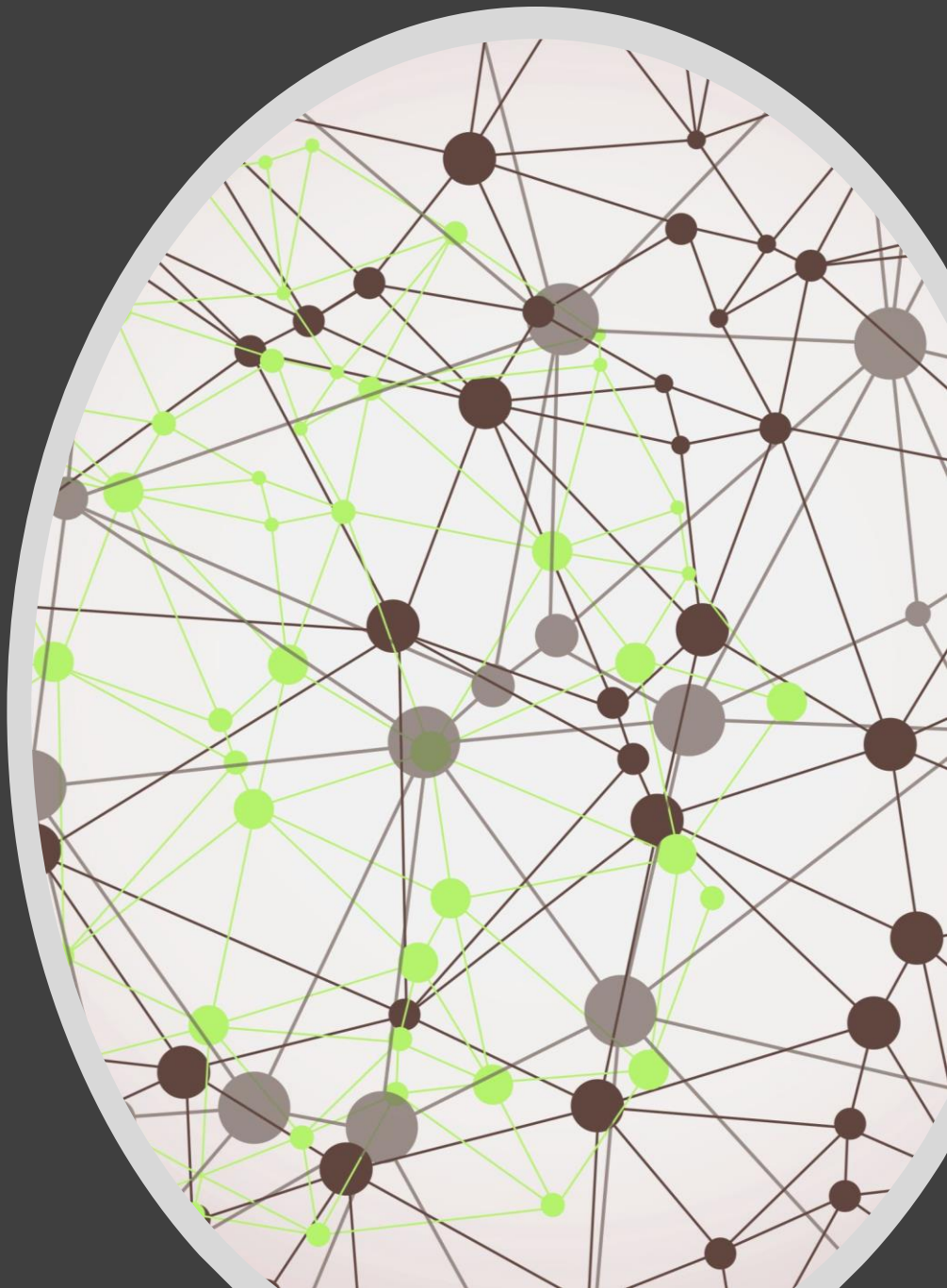



### Complementary colours

These colours when mixed together they give white colour e.g. **deep blue** and **yellow**; red and cyano



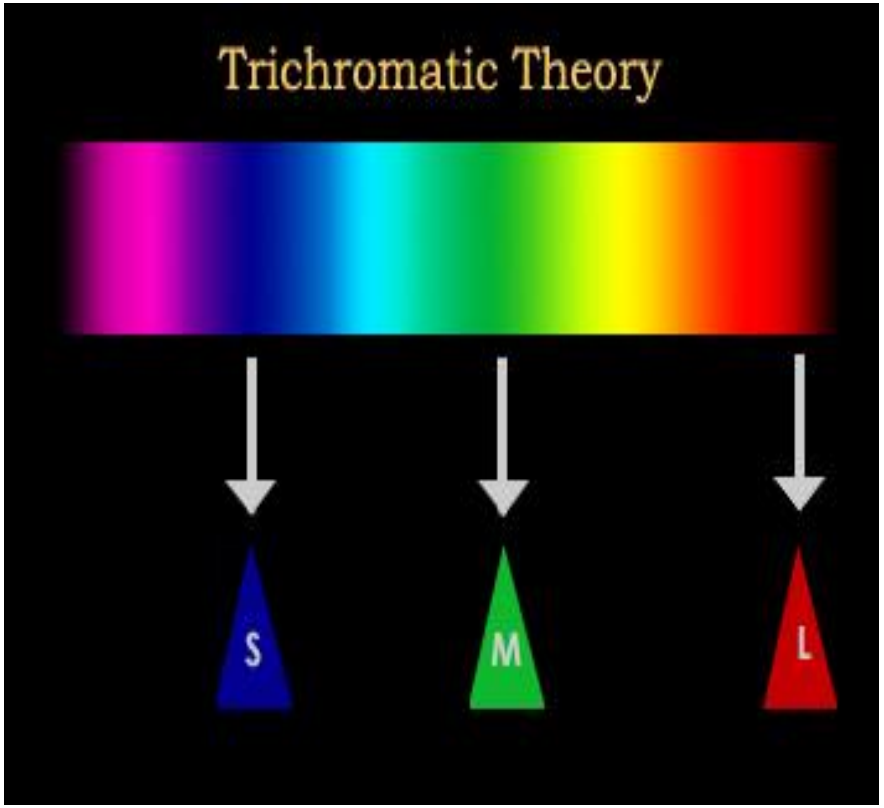
# Mechanism of Colour Vision



# Young-Helmholtz Theory

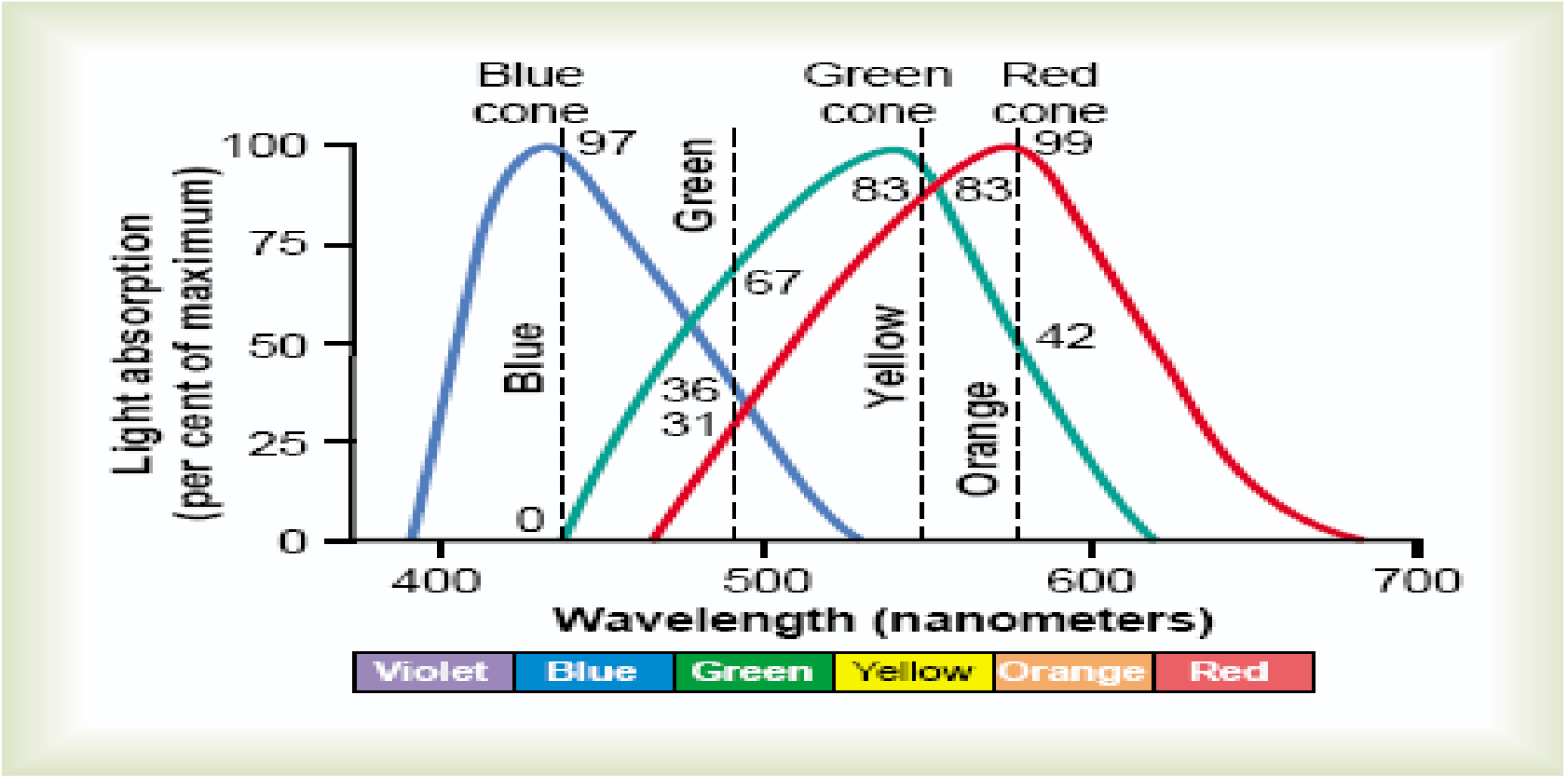
- It is the **most accepted theory** of colour vision.
- It explains the mechanism of colour vision at the **level of receptors.**
- It postulates that there are **3 kinds of cones**; each containing a different photopigment and maximally sensitive to one of the three primary colors.

a. ***Blue-sensitive or short-wave pigment (S-cone)*** → absorbs light maximally in the blue-violet portion of the spectrum.
b. ***Green-sensitive or middle-wave pigment (M-cone)*** → absorbs maximally in the green portion.
c. ***Red-sensitive or long-wave pigment (L-cone)*** → absorbs maximally in the yellow portion.



# Young-Helmholtz Theory

- Equal stimulation of the **3 cone systems** produces *white sensation* while unequal stimulation produces another colour e.g. **yellow colour** is perceived when red cone stimulated by **83%**, green cone by **83%,** and blue cone by **0%**



# Colour Blindness

# Color Blindness

- It is inability of the subject to discriminate between colours which normal person can recognize.
- Colour blindness may be a complication of certain eye diseases or a manifestation of certain psychological disorders, but commonly it is **inherited as a recessive X-linked chromosome),**
- **Males are more affected than famels (8% & 0.4% respectively**)

# Types of colour blindness

- The suffix "**-anomaly**" denotes color weakness and **-anopia**" color blindness.
- The prefixes "prot-=red," "deuter-=green," and "trit-= blue".
- Colour blindness include;

**1) <u>Anomalous trichromate:</u>**

- These patients have all three cone systems, but one may be weak.
- So they may have tritanomaly, deuteranomaly, or protanomaly.

**<u>2) Dichromats:</u>**

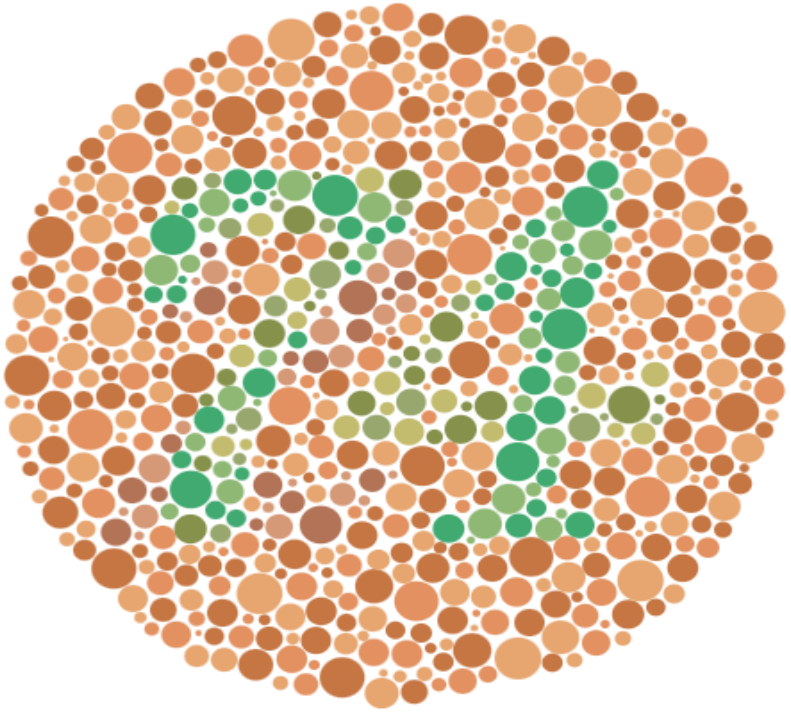
- These are individuals with only two cone systems.
- They may have protanopia, deuteranopia, or tritanopia.
- Dichromats can match their color spectrum by mixing only two primary colors.

## 3) Monochromats

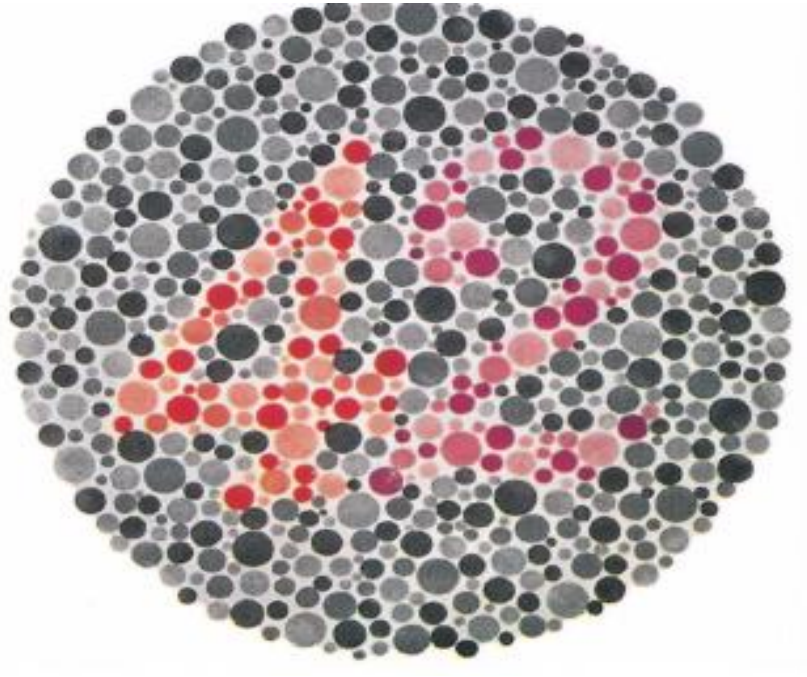
- It is a rare condition where only one cone system is present.
- Monochromats match their colour spectrum by varying the intensity of only one.

# Tests for Colour Vision

# Ishihra chart



Normal person reads “74,” but the red-green color-blind person reads “21.



Normal person reads “42.” Red-blind person (protanope) reads 2 green-blind person (deuteranope) reads “4.”

# Ishihra chart


# Wool classification & matching test

# Edridge Green Lantern test


THANKS