NSII
Lab I
Visual Functions Tests

Zuheir A Hasan
Professor of physiology College of Medicine HU

Visual Functions Tests

- Fundoscopy
- Visual acuity
- Color vision testing
- Tonometry
- Perimetry (visual field testing)

Ophthalmoscope

Pupil dilation Prior to ophthalmoscopy

- For a good view of fundus the pupil should be dilated by instilling few drops of short acting mydriatic drug (e.g. 1% cyclopentolate).
- The subject should be examined in sitting
- Examination room should be dark.
- keep the eye as still as possible

Position of the examiner

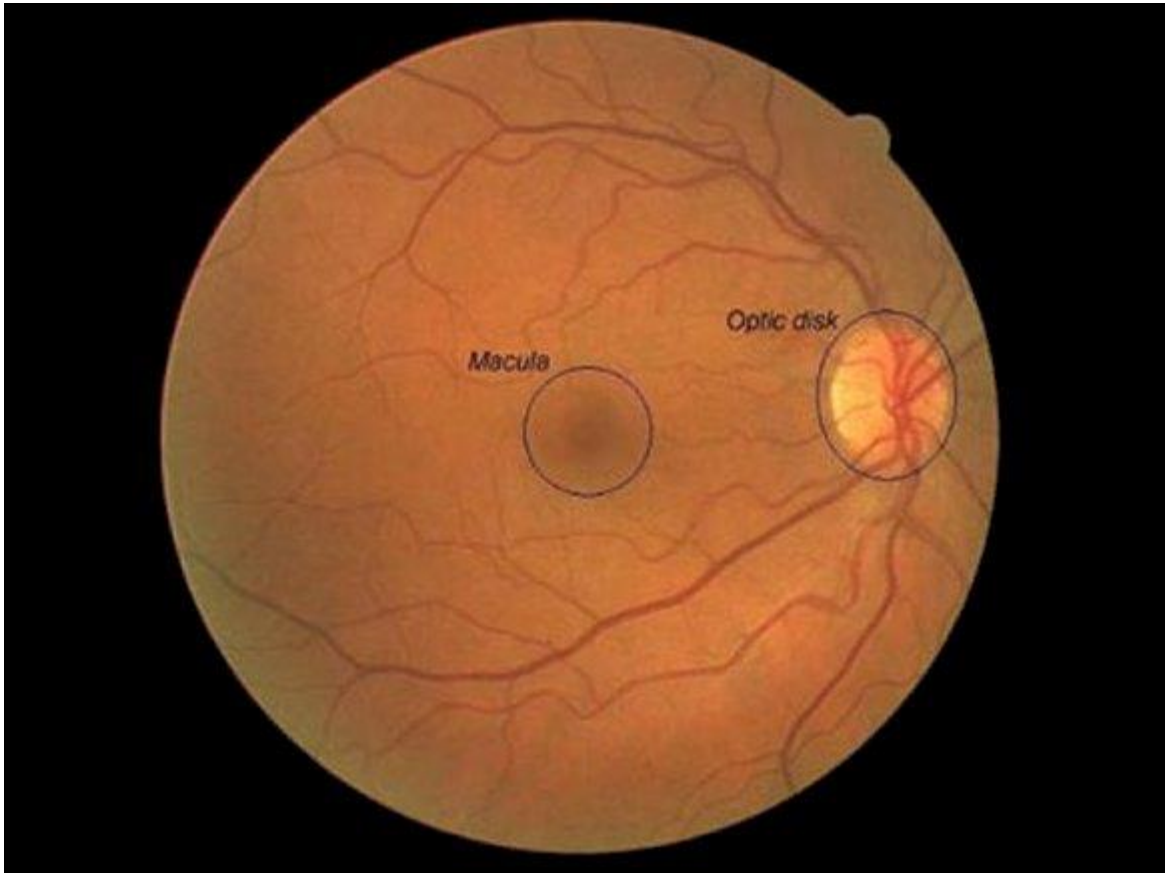
For examining right eye of the patient,

- Examiner should stand on right side of the patient.
- Hold the instrument in his right hand.
- Use examiner’s right eye.
- If examining left eye, stand on left side, hold instrument in left hand use left eye.

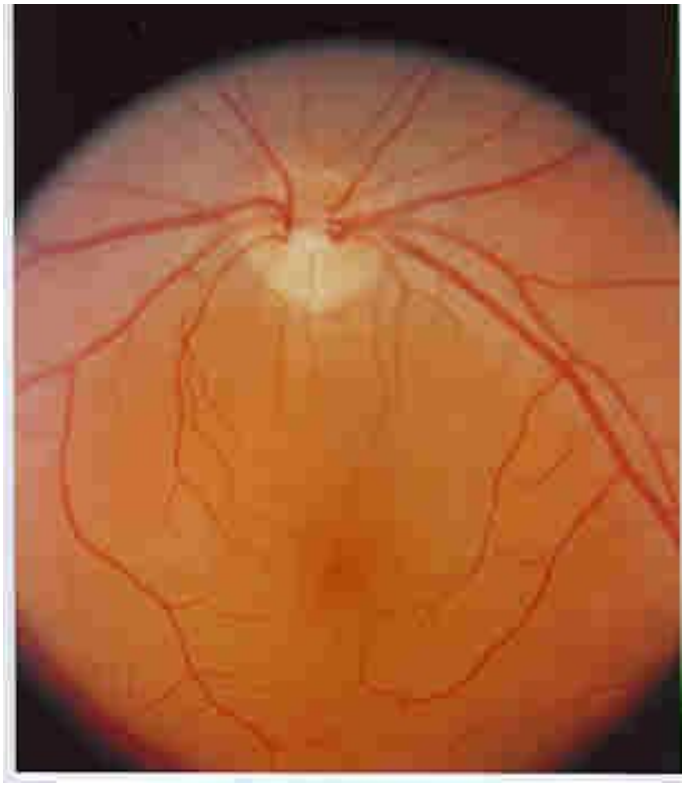
Ophthalmoscopy

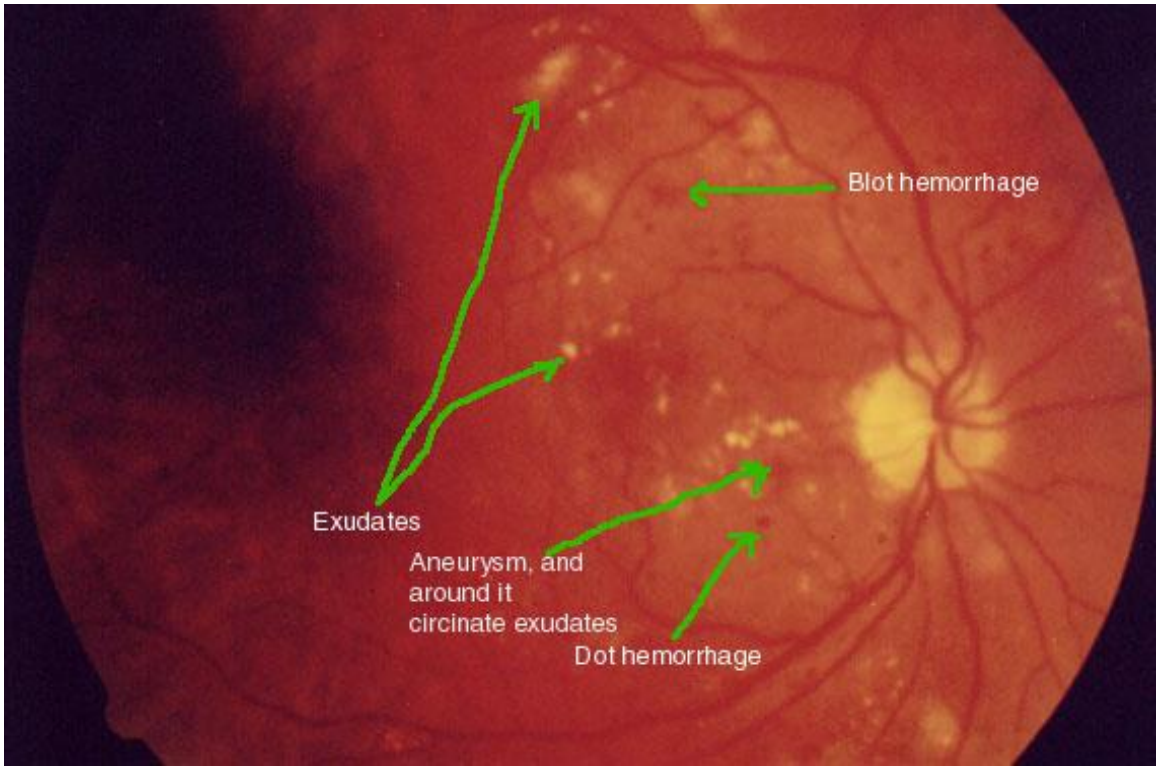
- Viewing should begin about half meter away from the eye.
- First see the “Red reflex”
- Initially the lens power in the instrument should be set to zero, or refractive error of patient or examiner, e.g. if the patient is myopic then set the (-ve)lens, if the examiner or patient is hypermetropic then set the lens to (+ve) lens. If both patient & examiner have refractive error then sum together their powers.
- e.g. if examiner having +2, & pt. having +1 lens then adjust +3 lens in ophthalmoscope.
- If examiner have +2 diopters lens & pt. having -4 diopters lens then adjust (+2)+(-4) =(-2) lens in ophthalmoscope.

POSSITION TO EXAMINER FUNDUS

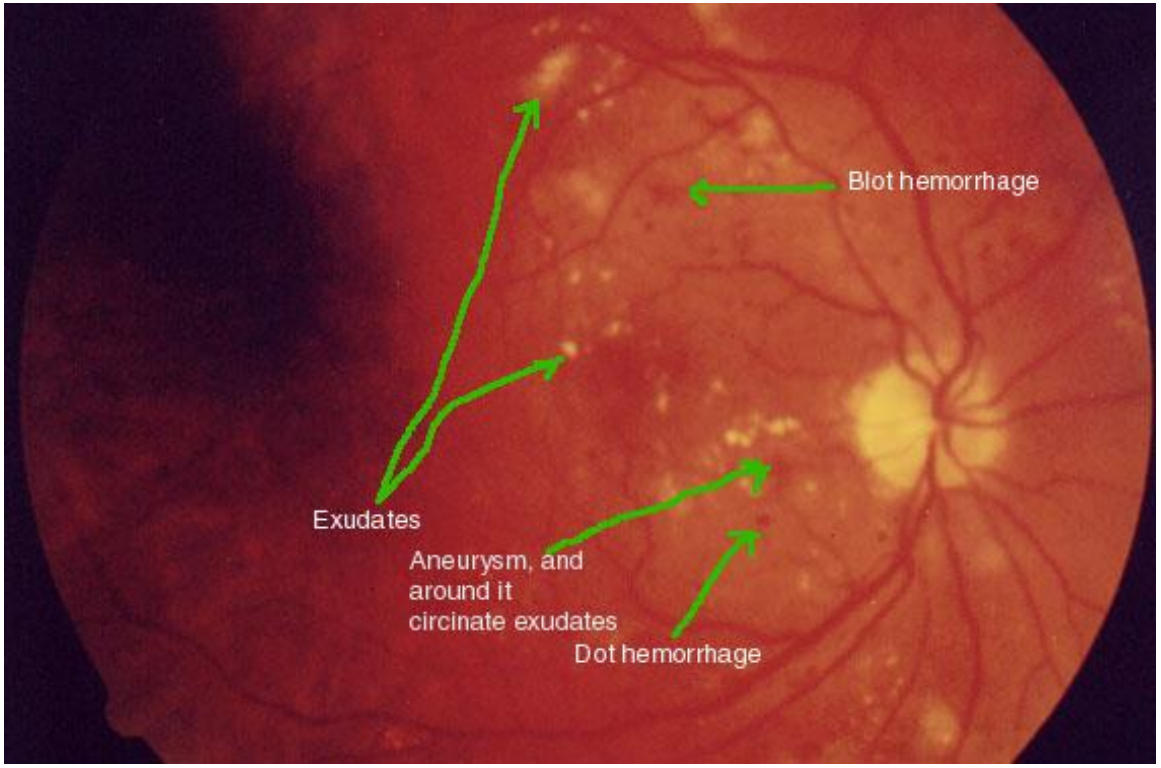

Optic disk
Macula

NORMAL HUMAN RETINA




Blot hemorrhage
Exudates
Aneurysm, and
around it
circinate exudates
Dot hemorrhage

Diabetic retinopathy



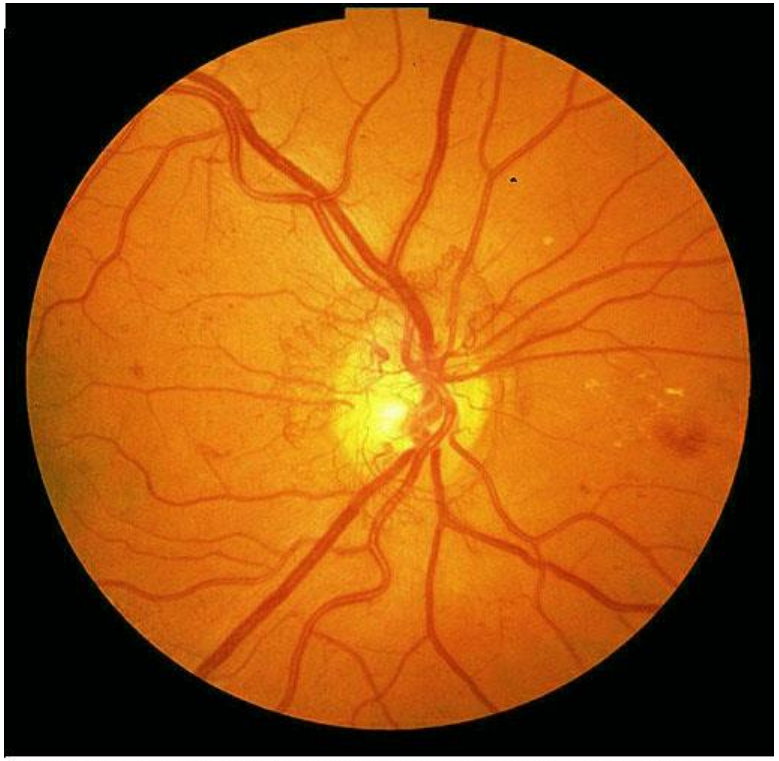
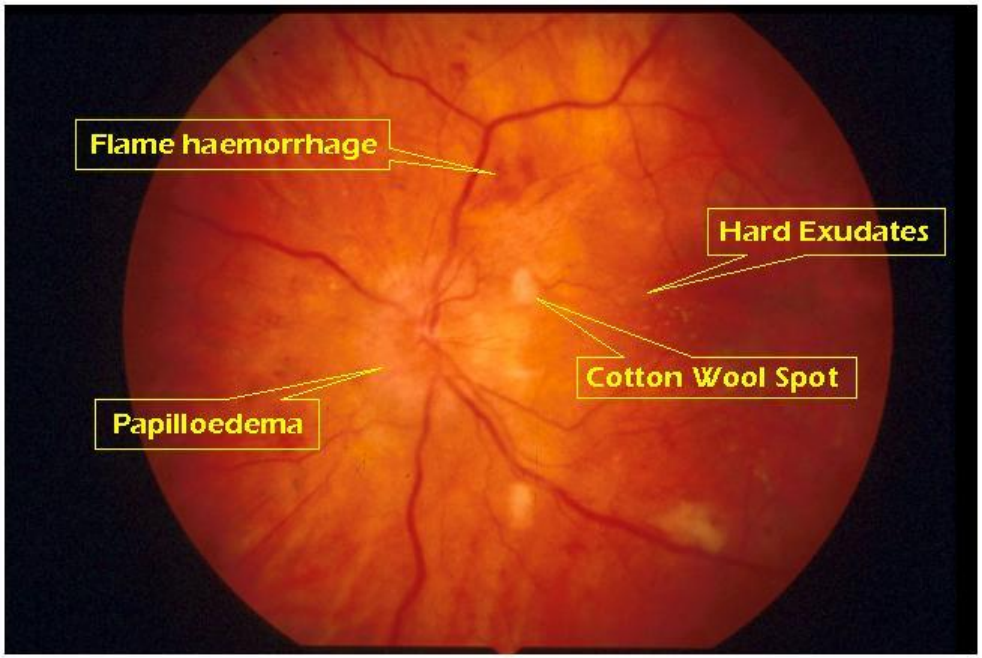


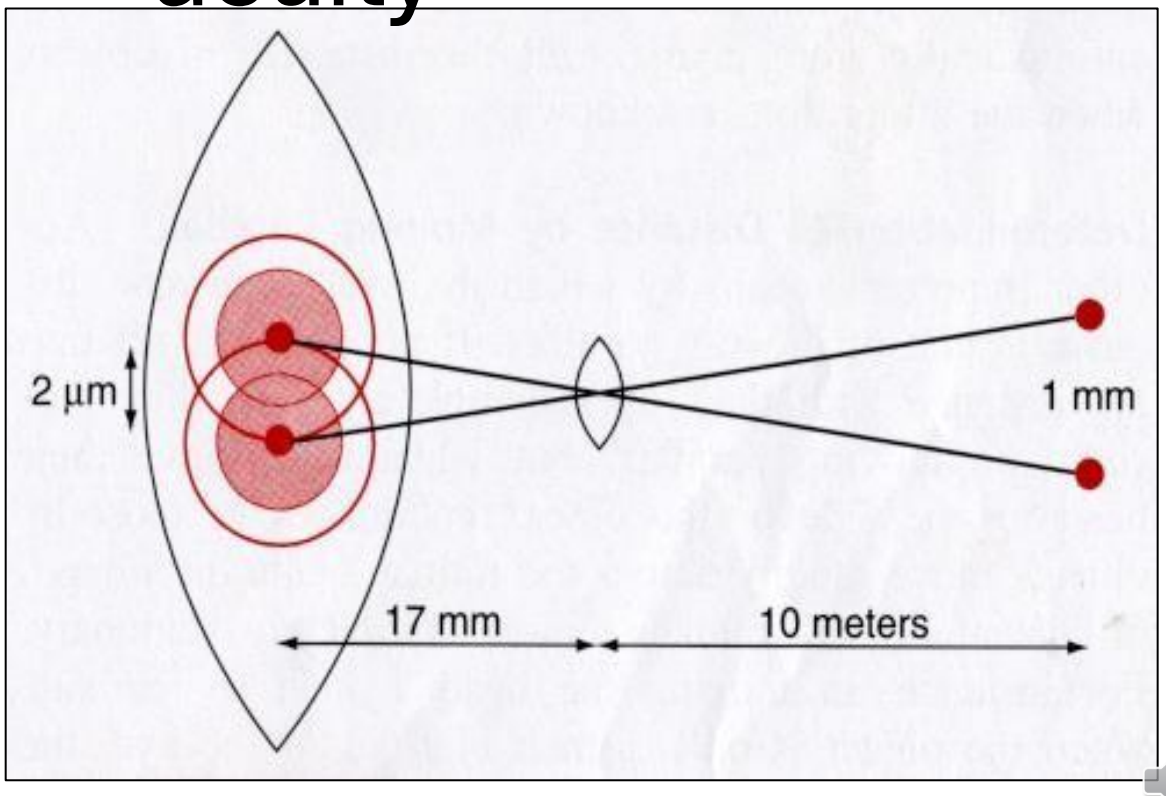
Fig. 25. A view of the fundus of the eye and of the retina in a patient who has advanced diabetic retinopathy.

Hypertensive Retinopathy - Grade 4



Visual acuity

The diameter of the cones in the fovea is ~ 1.5 µm



Visual Acuity

How a newborn would see a doll from 15 in

One month

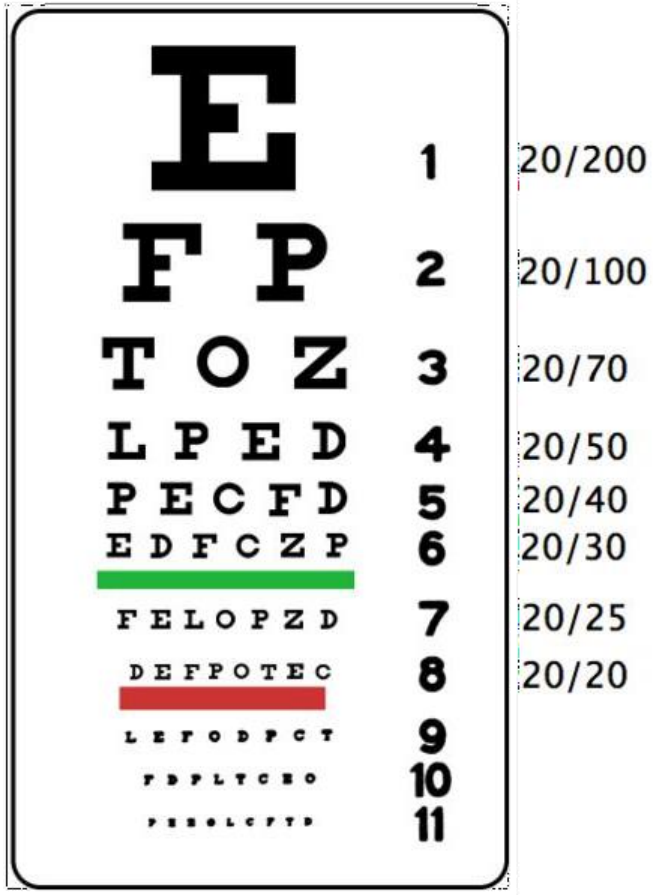
Two months

4 months

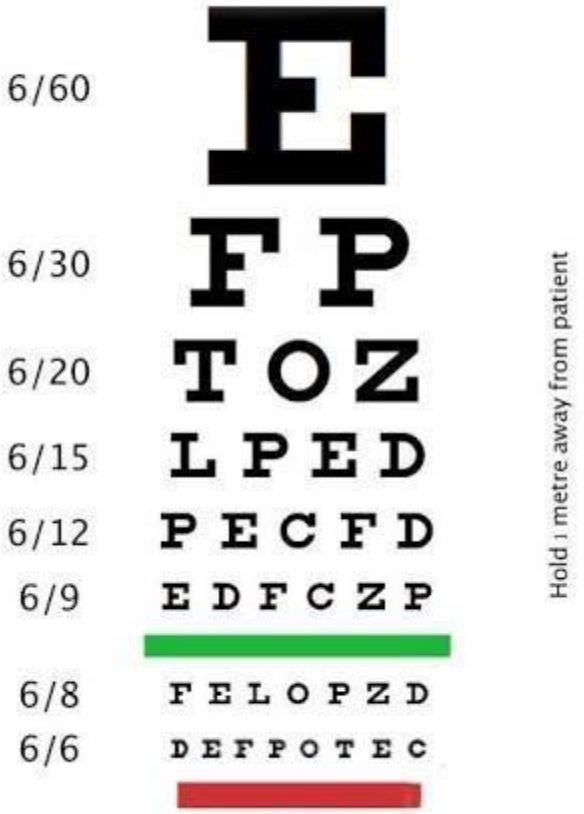
6 months

8 months

Snellen's chart



Snellen's chart



Visual Acuity: depends on the density of receptors (primarily Cones)

- 6/6 ability to see letters of a given size at 6 meters
- 6/12 what a normal person can see at 12 meters, this person must be at 6 meters to see.
- 6/60 what a normal person can see at 60 meters, this person must be at 6 meters to see.

Young–Helmholtz theory of color vision

- Is based on the existence of three kinds of cones, each containing a different photopigments that is maximally sensitive to one of the three primary colors.
- The sensation of any given color is determined by the relative frequency of the impulses from each of these cone pigments systems
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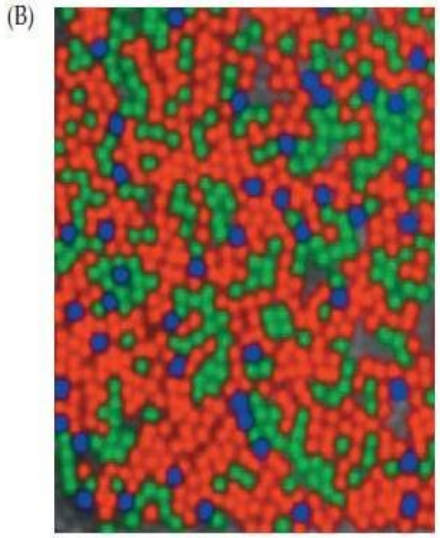
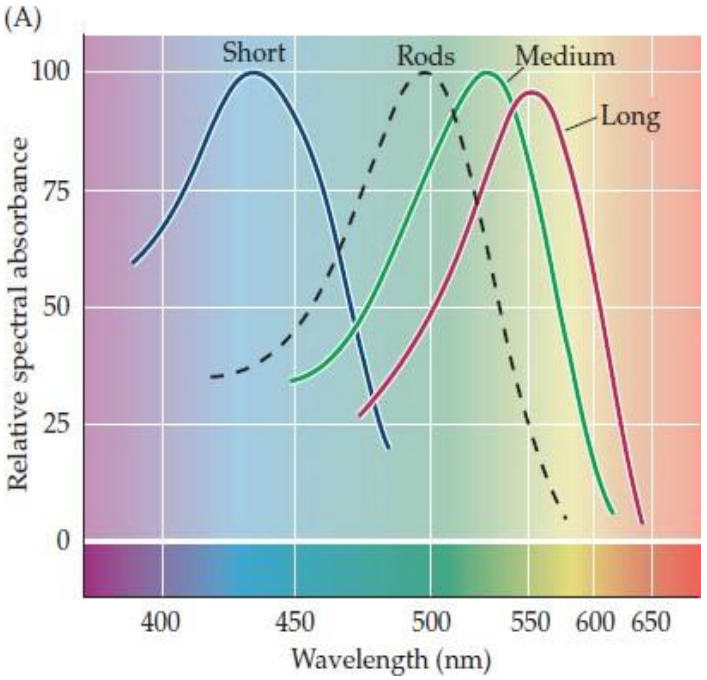
Colored vision





Cones pigments detecting color vision

1. Blue-sensitive, or short-wave, pigment, absorbs light maximally in the blue-violet portion of the spectrum (445n m).

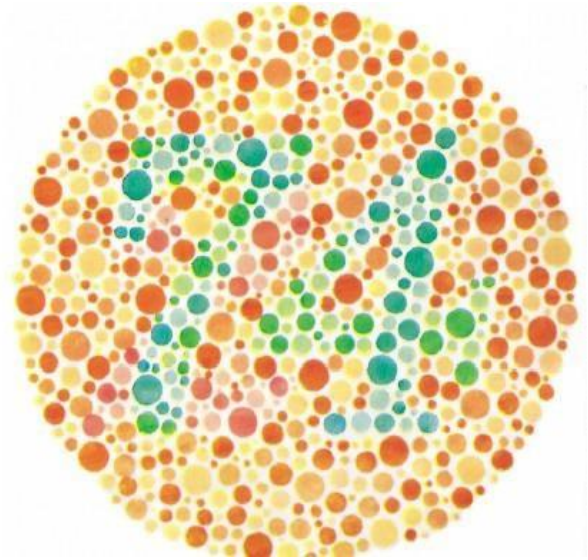
- 2. The green-sensitive, or middle-wave, pigment, absorbs maximally in the green portion (535nm).

3.the red-sensitive, or long-wave, pigment absorbs maximally in red de portion(570 nm).

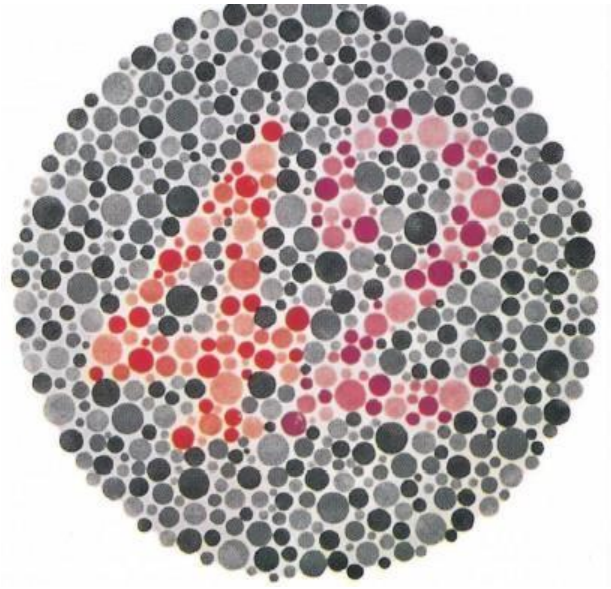
Rods (505 nanometers).

4.Blue, green, and red are the primary colors

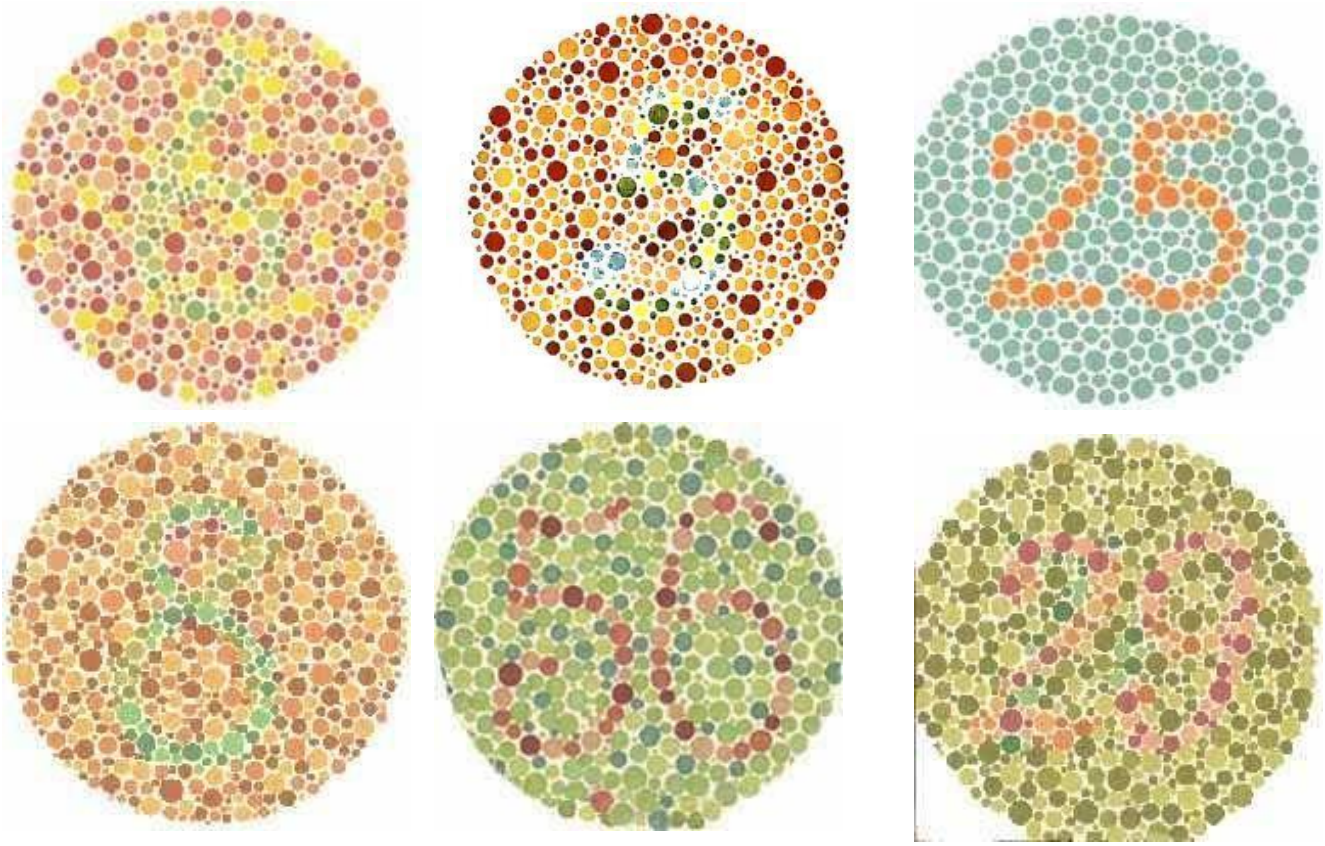
Ishihara charts



Normal read 74, Red- green read it 21

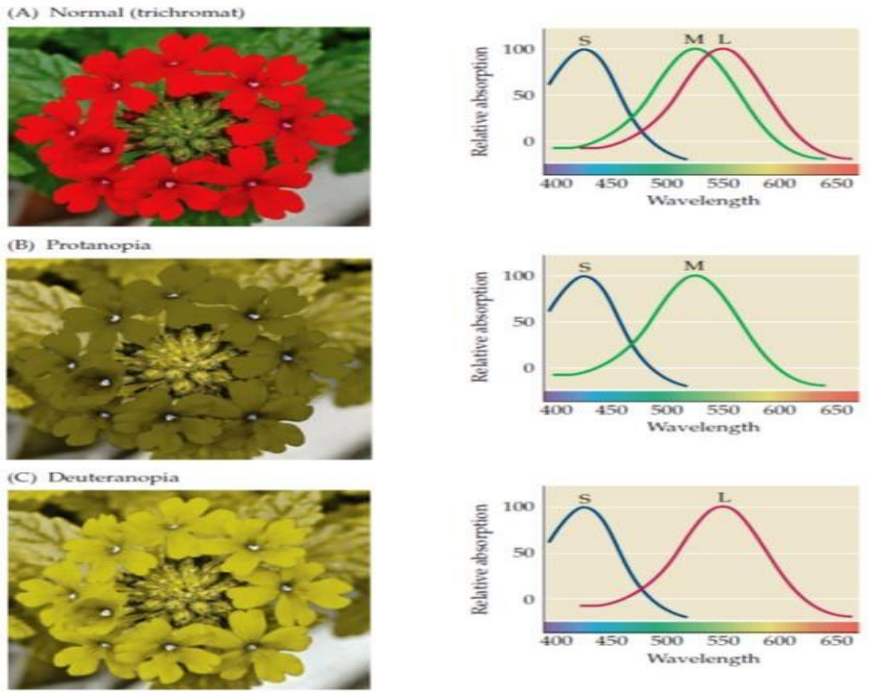


Normal read it 42, Red blind read 2, Green blind read it 4



Abnormalities Color blindness

Abnormalities of color vision. Simulation of the image of a flower as it would appear to (A)an observer with normal color vision (B)an observer with protanopia (loss of long-wavelength-sensitive cones); (C)an observer with deuteranopia loss of medium-wavelength- sensitive cones). The graphs show the corresponding absorption spectra of retinal cones in normal males and in males with defective color vision. (



Abnormalities of color vision

- Trichromats : Individuals with normal color vision are called
- The prefixes “prot-,” “deuter-,” and “trit-” refer to defects of the red, green, and blue cone systems
- Dichromats are individuals with only two cone systems; they may have protanopia, deuteranopia, or tritanopia.
- Monochromats have only one cone system.

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Color vision abnormalities

- Dichromats can match their color spectrum by mixing only two primary colors;
- monochromats match their color spectrum by varying the intensity of only one.
- most color blindness results from lack of the red or green
- Abnormal color vision is an inherited abnormality
- 8% of white males and 0.4% of white females
- genetic disorder passed along on the X chromosome

Anomalous trichromats

- .Color matching requires higher intensity is needed to evoke color vision .
- protanomalous require higher intensity for long-wavelength stimulation to make color matches trichromats
- deuteranomalous trichromats require higher intensity for medium-wavelength or short-wavelength (tritanomalous trichromats)
- tritanomalous trichromats) require higher intensity or short-wavelength stimulation.
- Anomalous trichromats may not be aware that they have a color vision deficiency and often pass as normal observers in everyday activities.

Abnormalities of color vision

- Females show a defect only when both X chromosomes contain the abnormal gene.
- women could be color blindness carriers
- Female children of a man with X-linked color blindness are carriers of color blindness and pass the defect on to half of their sons.
- X-linked color blindness skips generations and appears in males of every second generation.
- Color blindness can also occur in individuals with lesions of area V8 of the visual cortex since this region is uniquely concerned with color vision in humans.
- This deficit is called achromatopsia

Perimetry.

- Is used to diagnose blindness in specific portions of the retina,
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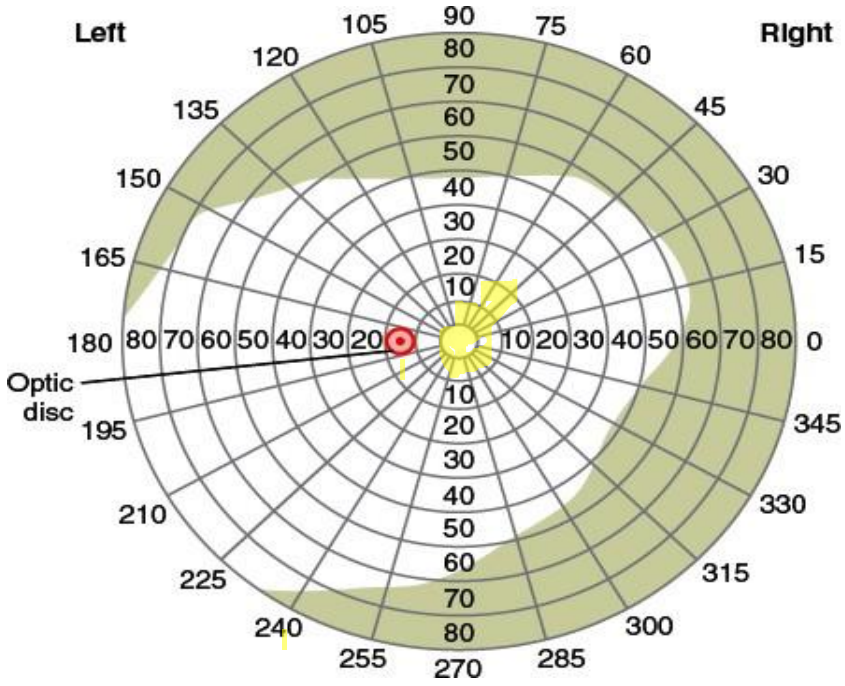
- Charting of the field of vision for each eye by a process called perimetry
- This charting is performed by having the subject look with one eye toward a central spot directly in front of the eye; the other eye is closed.
- A small dot of light or a small object is then moved back and forth in all areas of the field of vision, and the subject indicates when the spot of light or object can and cannot be seen

A perimetry chart showing the field of vision for the left eye. The red circle shows the blind spot.



Procedures for perimetry

1. Confrontation test
2. Manual Perimetry
3. Digital perimetry

Confrontation Testing

- The visual fields of both eyes overlap; therefore, each eye is tested independently.
- The patient should cover their right eye with their right hand (vice versa when testing the opposite eye).
- With the examiner seated directly across from the patient, the patient should direct their gaze to the corresponding eye of the examiner.
- The testing itself can be performed using stationary or moving targets (disk mounted on a stick or examiner's fingers).
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Confrontation Testing

- A moving target should start outside the usual 180 º visual field, then move slowly to a more central position until the patient confirms visualization of the target.
- To perform stationary testing, the examiner holds up a certain number of fingers peripherally, equidistant between the examiner and the patient.
- The patient is asked to correctly identify the number of fingers.
- All four quadrants (upper and lower, temporal and nasal) should be tested.
- Stationary targets are more precise because they present a finer stimulus to the retina and are less easily identifiable relative to a moving target.
- In addition, for unknown reasons, colored targets such as red or green discs are more sensitive in detecting deficits when compared to a white test object (cotton disc mounted on a stick).

Visual field determined by Automated perimetry