

**Vision**

**Accommodation &  
pupillary light reflex**

**By**

**Dr/Faten zakareia**



## VISUAL ACUITY

**-Definition :- DEGREE TO WHICH DETAILS OF OBJECTS ARE PERCIEVED**

**Visual threshold / is minimal amount of light that elicit sensation of light**

2 lines can be seen as 2 if a visual angle of about 1 minute between them

**-Snellen s chart to measure visual acuity**

Normal acuity = (  $d/D = \text{distance of Patient} / \text{distance of normal person} = 6/6$  )

A person of // 12/6 has better vision than normal vision (not hyperope)

A person of // 6/12 has less vision than normal vision

# DUPLICITY THEORY OF VISION (2 kinds of vision under diff conditions)

Q. Differentiate between cones & rods vision.

## 1-PHOTOPIC VISION (bright light vision)

- served by cones
- high visual acuity = colors & details
- low sensitivity to light = needs high visual threshold to be stimulated

## 2-SCOTOPIC VISION (night vision, dimlight vision)

- served by rods
- low visual acuity = no colors or details
- great sensitivity to light = low visual threshold

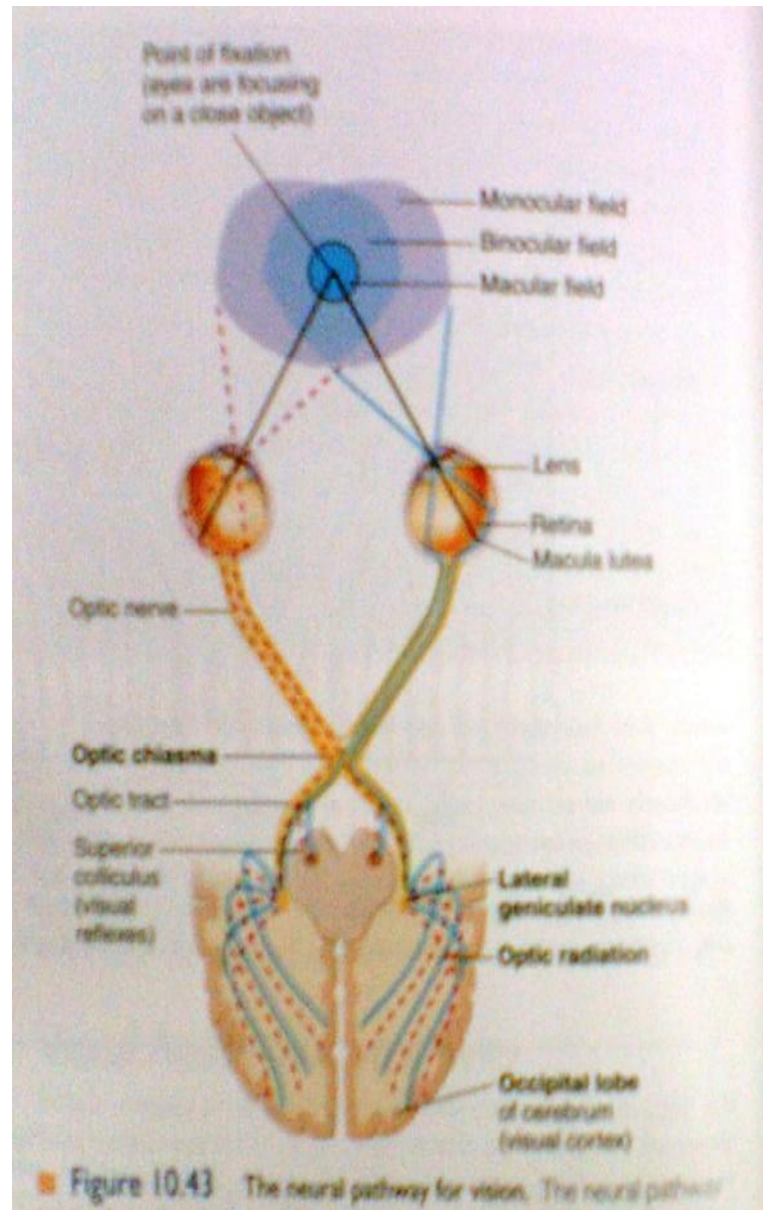
## VISUAL PATHWAY:-

- Cones & rods → bipolar cells → ganglion cells → optic nerve ( axons of ganglion cells) → optic chiasma → optic tract → lateral geniculate body in thalamus → axons of cells form geniculocalcarine tract → optic radiation → visual cortex in occipital cortex (Brodmann area 17 on sides of calcarine fissure)

**\* 1- some ganglion cells axons pass from optic tract to pretectal region of midbrain for pupillary reflexes & eye movement**

**\* 2- Some axons of ganglion cells from optic chiasma pass directly to hypothalamus for circadian rhythm (light-dark cycle)**

**\*3-Some axons from lateral geniculate body in thalamus to superior colliculus in midbrain for accommodation. R & its miosis component**



## **-VISUAL PATHWAY & FIELD :-**

- The nasal fibers (medial) cross to opposite side •**
- The temporal fibers (lateral) do not cross •**
- Nasal fibers conveys temporal field (outer)of vision •**
- Temporal fibers conveys nasal field ( inner)of vision •**

## **OPTIC TRACT :- •**

**includes temporal fibers of the same side i.e nasal •  
field of same eye (inner)+ nasal fibers of the  
opposite side i.e temporal field of other eye(outer)**

## exp//LEFT OPTIC TRACT:-

Conveys temporal fibers of the left eye  
+ nasal fibers of the right eye

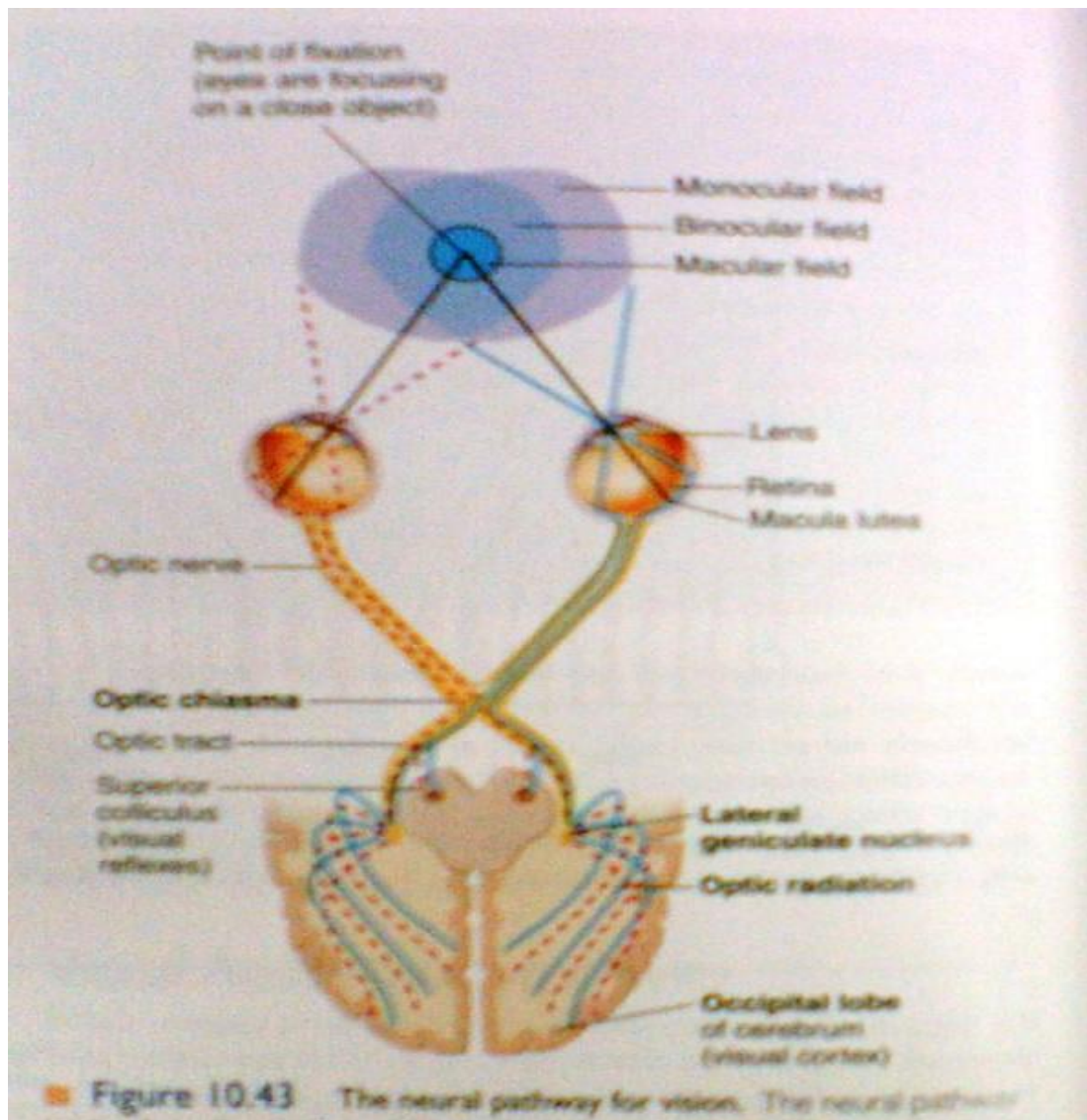
=(left nasal visual field(right half of visual field of left eye)+ right temporal visual field(right half of visual field of right eye), both form right half of visual field of both eyes.

N.B

-- The **left** optic tract corresponds to the **right**  $\frac{1}{2}$  of the visual field

--The **right** optic tract corresponds to the **left**  $\frac{1}{2}$  of the visual field





# Accommodation:-

At rest (looking at far objects):- -

Ciliary muscles are **relaxed + taut (tense)** -  
ligaments + **flat** lens

- looking at near objects:- from near (close) •  
objects parallel rays focus behind retina( if  
ciliary muscles remain  
relaxed)>>>>>>>>blurred vision

Solution is to increase curvature & refractive •  
power of lens by accommodation to bring  
focus on retina.

## Accommodation reflex:- •

- 
- Focusing at near object( **increased** anterior surface curvature of lens by ciliary muscles **contraction** , **slack = relaxed** ligaments, **increased** anterior surface curvature of lens . why?
  - -to add 12D to refractive power of lens. •
  - -both circular & longitudinal ciliary muscles contract to pull ciliary muscle forwards & inwards>>>>ciliary muscles edges come close to each other to **increase** anterior surface curvature of lens.
- **Test//sanson purkinje image** •

looking at a close object **(near response)** •

a- convergence. Why? •

b- pupil constriction. Why? •

c- Accomodation. Why? •

**Near point:-** •

Nearest point to eye at which object can brought •  
into focus on retina by **ACCOMODATION**

-10 years-----9 cm •

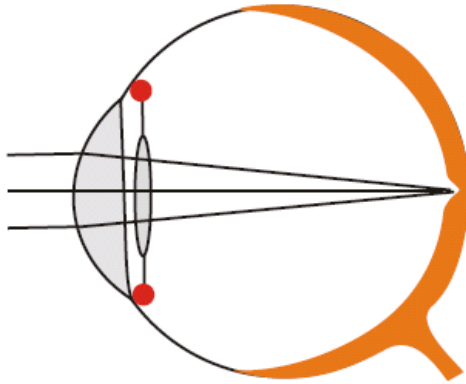
-At 60 years-----80-100 cm, due to hardness of lens & •  
loss of accomodation.

-(**presbyopia:-((triade)**) •

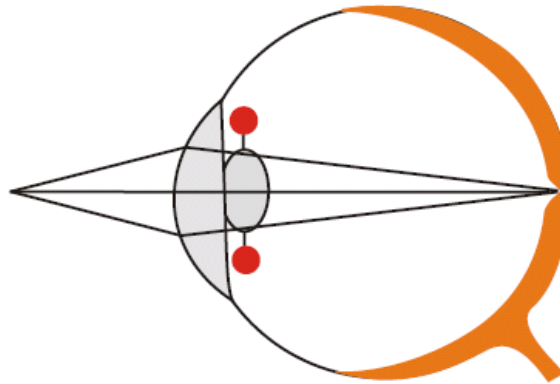
1-loss of accomodation      2-loss of lens elasticity •

3- near point receed •

-correction by **biconvex lens** •



When the ciliary muscles are **relaxed** the lens is flat and distant objects are focussed onto the retina



When the ciliary muscles are **contracted**, the lens becomes more round and a close object is focussed onto the retina

## Pathway of accommodation:- •

Light on eye>>>>>retina >>>>>optic •  
nerve >>>>>optic chiasma>>>>> optic  
tract->>>>> lateral geniculate body in  
thalamus & to superior colliculus in  
midbrain for->>>>>EWN>>>>> ciliary  
ganglion to oculomotor N>>>>>>ciliary  
body contraction ( accommodation. R) &  
miosis of near response

- this pathway of near response is •  
ventral to pupillary light reflex)

## Pupillary light reflex:-

Light on one eye pupil>>>>>constiction of this pupil (direct)

& the other pupil (indirect)

## Pathway of consensual Pupillary light reflex (indirect):-

Light on eye>>>>retina>>>optic nerve >>>optic chiasma>>>>optic tract>>>>pass through superior colliculus to end **in pretectal nucleus** >>>>>both oculomotor nerve nuclei (EWN)>>>>> both ciliary ganglia>>>>>supply both eyes by oculomotor nerves>>>>>>miosis in both eyes.

-Atropine drops:- block parasympathetic supply of oculomotor >>>>>>mydriasis

## **Q. Argyll Robertson pupil?**

**In syphilis tabes dorsalis which destroy pretectal nucleus**

**-light .R is lost & accommodation .R remains**

**because lesion is in pretectal nucleus •  
only, away from superior colliculus &  
fibers of accommodation.**



## Lateral geniculate body:- •

Thus **left LGB** (similar to left optic tract) has •  
all layers receive from **RIGHT ½ of visual**  
**field**

- **Right LGB** (similar to right optic tract) has •  
all layers receive from **LEFT ½ of visual field.**

## FUNCTION OF LGB:- •

1-acts as a relay station for visual information •  
from optic tract to cortex.

2-It has point to point transmission( spatial •  
fidelity)

3-Acts as gate controls signal transmission •  
to visual cortex i.e control how much signals  
reach visual cortex

4-color vision & detect shapes & texture •

NB/ it is rapidly conducting to visual cortex. •

visual cortex has 6 layers •

1-Primary visual cortex(Braodmann area 17):- perceive sensation of vision (movement + shapes+ stereoscopic vision + brightness) &has blobs for color detection

2-Association visual cortex(area 18&19):- interpretation of visual stimuli

*Thank you for  
listening*

