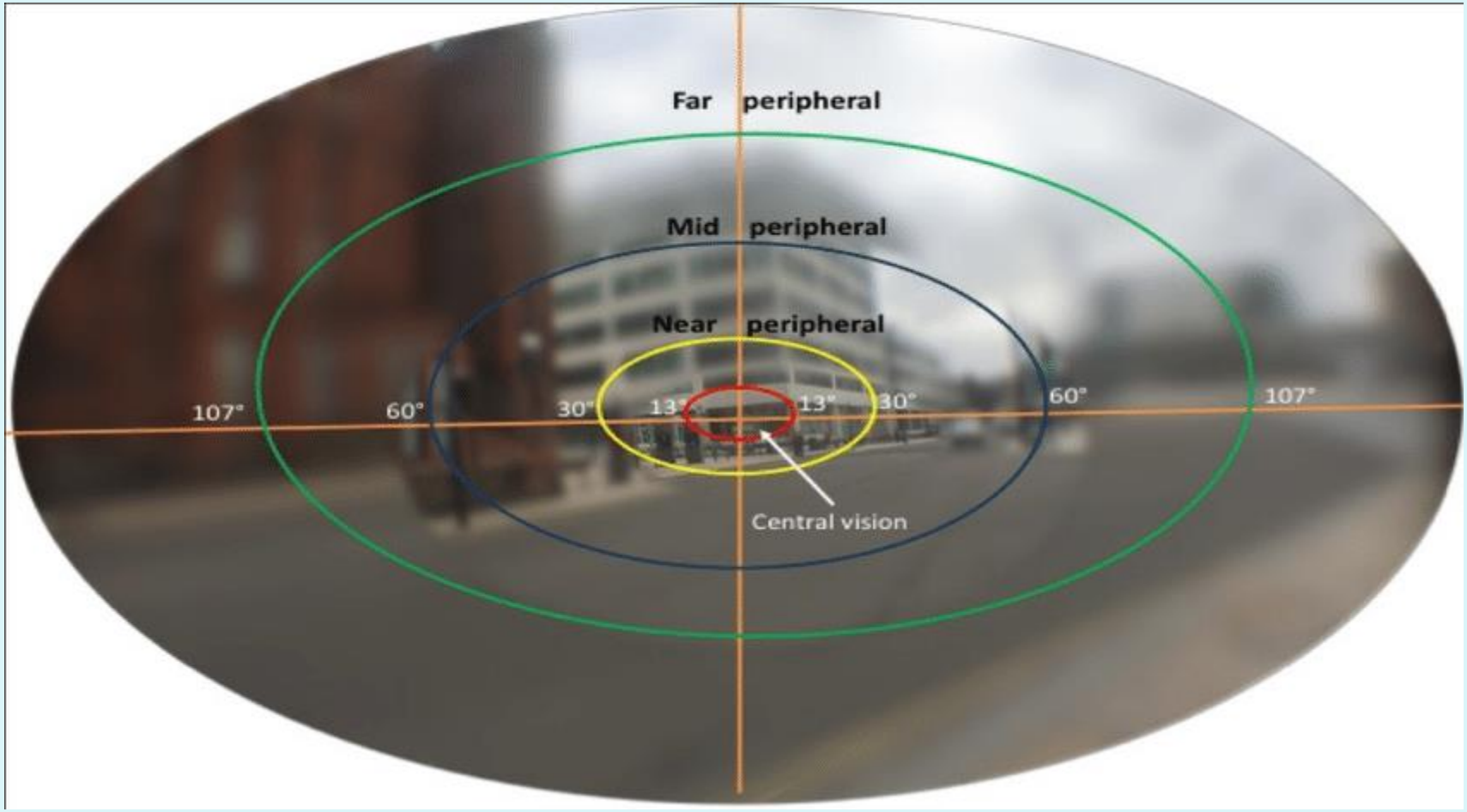

بسم الله الرحمن الرحيم


Far peripheral
Mid peripheral
Near peripheral
107°
60°
30°
13°
13°
30°
60°
107°
Central vision

FIELDS OF VISION

LECTURE 4

Dr Zubia Shah

Learning Objectives

By the end of the lecture the second year student should be able to

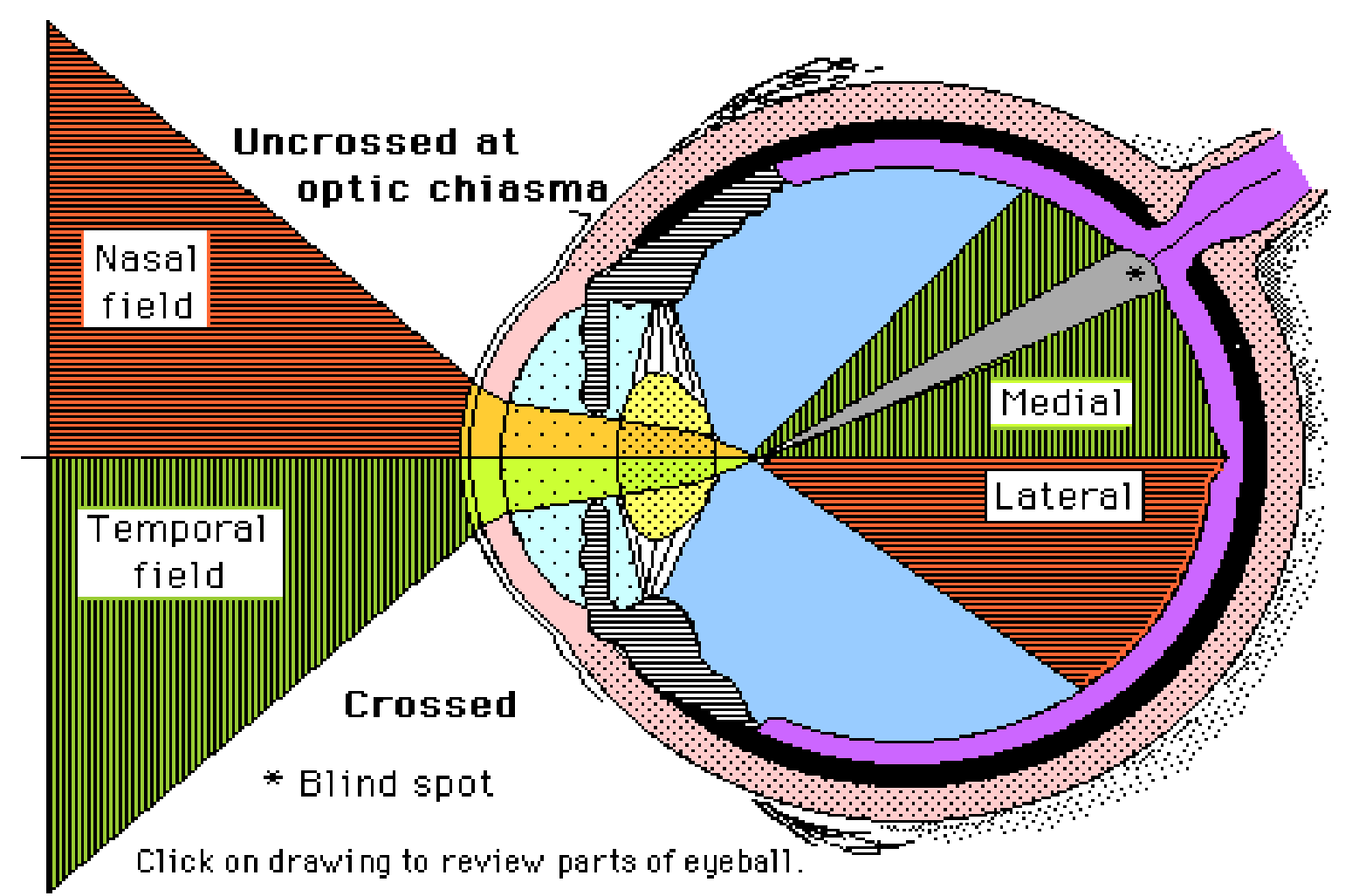
- Describe the fields of vision
- Define Perimetry
- Define scotomata
- Enumerate the causes of scotomata
- Describe visual pathway
- Describe the visual cortex
- Describe the visual field defects

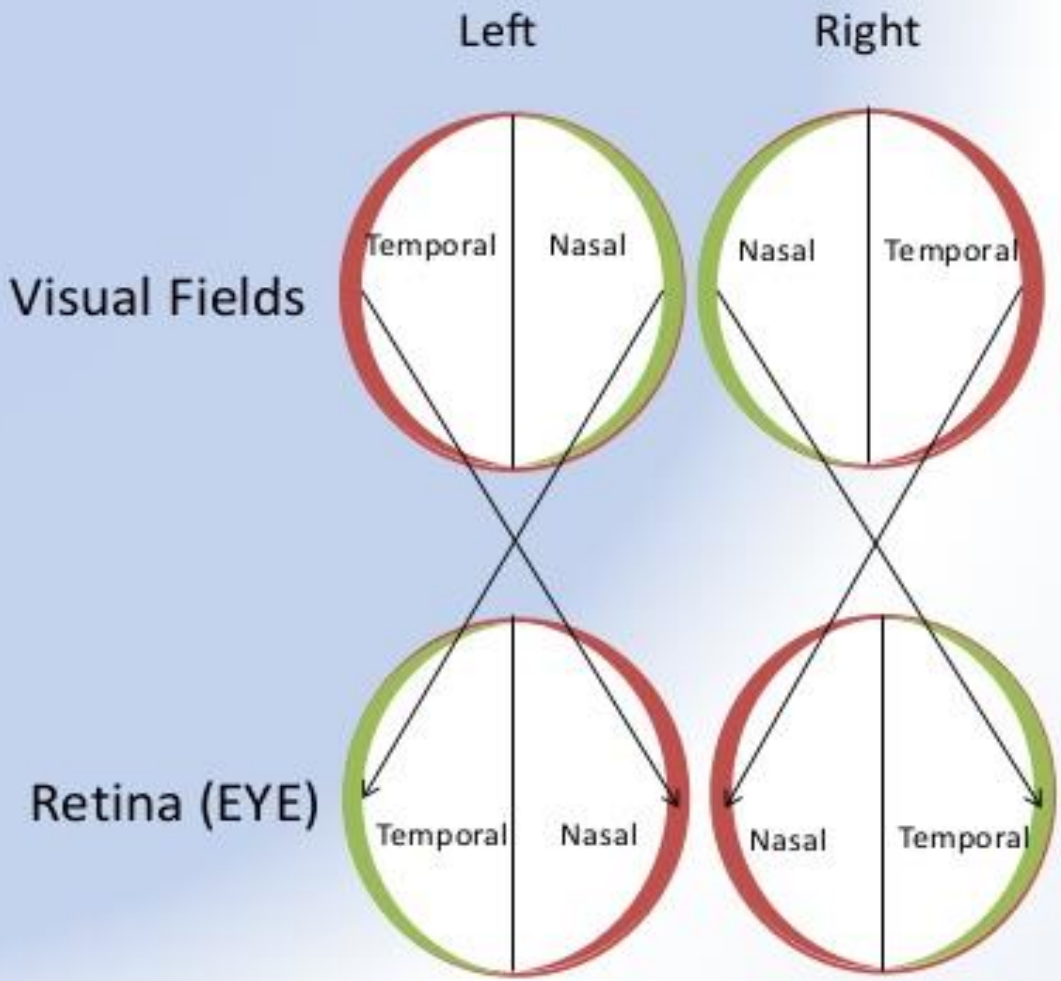
What is a field of vision?

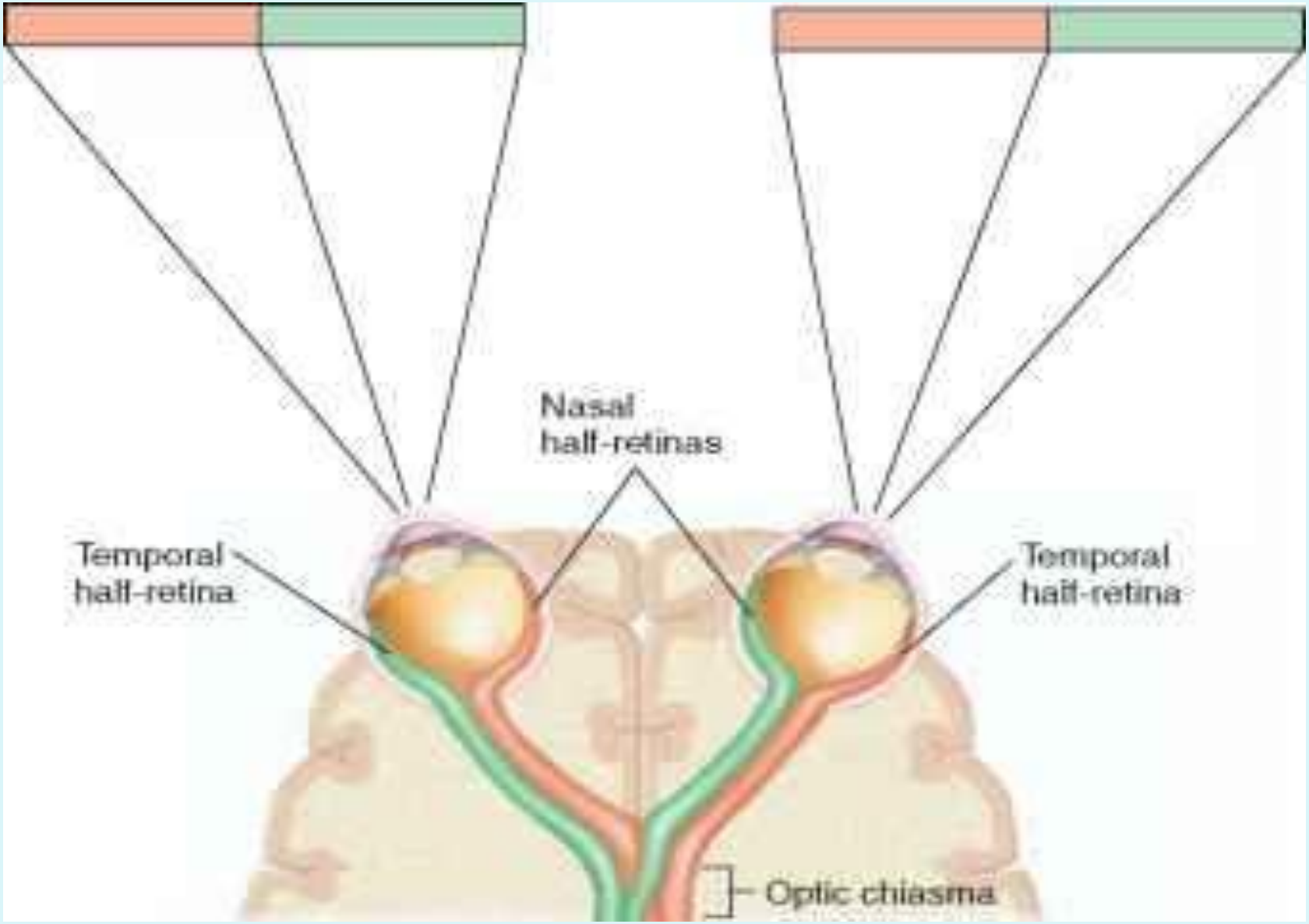
Definition Of Field Of Vision

- The visual area seen by an eye at a given instant
- Towards nasal side is Nasal Field of Vision
- To lateral side is the Temporal Field of Vision

Fields Of Vision




Left
Right
Visual Fields
Temporal
Nasal
Nasal
Temporal
Retina (EYE)
Temporal
Nasal
Nasal
Temporal


Nasal
half-retinas
Temporal
half-retina
Temporal
half-retina
Optic chiasma

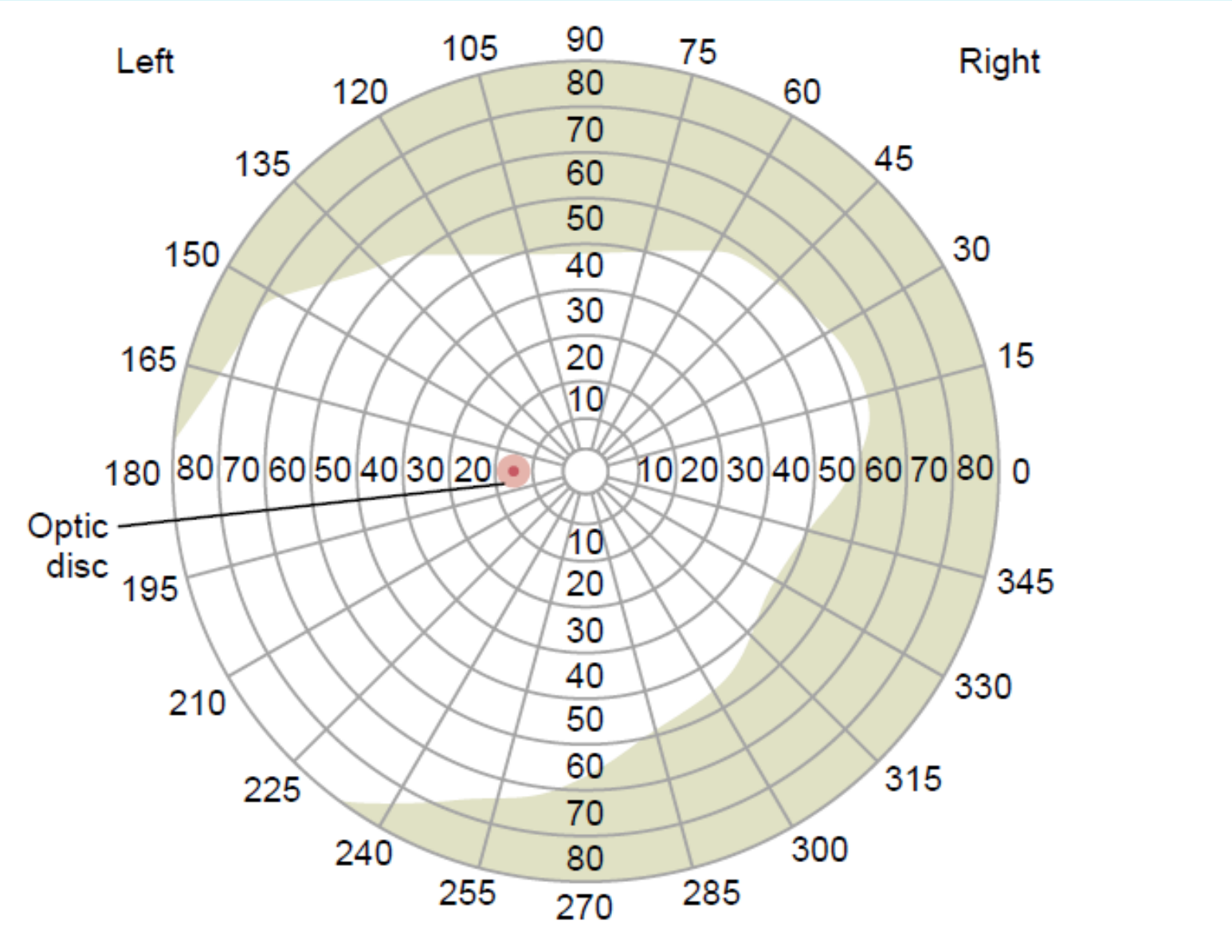
Perimeter

Perimetry

For diagnosis of blindness in specific parts of Retina, chart the field of vision for each eye

Physiological blind spot due to lack of rods and cones in optic disc is found 15 degrees lateral to central point of vision

Perimetry Chart



Scotomata In The Fields Of Vision

Blind spots found in the visual field other than the optic disc area → are called

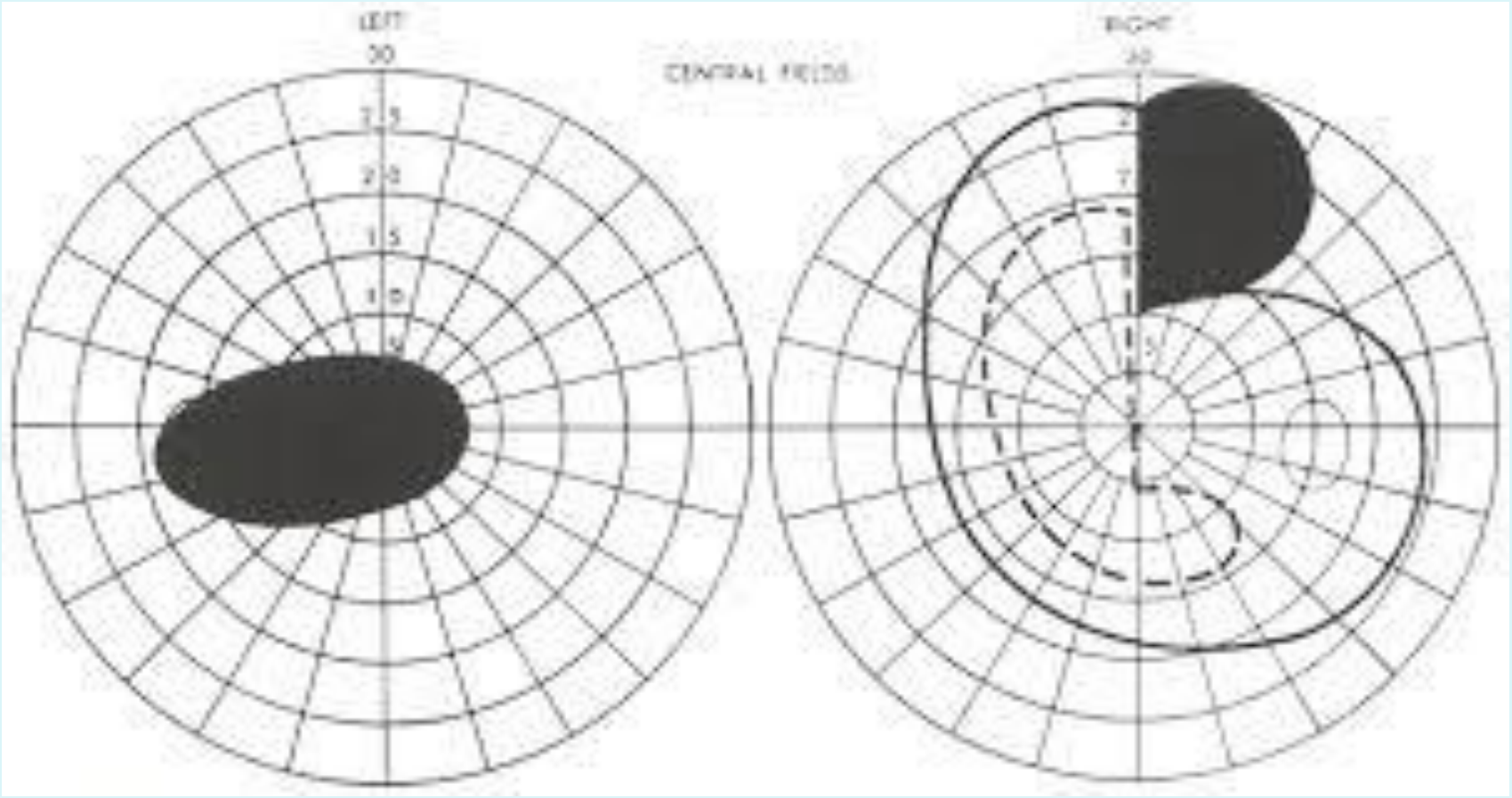
SCOTOMATA; caused by

i. **Glaucoma**

ii. **Allergic reactions** in the retina

iii. T**oxic conditions** such as lead poisoning or excessive use of tobacco

Scotomata



Scotomata

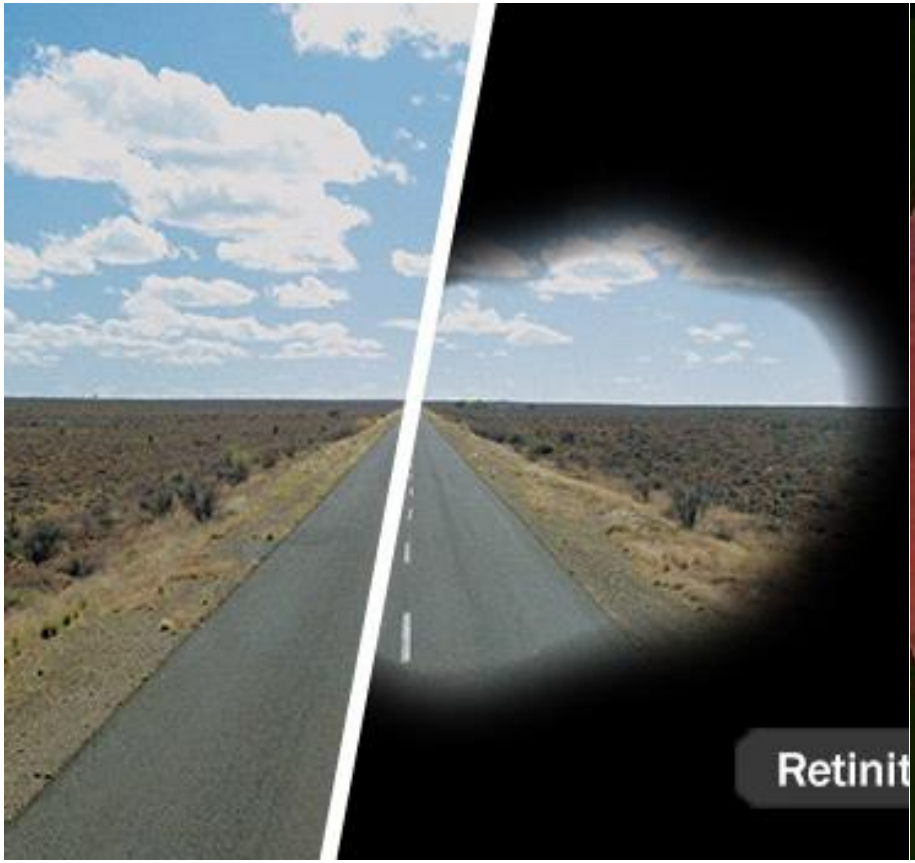
Retinitis Pigmentosa

Genetic Disorder

- Portions of the retina degenerate and excess melanin pigment deposits in these areas

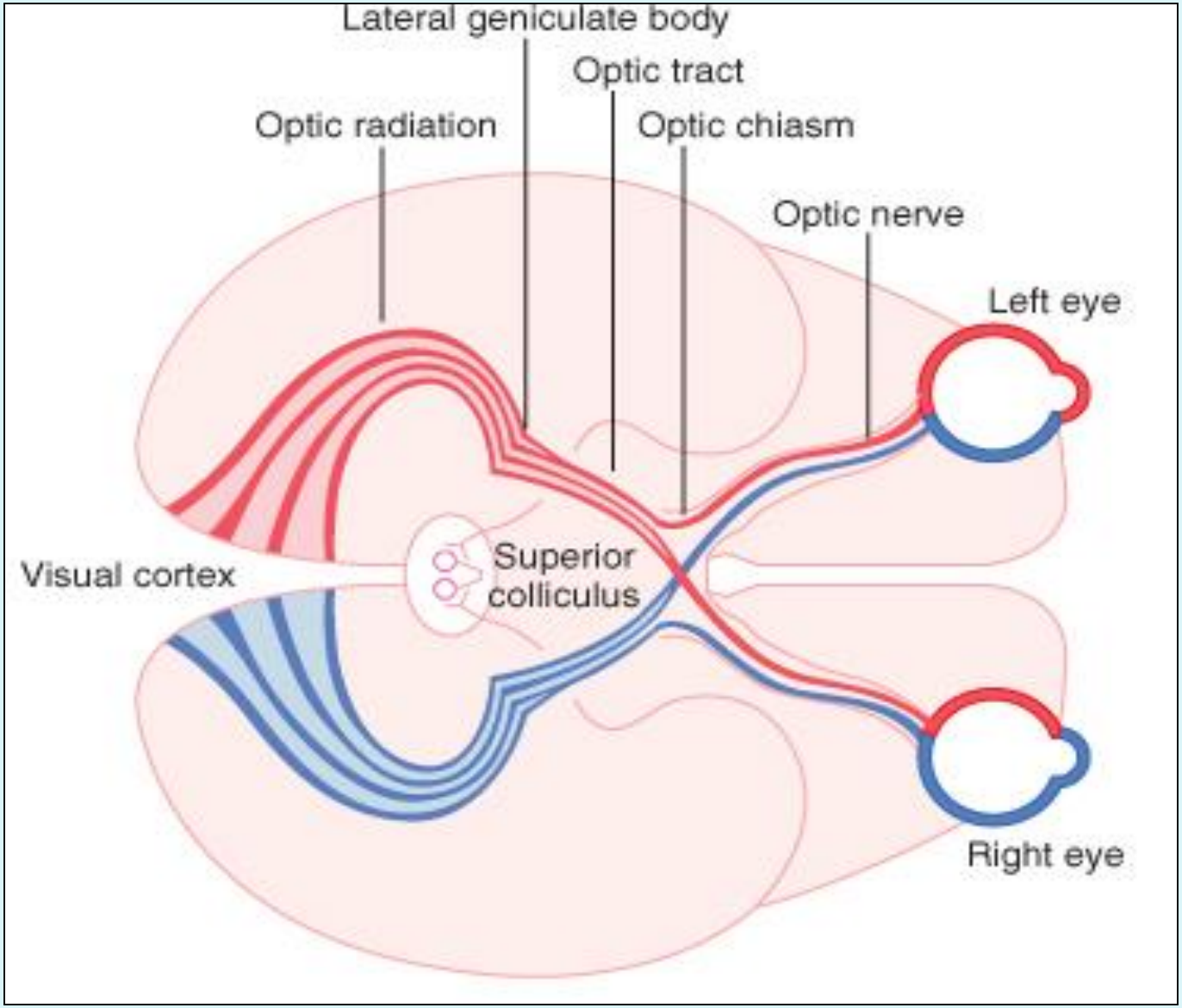
- Usually causes blindness in the peripheral field of vision first and then gradually encroaches on the central areas

Retinitis Pigmentosa



Visual Pathway

Visual Pathway



Visual Pathway

OPTIC NERVE

↓

OPTIC CHIASMA

↓

OPTIC TRACT

↓

LATERAL GENICULATE BODY(thalamus)

↓

OPTIC RADIATION (geniculocalcarine fibers)

↓

VISUAL CORTEX

Visual Fibres To Other Areas Of Brain

Suprachiasmatic nucleus

of hypothalamus to control **circadian rhythm**

Pretectal nuclei in the midbrain

reflex movements of the eyes and **pupillary light reflex**

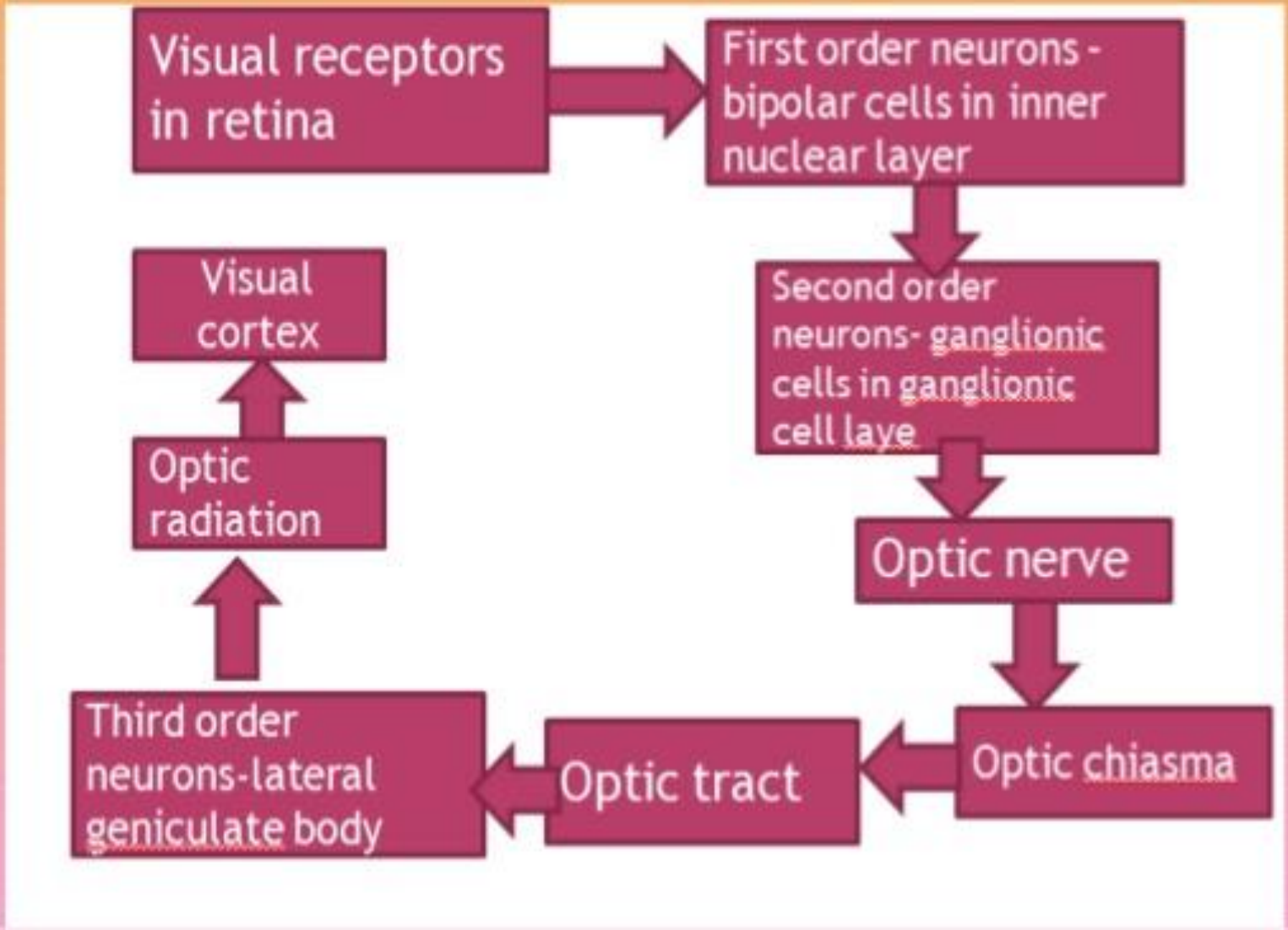
Superior Colliculus

to control rapid **directional movements** of two eyes

Ventral lateral geniculate nucleus

of thalamus and basal regions of brain for some of the body's behavioural functions

Schematic representation of visual pathways



Function of Dorsal Lateral Geniculate Nucleus Of Thalamus

Accurate Visual information to visual cortex via optic radiation and signals from two eyes are **Kept Apart** in the dorsal lateral geniculate nucleus

major function is to **"GATE"** the transmission of signals to the visual cortex

Dorsal lateral geniculate….

composed of 6 nuclear layers

Layers II, III and V receive signals from **lateral** half of ipsilateral retina

Layers I, IV and VI receive signals from **medial** half of the retina of opposite eye

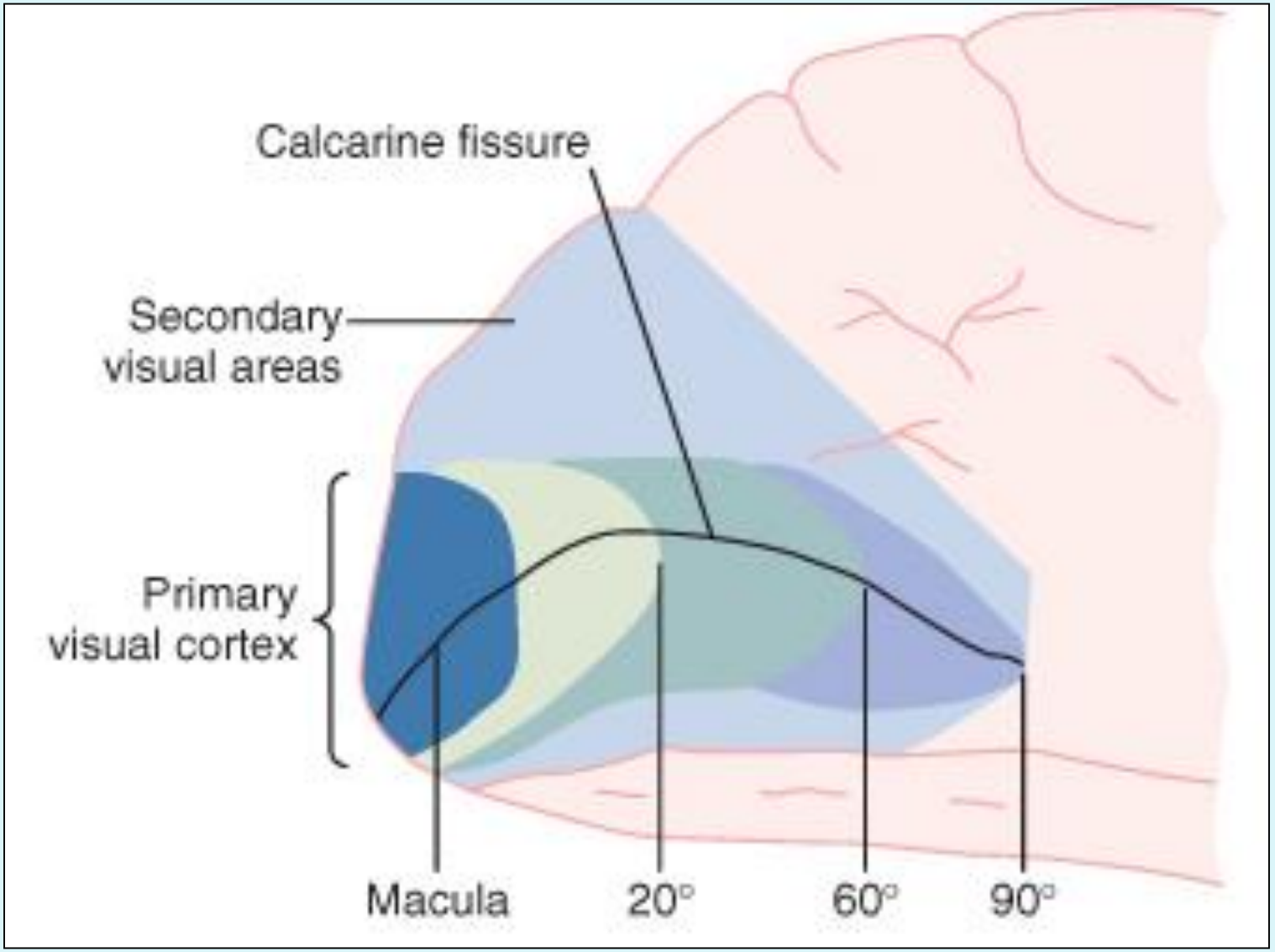
and parallel transmission is preserved all the way to the visual cortex

Magnocellular And Parvocellular Zones Of DLGN

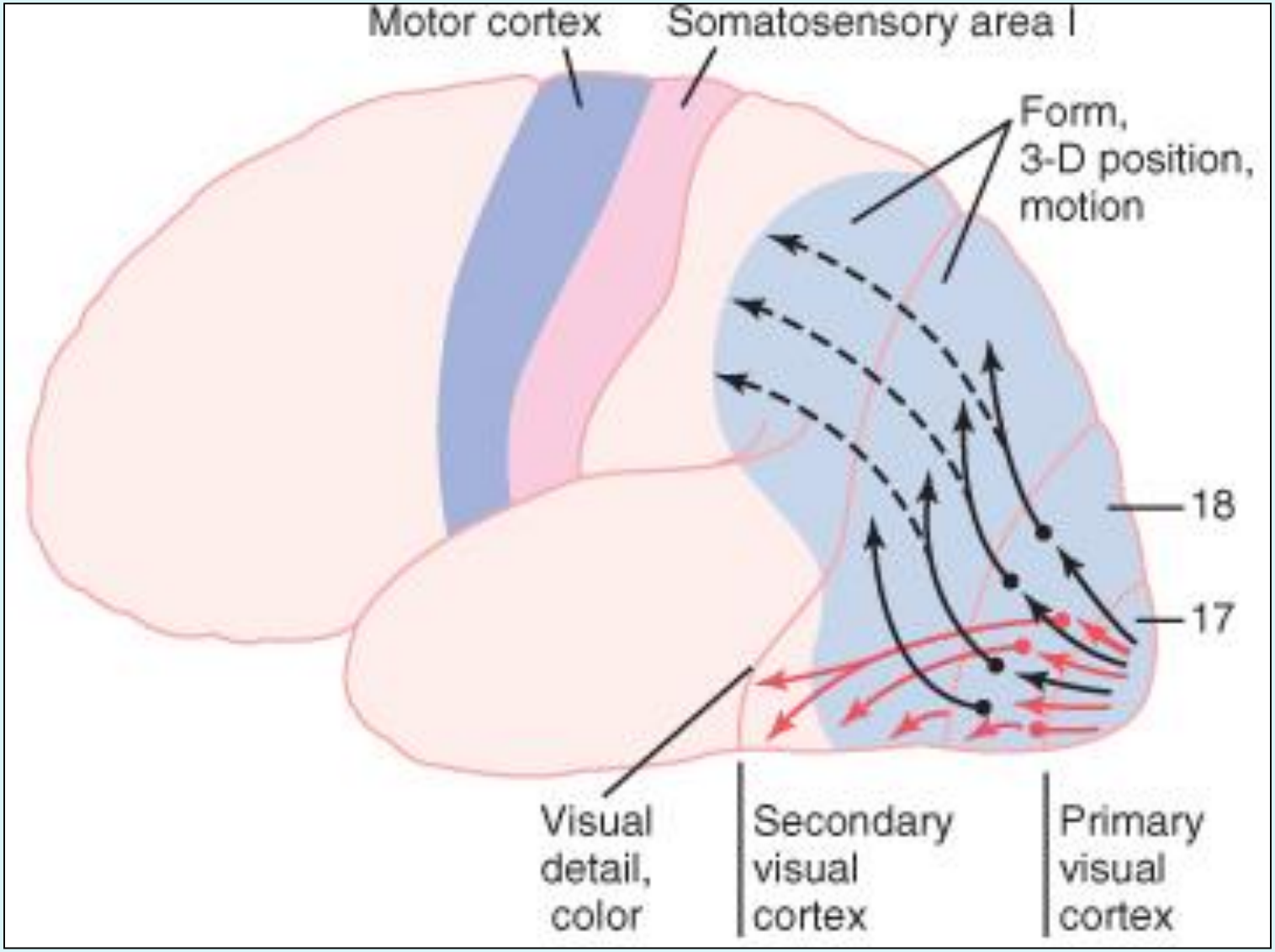
Layers I and II → **Magnocellular** (large) → a **rapidly** conducting pathway to visual cortex → transmit only **black-and-white information**

Layer III through VI → **Parvocellular** (small to medium-sized) → transmit **colour and exact point to point transmission** at **moderate velocity**

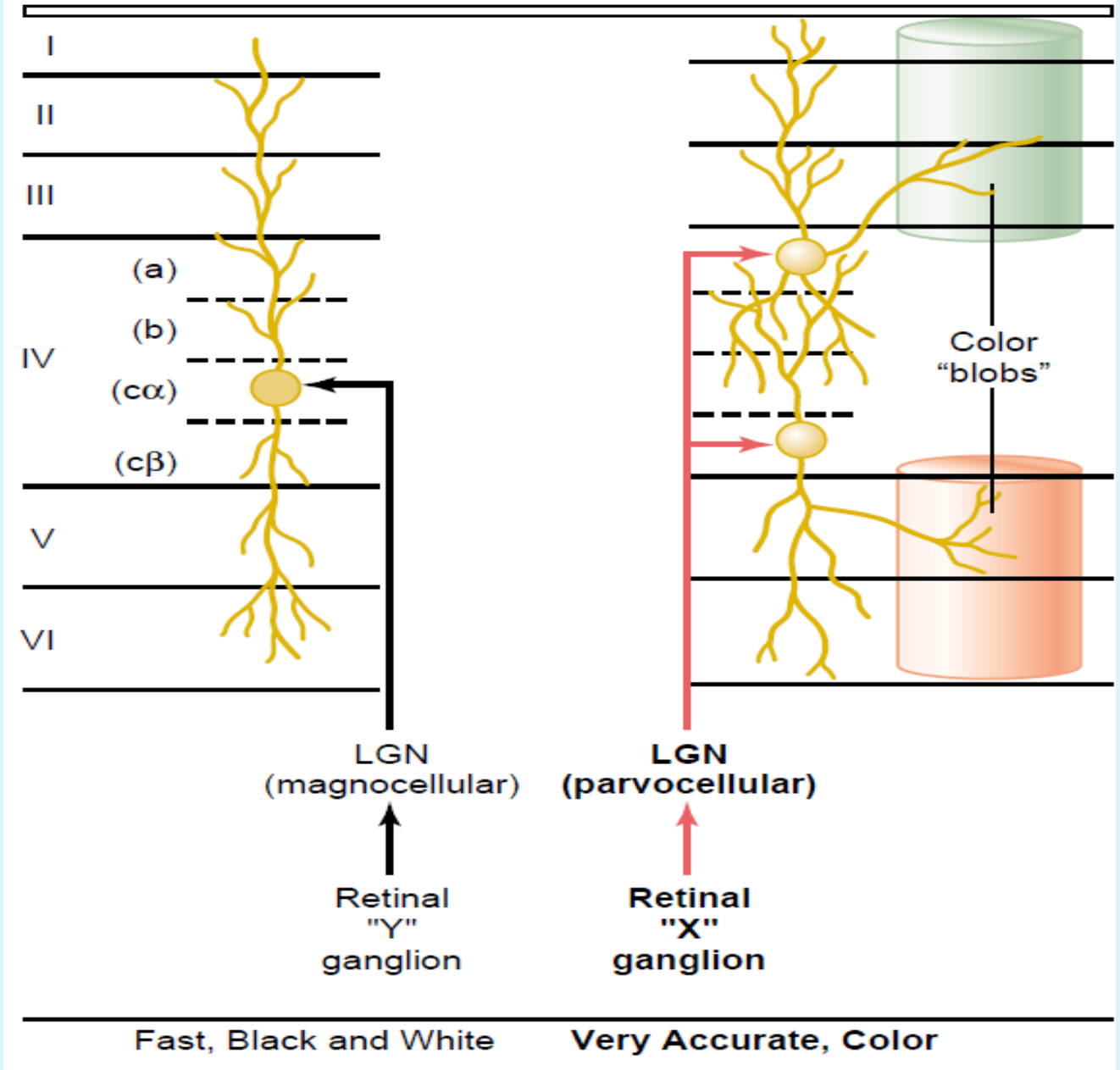
Visual Cortex



Analysis of Visual Information



6 Layers of Primary Visual Cortex



Layered Structure Of Primary Visual Cortex

- Visual signals from the two separate eyes remain separated from each other when they arrive in **layer IV of the primary visual cortex**

- **Information is deciphered and adjusted so that images of 2 eyes will fuse with each other**

Major Pathways For Analysis Of Visual Information

Two major pathways for analysis of visual information

- **The Fast "Position" and "Motion" Pathway**

black and white image

- **The Accurate Color Pathway**

Color vision, reading, recognizing letters, texture..

Cells in Layer IV of Visual Cortex

- **Simple cells →**

detect orientation of lines and borders, respond best to bars of light with correct position

- **Complex cells →**

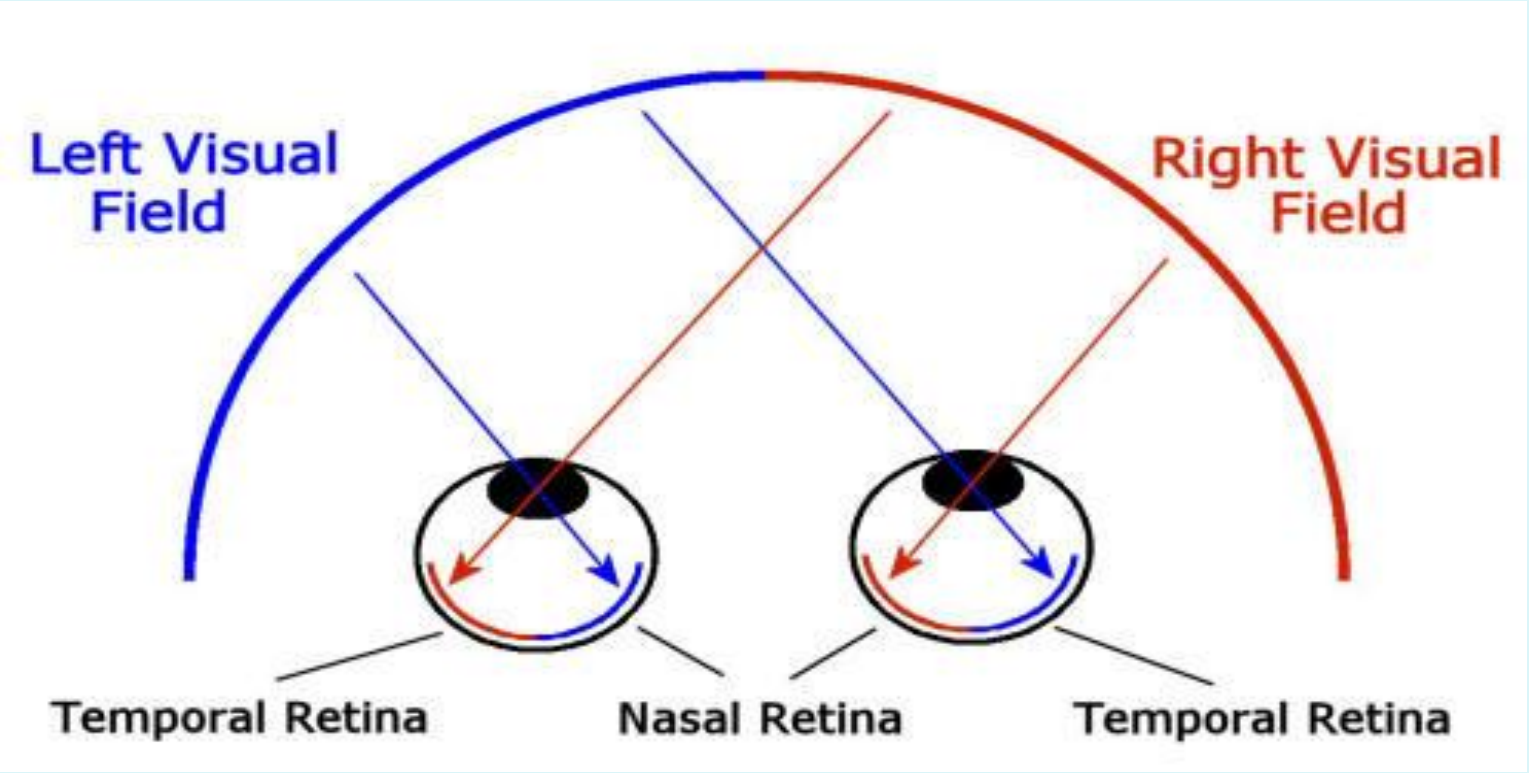
respond best to moving bars or edges of light

- **Hypercomplex cells →**

respond best to lines with a particular length, curves and angles

Effect of Removing the Primary Visual Cortex

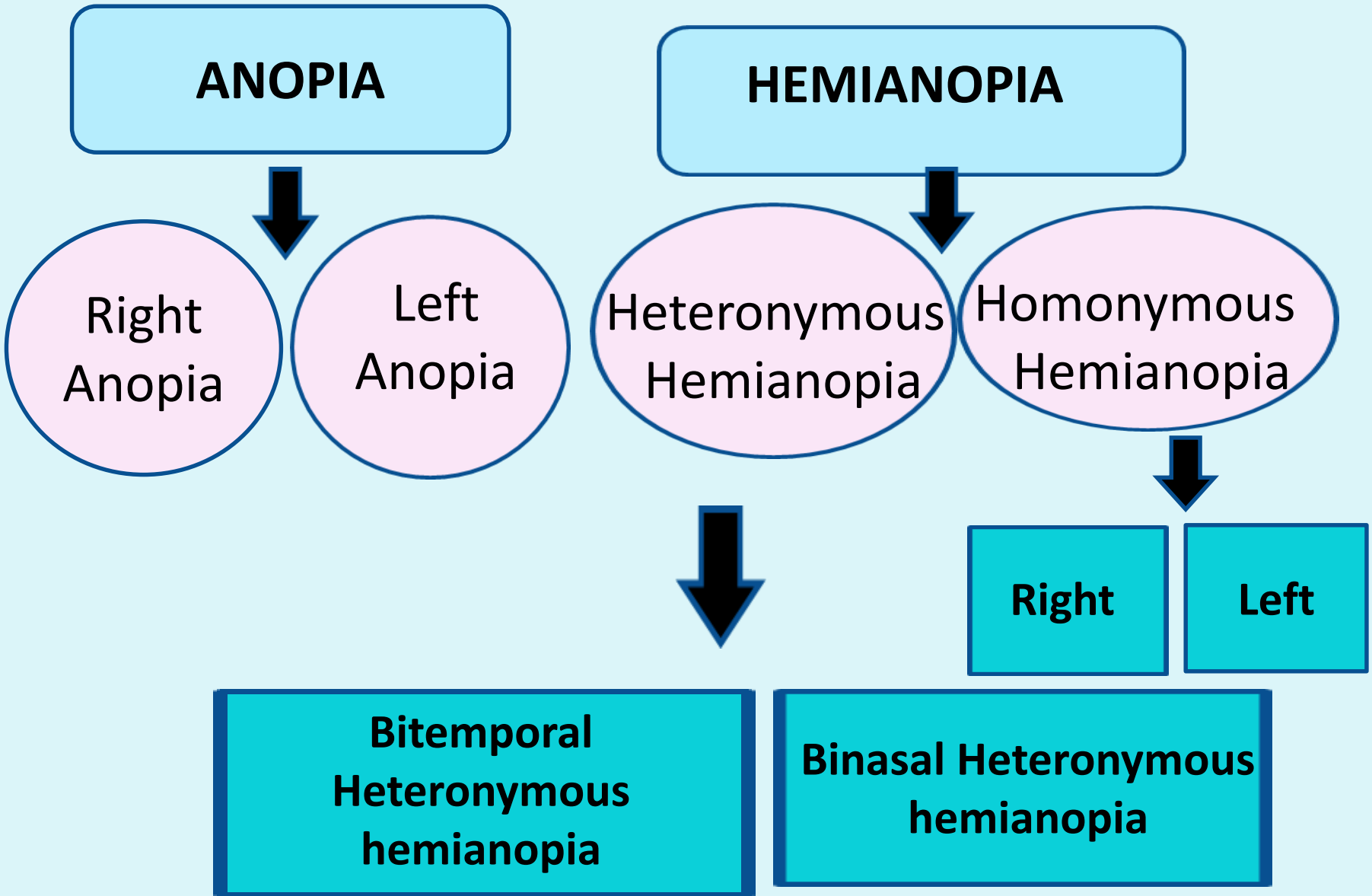
Removal of the primary visual cortex in the human being causes loss of conscious vision → **Blindness**


Left Visual Field
Right Visual Field
Temporal Retina
Nasal Retina
Temporal Retina

Visual Field Defects

- Anopia → complete blindness
- Hemianopia → blindness in half of visual field
- Homonymous → same side
- Heteronymous → opposite sides

Visual Field Defects



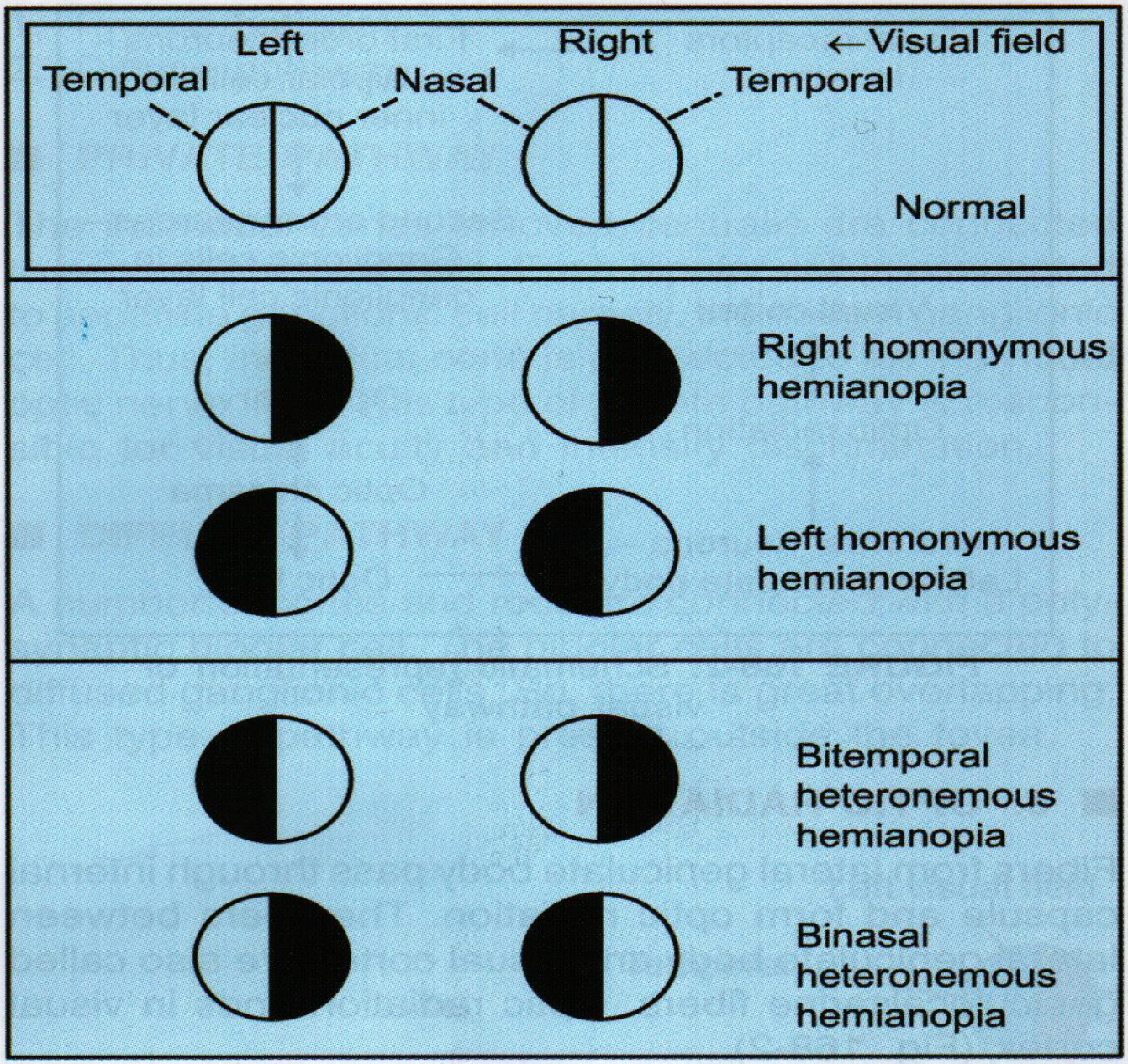
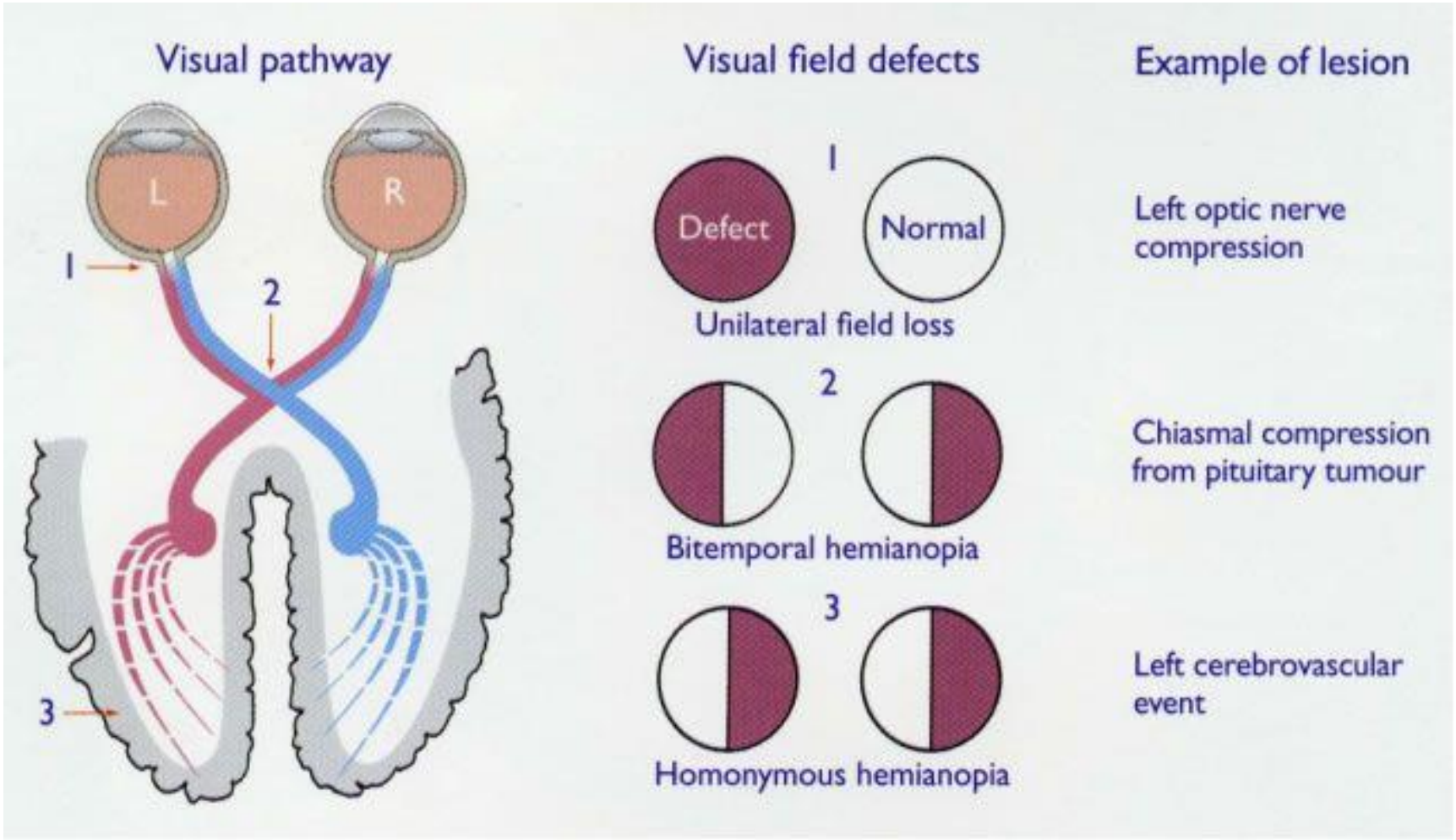


FIGURE 168-3: Types of hemianopia

‘Doc, Part of My Vision Is Gone!’


Visual pathway
L
R
1
2
3
Visual field defects
1
Defect
Normal
Unilateral field loss
2
Bitemporal hemianopia
3
Homonymous hemianopia
Example of lesion
Left optic nerve compression
Chiasmal compression from pituitary tumour
Left cerebrovascular event

Effects Of Lesions Of Optic Pathway

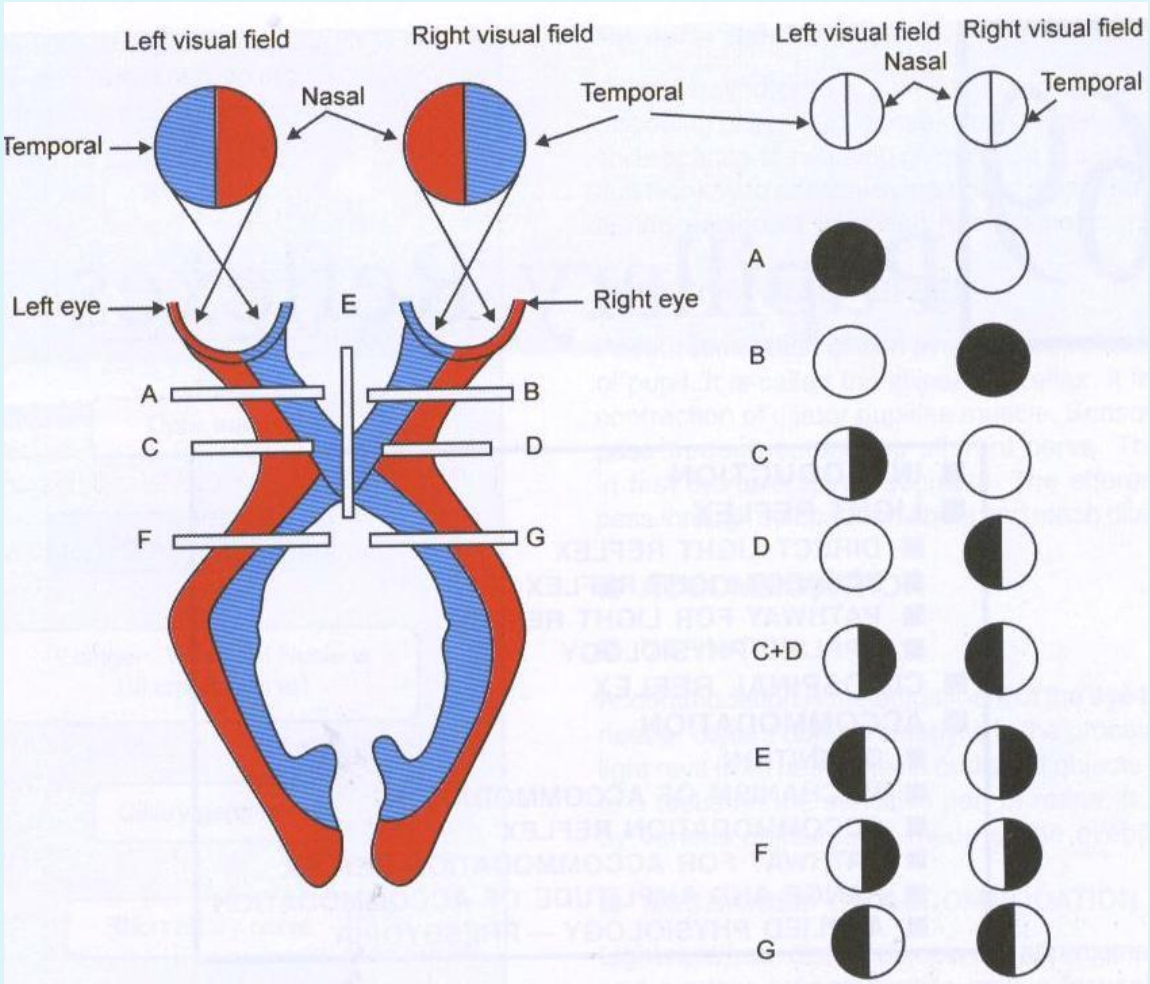
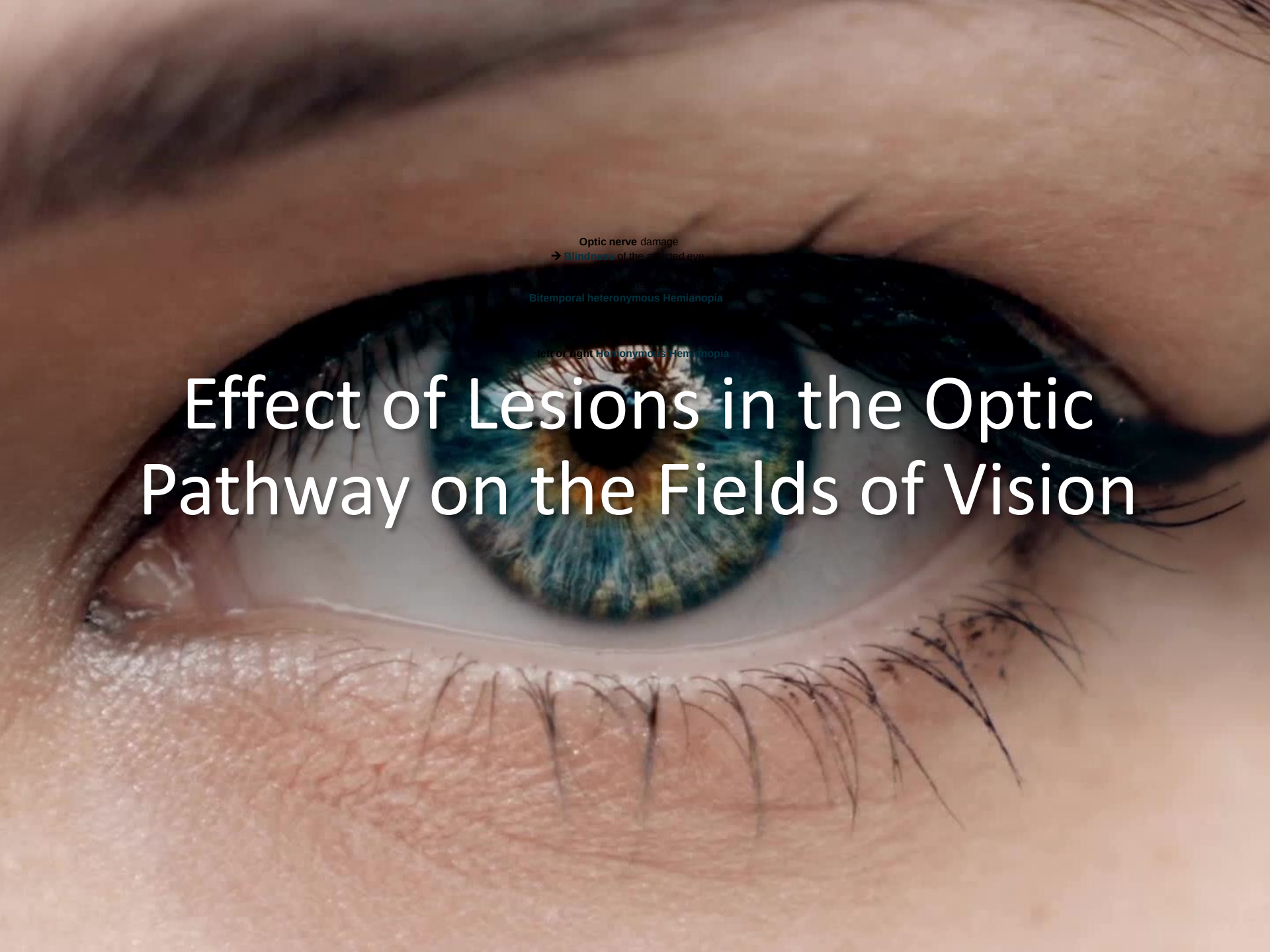


FIGURE 168-4: Effects of lesions of optic pathway. Dark shade in circles indicates blindness

A. Lesion of left optic nerve—Total blindness of left eye
B. Lesion of right optic nerve—Total blindness of right eye
C. Lesion of lateral fibers in left side of optic chiasma—Left nasal hemianopia
D. Lesion of lateral fibers in right side of optic chiasma—Right nasal hemianopia
C + D. Lesion of lateral fibers in both sides of optic chiasma—Binasal hemianopia
E. Lesion of medial fibers in optic chiasma—Bitemporal hemianopia
F. Lesion of left optic radiation—Right homonymous hemianopia
G. Lesion of right optic radiation—Left homonymous hemianopia



Effect of Lesions in the Optic Pathway on the Fields of Vision

Effect of Lesions in the Optic Pathway on the Fields of Vision

Optic nerve damage

→ **Blindness** of the affected eye

Optic Chiasma → person is blind in the temporal field of vision for each eye –

Bitemporal heteronymous Hemianopia

Optic tract lesion →

left or right Homonymous Hemianopia

Normal vision

Bitemporal Hemianopia

Binasal Hemianopia

Homonymous Hemianopia

Campo visual
normal

Hemianopsia
homónima

Hemianopsia
biterminal

Hemianopsia
homónima II

What is Hemianopia?

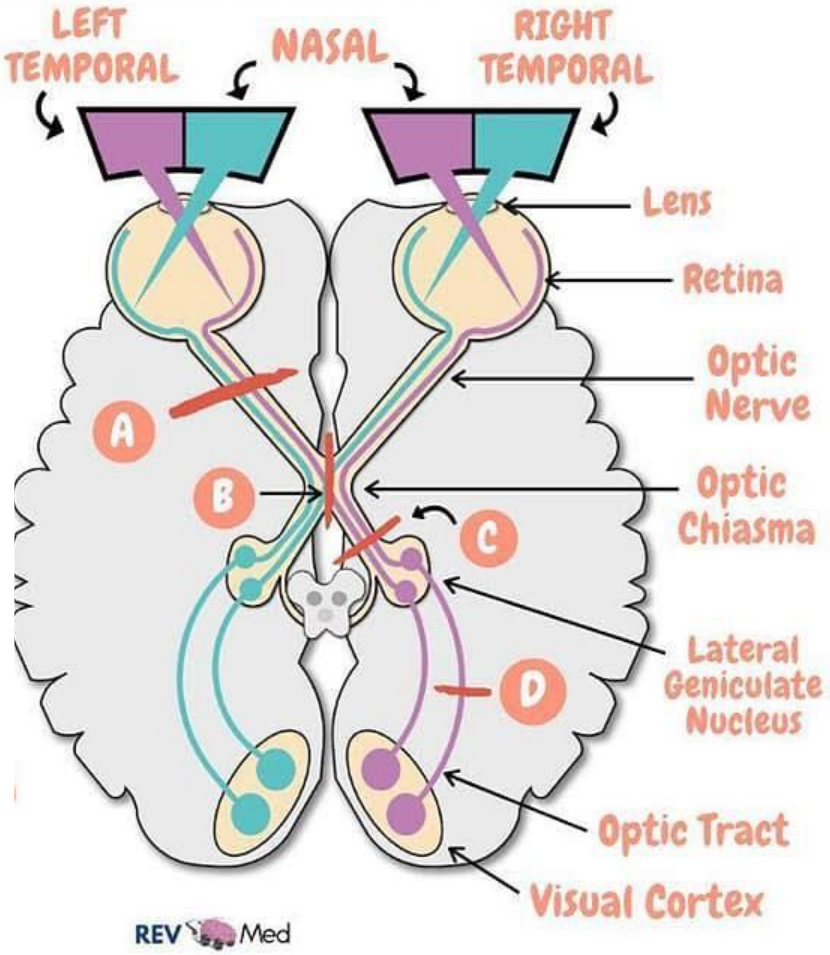
It is a visual disorder in which half of the visual field is affected and the person is able to see only half the things in his visual field and has complete blindness or decreased vision in the other half.

Right Side Homonymous Hemianopsia (Hemianopia)

For More Information:
Visit: www.epainassist.com

VISUAL PATHWAY

LESIONS



A

B

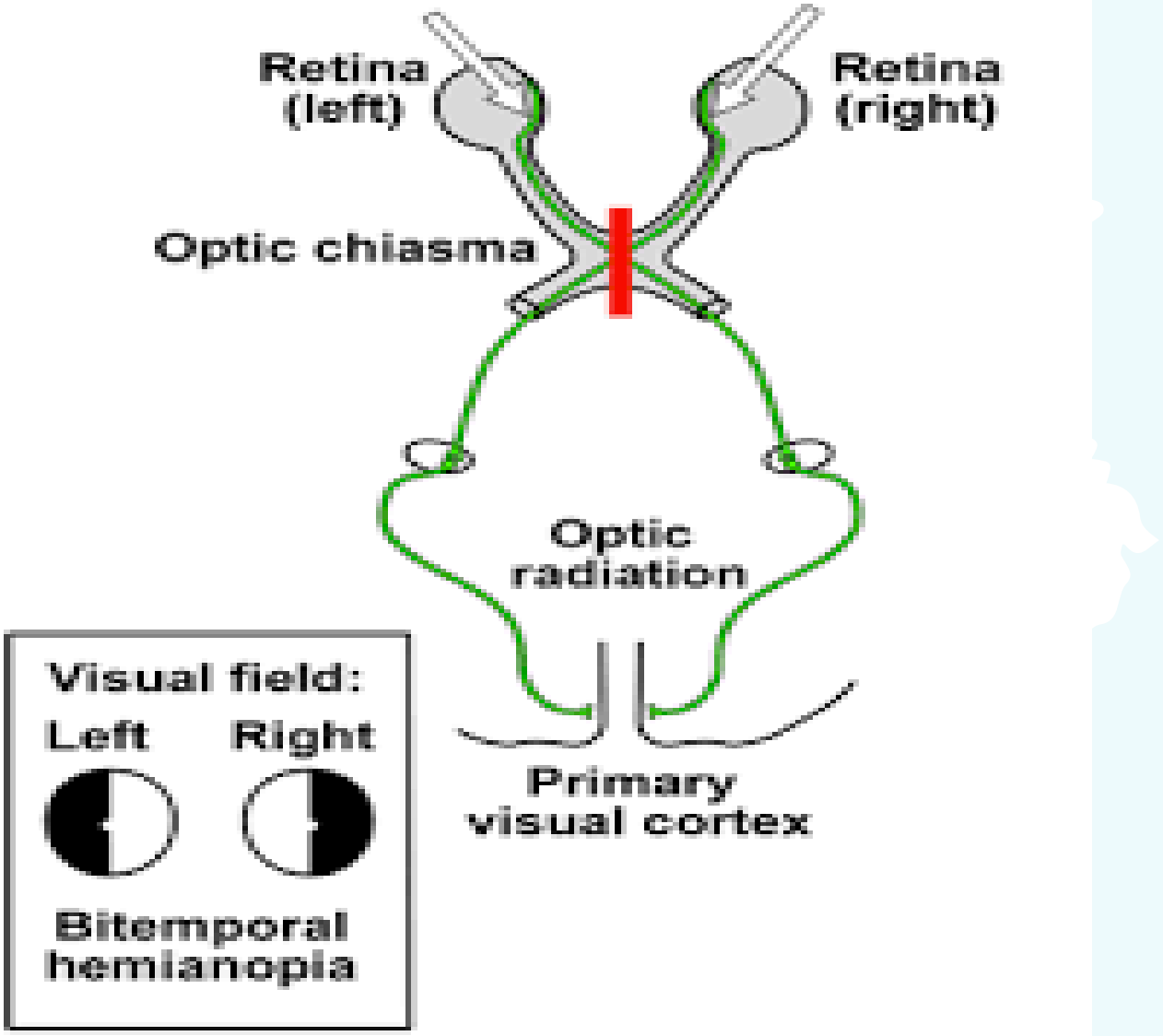
C

D

REV Med

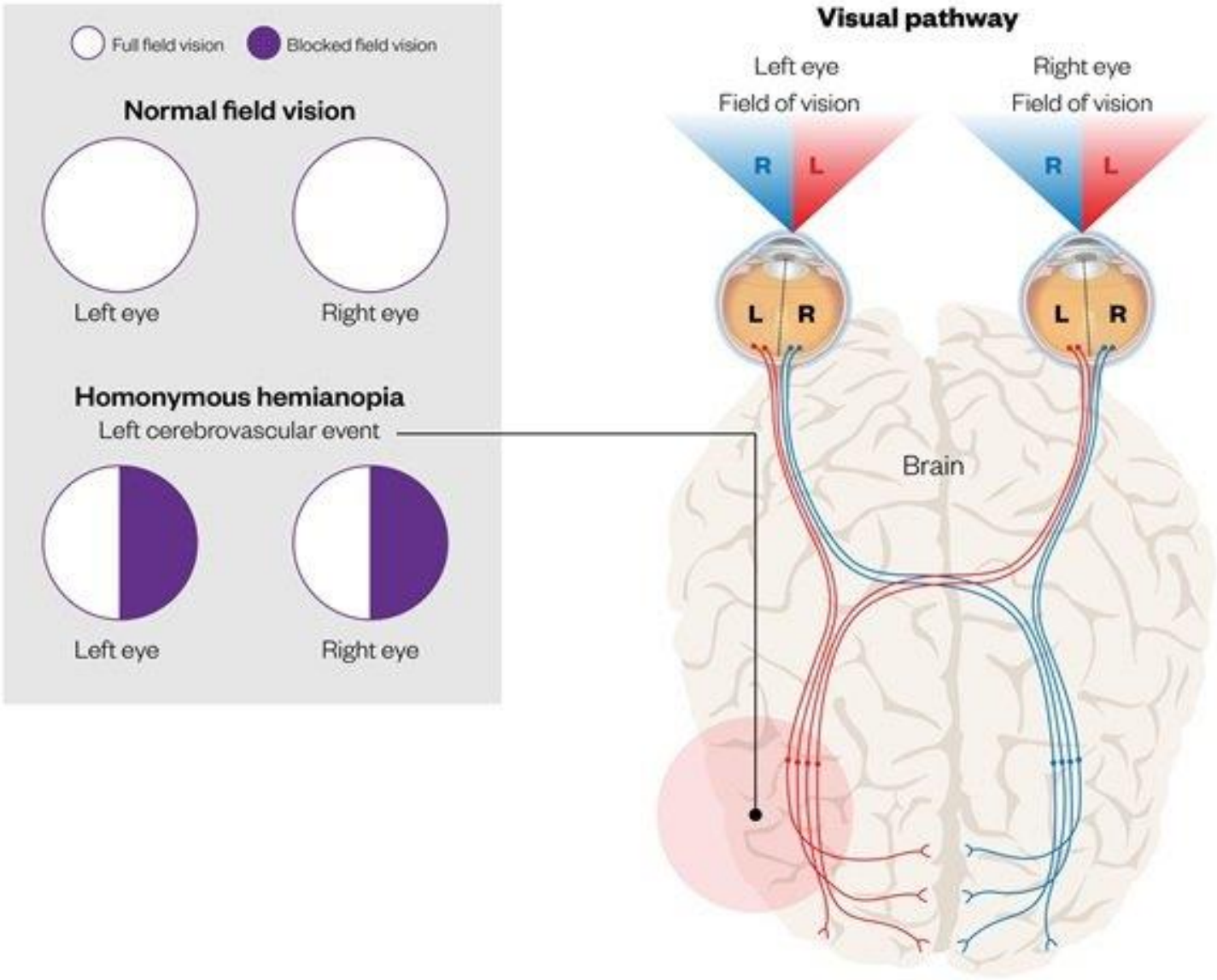
A 29 year old woman who complains of slowly progressive loss of vision in right side of both eyes is seen by a neurologist. A CT scan demonstrates a high density space occupying lesion producing the visual field defect by compressing the

A. left optic nerve
B. right lateral geniculate nucleus
C. right visual cortex
D. optic chiasma
E. left optic tract


Retina (left)
Retina (right)
Optic chiasma
Optic radiation
Primary visual cortex
Visual field:
Left
Right
Bitemporal hemianopia

A female with brain tumour presents with loss of vision in temporal fields of both eyes. Site of lesion is

A. optic nerve
B. optic chiasma
C. optic tract
D. visual cortex
E. visual association area


Full field vision
Blocked field vision
Normal field vision
Left eye
Right eye
Homonymous hemianopia
Left cerebrovascular event
Left eye
Right eye
Visual pathway
Left eye
Field of vision
Right eye
Field of vision
R
L
R
L
L
R
L
R
Brain

References

- Guyton and Hall Physiology 13th edition
- Sherwood Physiology
- Ganong's Physiology
- Ophthalmologynotes/photos/pcb.2022193751225844/2022193717892514


THANK YOU.