

Exercise walk-through

9.4

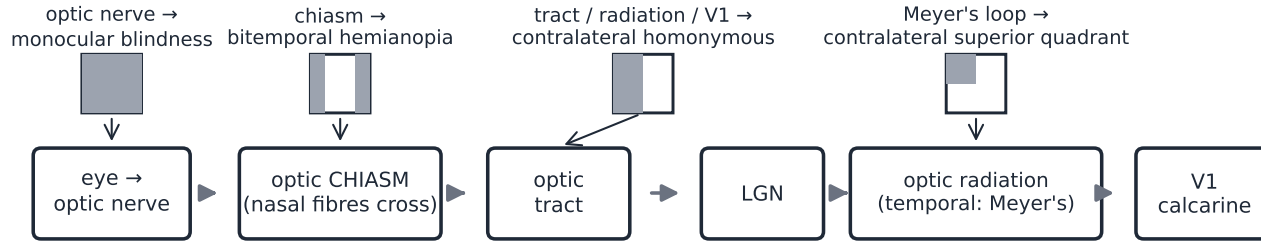
Special senses

University Medicine

Special senses: mapped pathways

- 1 Vision** Nerve → chiasm (nasal crosses) → tract → LGN → radiation → V1:
nerve = monocular, chiasm = bitemporal, behind = contralateral homonymous,
Meyer's loop = superior quadrant.
- 2 Hearing Tonotopy:** base high, apex low (~20-20,000 Hz); Rinne + Weber split
conductive (air lost, bone kept) from sensorineural (both lost).
- 3 Balance** Three canals in orthogonal planes report rotation; otoliths report tilt and
linear acceleration.

The visual pathway and its field defects



cochlea is tonotopic

base → high frequencies · apex → low
young adult range ~20-20,000 Hz

Rinne + Weber

air > bone lost = conductive (middle ear)
both lost = sensorineural (cochlea/nerve)

Each lesion site stamps a signature field defect.

Exercises 2.1-2.3

2.1 Which fibres cross at the chiasm, and what do they carry? [3]

2.2 A lesion behind the chiasm on the right – name and side the field defect. [3]

2.3 In tonotopy, which end of the cochlea carries high frequencies? [3]

Exercises 2.1-2.3

2.1 Which fibres cross at the chiasm, and what do they carry? [3]

2.1

- Nasal retinal fibres – each carries the TEMPORAL field ✓.
-

2.2 A lesion behind the chiasm on the right – name and side the field defect. [3]

2.2

- Left homonymous hemianopia ✓.
-

2.3 In tonotopy, which end of the cochlea carries high frequencies? [3]

2.3

- The base ✓.

Exercise 3.1

3.1 A fictional driver cannot see the LEFT half of each visual field after a stroke.

Name the defect (left homonymous hemianopia) and localise (right tract, radiation or V1). Justify each word of the name. Predict the additional defect if only the temporal-lobe fibres (Meyer's loop) were involved. [8]

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3.1

- Left homonymous hemianopia: 'homonymous' = same half of each eye's field; 'left' = the lost side; lesion RIGHT of the chiasm ✓.
- Field word order encodes side and level – behind the chiasm = contralateral ✓.
- Meyer's loop (temporal, inferior fibres) carries superior fields: a LEFT superior quadrantanopia ✓.
- (Corresponding inferior quadrantanopia would be parietal fibres.)

Exercise 3.2

3.2 A fictional musician: left ear air conduction absent, bone conduction present; Weber lateralises LEFT.

Interpret the pair (conductive loss on the left – middle ear). State the findings that would instead indicate a sensorineural loss (both air and bone reduced, Weber lateralising RIGHT). Explain why the audiogram's shape can localise within the cochlea (tonotopy). [7]

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3.2

- Air lost, bone kept, Weber to the LEFT = conductive loss, left middle ear ✓.
- Sensorineural: air and bone both reduced; Weber lateralises to the BETTER (right) ear ✓.
- Tonotopy: base transduces highs, apex lows – a high-frequency notch points to the base ✓.