UNIVERSITY MEDICINE • EXERCISE SHEET

9.4 Special senses

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS optic chiasm • hemianopia • tonotopy

Objective

Read field defects and tuning-fork tests back to their sites.

1 Key knowledge and worked examples

The pathway

Nerve → chiasm (nasal fibres cross) → tract → LGN → radiation → V1 ✓. Nerve = monocular blindness; chiasm = bitemporal hemianopia; behind = contralateral homonymous; Meyer's loop = superior quadrantanopia ✓.

Worked example: the ear maps

Tonotopy: base high, apex low (~20–20,000 Hz). Rinne + Weber: air lost with bone kept = conductive; both lost = sensorineural ✓.

2 Practice

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]

3 Exam-style questions

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]

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]

Solutions

2.1

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

2.2

- Left homonymous hemianopia ✓.

2.3

- The base ✓.

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.)

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 ✓.

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