



The Royal Australian and New Zealand College of Ophthalmologists

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OPHTHALMIC BASIC SCIENCE EXAMINATIONS PHYSIOLOGY

14 September 2010

Duration of paper: 3 hours **Total Marks:** 150 **Total No. of questions:** 15

- ◆ Candidates must attempt all questions
- ◆ Write your answers in the answer pad using CLEAR and LEGIBLE writing, use diagrams and point form where appropriate
- ◆ Start a new page for each question; do not write on the reverse of any answer page. Make sure to put your candidate number on each page
- ◆ If you cross out an area of your own writing, it will not be considered by the examiners

Question 1

(20 Marks)

How would you define 'contrast sensitivity' in the human visual system? How is it measured and what is its normal value? Draw and label the graph that plots contrast sensitivity against spatial frequency, and include the contributing components. What variables affect contrast sensitivity and how do they do this?

Question 2

(20 Marks)

Visual processing demonstrates a hierarchical organisation with important processing occurring at the level of the primary visual cortex.

Discuss the varieties of cells that can be identified in the primary visual cortex by electrophysiological recording microelectrodes and describe how they are organised within the cortex. Exclude retinotopic organisation.

Question 3

(20 Marks)

List the functions of the retinal pigment epithelium (RPE). Explain how the RPE achieves these functions (discuss only that part of the visual cycle that occurs in the RPE).

Question 4

(10 Marks)

The right pupil is brightly illuminated and both pupils constrict equally.

Describe the neuronal pathways that underlie this phenomenon. Do not use diagrams.

Question 5

(10 Marks)

- a) Describe the physiologic basis for static white on white automated perimetry.
- b) Describe how this differs from kinetic perimetry, blue on yellow automated perimetry (SWAP) and frequency doubling technology (FDT) perimetry.

Question 6

(10 Marks)

Compare and contrast the microcirculation of the iris and ciliary body. How do they contribute to the blood aqueous barrier and formation of aqueous?

Question 7

(10 Marks)

Describe the types of perception that may result when:

- a) dissimilar stimuli are presented to corresponding retinal points
- b) similar stimuli are presented to non-corresponding retinal points

Question 8

(10 Marks)

- a) Describe the features of vergence eye movements
- b) Describe what stimuli initiate them.
- c) Explain what is known about their control pathways.

Question 9

(10 Marks)

Describe how the corneal endothelium contributes to the maintenance of corneal clarity.

Question 10 (5 Marks)

Describe the physiology of aqueous drainage through trabecular meshwork.

Question 11 (5 Marks)

A significant component of visual perception involves the visual system responding to temporal variations in light information (i.e. changes in the radiant energy as a function of time).

Define the following terms;

- a) Temporal summation
- b) Spatial Summation
- c) The Talbot-Plateau law
- d) Motion after-effect

Question 12 (5 Marks)

- a) Define ocular incyclotorsion and excyclotorsion.
- b) List the torsional actions of the extraocular muscles.

Question 13 (5 Marks)

Describe the features of spontaneous blinking.

Question 14 (5 Marks)

Describe the changes that occur in accommodation with regard to the:

- a) Zonules
- b) Lens
- c) Anterior and vitreous chambers

Question 15 (5 Marks)

What are the functions of horizontal cells?

END OF PAPER