



The Royal Australian and New Zealand College of Ophthalmologists

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OPHTHALMIC BASIC SCIENCE EXAMINATIONS PHYSIOLOGY 29 May 2007

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
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Question 1

(20 Marks)

The human lens has a number of physiologic processes that are crucial in preventing the formation of cataract. Outline the physiologic processes of the lens that maintain transparency in terms of:

- a. Cell metabolism and energy production
- b. Cell structure and protein specializations
- c. Protection from oxidative damage

Question 2

(20 Marks)

Disorders of the vestibular system may result in abnormalities of eye movement. Explain the role of the vestibular system in the neural control of eye movements and describe how this is achieved.

Question 3

(20 Marks)

Discuss the general principles of the autonomic nervous system. Include specific reference to the autonomic innervation of the pupil by way of illustration.

Question 4

(10 Marks)

Write notes that describe the factors that influence visual acuity.

Question 5 (10 Marks)

Describe the blood aqueous barrier. Explain of the role of active transport mechanisms.

Question 6 (10 Marks)

Recurrent erosion syndrome is a common condition of corneal epithelial instability. Describe the proteins and structures critical for cell adhesion in the corneal epithelium and its interface with Bowman's membrane.

Question 7 (10 Marks)

Visual symptoms often relate to variation in contrast sensitivity.

1. Draw a graph which explains the relationship between the normal human contrast sensitivity function and its components.
2. Explain the changes to the modulation transfer function with changes in pupillary aperture.

Question 8 (10 Marks)

Inherited colour vision defects are common, usually related to defects in one pigment class.

1. Explain the concept of trichromacy, with particular emphasis on the importance of the rate of photon capture.
2. Explain opponent processes that occur as part of colour signal processing in the retina.

Question 9 (10 Marks)

Describe the elimination of tears on the human eye.

Question 10 (5 Marks)

Draw a diagram illustrating the absorption spectra of the 4 human photopigments including the peak sensitivity of each opsin. Use this diagram to define the Purkinje shift.

Question 11 (5 Marks)

Draw a diagram showing the main components of a mammalian muscle spindle.

Question 12 (5 Marks)

The cornea is one of the most sensitive tissues of the body. Describe the microanatomy and physiology of corneal sensation.

Question 13 (5 Marks)

Entoptic phenomena may be described by patients as symptoms that concern them. For each of the following briefly describe the visual perception and state its physiologic origin:

- a) Muscae volitantes
- b) Moore's Lightning Streaks
- c) Purkinje Figures

Question 14**(5 Marks)**

Briefly explain the concept of the “critical period” of visual development and its general implications for the treatment of eye diseases.

Question 15**(5 Marks)**

In order to diagnose extraocular muscle palsies, an understanding of the actions of each muscle is required. Draw a table that states the actions of each of the human extraocular muscles.

END OF PAPER