

The University of Melbourne

Semester Two 2002

Department: Anatomy & Cell Biology (joint course with Physiology)
Subject Number: 516-209
Subject Title: Introductory Neuroscience

Exam Duration: 3 hours

Reading Time: 15 minutes

This paper has 3 pages

Authorized materials:

None allowed

Instructions to Invigilators:

Script Books: 1 x 14 page
Exam paper may be removed from the exam room

Instructions to Students:

ALL questions should be attempted.
DIAGRAMS should be used wherever possible.

Paper to be held by Baillieu Library - This paper can be reproduced and lodged with the Baillieu Library.

**The University of Melbourne
Semester 2 Assessment, 2002**

Department of Anatomy and Cell Biology

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Question 1

Define the neurotrophins and identify their major roles within the nervous system.

(15 minutes)

Question 2

Describe the structural features of neurons that allow them to serve an information transmission and processing role?

(15 minutes)

Question 3: Answer 1 (either A or B) of the following essay questions

- A.** Discuss the mechanisms involved in generating an action potential in a central neuron once transmitter has been released from sufficient nerve terminals on the neuron's dendrites.

OR

- B.** An action potential has been generated in the axon hillock of a neuron. Discuss the mechanisms involved in producing a post-synaptic response in one of this neuron's targets. Consider both excitatory and inhibitory neurons.

(30 minutes)

Question 4: Answer 2 of the following short answer questions (allow 15 minutes each)

- A.** What are the major classes of ionotropic receptors, their preferred ligands (the transmitters that activate them) and the ions that pass through them?
- B.** What are the major roles of dendrites in the integration of synaptic input onto central neurons?
- C.** What are the major mechanisms involved in the generation of long-term synaptic plasticity (both potentiation and depression)?
- D.** Outline the sequence of events activated during and after the activation of a metabotropic receptor by a neurotransmitter. Remember that there are several different possible messenger systems.

(30 minutes for 2 answers)

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Question 5

Two important principles of sensory perception are: **(a)** there are receptors which convert the stimulus into electrical signals (transduction) and **(b)** there is an ordered representation (map) of the sensory space in the sensory cortex. Discuss these two principles using examples from touch, vision and hearing.

Parts (a) and (b) have equal value and should take about 15 minutes each.

(30 minutes)

Question 6

The production of movement relies on the input of sensory information at all levels of the motor hierarchy. Describe what these sensory inputs are and how they contribute to the production of movement.

(15 minutes)

Question 7

Discuss the functions of the prefrontal cortex; include in your answer the cognitive and behavioural effects that result from damage to different regions of prefrontal cortex.

(30 minutes)

Question 8

Damage to a peripheral nerve can often be repaired whereas little regeneration occurs in the central nervous system after injury. Discuss the possible reasons for the difference in the regenerative capacities of the peripheral and central nervous systems.

(15 minutes)

END OF EXAM