

The University of Melbourne
Semester One Assessment 2005

COPY

Department: Anatomy and Cell Biology
Subject Number: 516-306
Subject Title: Developmental Neurobiology

Reading Time: 15 minutes

Writing Time: 2 hours

This paper has 3 pages

Authorized materials:

None allowed.

Instructions to Invigilators:

Script Books: 7 x 7 page.
Exam paper may be removed from the exam room.

Instructions to Students:

Answer ALL 6 questions.
Use a separate script book for each question.
Some questions have multiple parts. Answer ALL parts of each question.
The value of each question is indicated after the question.
DIAGRAMS should be used wherever possible.

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QUESTION 1:

Discuss a current model for the role of the genes *Krox-20* and *kreisler* in segmentation of the hindbrain. In your answer, include some of the experimental evidence in support of this model.

(15 minutes)

QUESTION 2:

Answer parts a) and b) of this question

- a) What function does lateral inhibition serve?
- b) Describe the process or draw a labeled diagram of how lateral inhibition occurs.

(10 minutes)

QUESTION 3:

Answer parts a) and b) of this question

- a) Discuss the similarities and differences in the developmental processes that result in the development of sympathetic noradrenergic neurons and sympathetic cholinergic neurons.
- b) Describe the processes that occur when neuroepithelial cells in the dorsal neural tube undergo an epithelial to mesenchymal transition and become neural crest cells.

(15 minutes)

QUESTION 4:

Choose **two** molecules or families of molecules that have been implicated in axon guidance. For **each** molecule, answer the following questions:

- a) Describe one line of experimental evidence that supports a role for that molecule in axon guidance. Explain the logic or reasoning behind the experimental approach used.
- b) Discuss the effect this molecule has on the growth cone.
- c) Briefly discuss a possible molecular mechanism of action of that molecule that is supported by current evidence.

(30 minutes)

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QUESTION 5:

Discuss the role played by nerve growth factor in matching the number of developing neurons to a target tissue.

(20 minutes)

QUESTION 6:

Axonal and dendritic processes and synapses are particularly plastic during the development of neural circuitry in the growing brain (neonatal plasticity). However the adult brain retains a degree of plasticity.

Discuss this statement using specific examples of both neonatal and adult brain plasticity in your answer and also discuss what role plasticity might play in the adult brain.

(30 minutes)

END OF EXAMINATION