

KING'S COLLEGE LONDON

NEUROSCIENCE MSc EXAMINATION

INSTITUTE OF PSYCHIATRY, PSYCHOLOGY AND NEUROSCIENCE
King's College London

8th of January 2015 at 14:00 - 16:30

PAPER A2

Answer **FOUR** questions only

A2.1 Neurogenetics

1. The generation of transgenic mouse models of disease is common practice in neuroscience research today. Discuss the various types of single genetic manipulation that are commonly used, together with their relative benefits and drawbacks.
2. What are the common modes of inheritance for Mendelian diseases? Illustrate your answer diagrammatically.
3. It is now possible to sequence the DNA of a patient quickly and at a reasonable cost. How useful is this for a patient with a Mendelian disease and their clinician?

A2.2 Developmental Neurobiology

4. What is the importance of the neural stem cell niche?
5. Describe the lineage of a projection neuron destined for one of the superficial cortical layers (II – IV) and the mechanisms that govern its migration from its point of origin to its final destination in the developing cortical plate.
6. How can we employ our understanding of neural development in order to tackle neurological diseases?

A2.3 Neuronal Plasticity

7. Discuss why long-term potentiation is thought to be a memory mechanism.
8. Compare and contrast two of the following types of artificial neural networks. 1.Hebbian 2.Back Propagation 3.Kohonen 4.Hopfield.

A2.4 Neuroimmunology

9. List the factors (cellular, anatomical, physiological) that limit immune reactions in the brain, and briefly outline how each factor exerts its effect.
10. Describe the main characteristics of "resting" and "active" microglia.
11. What are the key features of CNS inflammation?
12. Some haplotypes of MHC molecules give an increased risk for multiple sclerosis. Explain this observation, in relation to the function of MHC molecules.