NTNU
Faculty of Medicine
Department of Neuroscience

Exam NEVR3001
Basic Neuroscience

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Supporting materials: Dictionary

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EXAMINATION NEVR3001 "BASIC NEUROSCIENCE"
October 14th, 2010 9 am – 1 pm

Permitted abbreviations:

DNA
RNA
ATP
SNARE
Vertebral levels
Neurotransmitter receptors

The number of marks allotted to each question is given in parenthesis.

1. In genetics, what is meant by the term "diploid"? (1)

2. How does a dominant gene affect the phenotype compared to a recessive gene? (2)

3. These letters represent a short sequence of DNA bases.

   C A A G C C

   Write out the complementary RNA sequence. (1)

4. Name four types of RNA (only "RNA" may be abbreviated) (2)

5. What is the difference between genotype and phenotype? (2)

6. What is the trinucleotide genetic code? (1)

7. What is a genome browser? (1)

8. How can genomes of multiple organisms help identify functional DNA? (1)

9. In what class of organisms can a scan for open reading frames be used to identify genes? (1)

10. Which characteristics of proteins are employed to separate proteins by two-dimensional polyacrylamide gel electrophoresis (2D-PAGE) in the 1st and 2nd dimension, respectively? (2)

11. What is meant by the proteome? (1)

12. Why is proton magnetic resonance spectroscopy one of the most popular techniques in metabolomics? (2)

13. Give two other atoms (other than protons) with their atomic weight, that are useful for neuroscience research in studies using magnetic resonance spectroscopy. (1)

14. What is a peptide? (1)

15. What are the three principles of Darwinian natural selection? (2)

16. What is an enzyme? (1)

17. Give two physical aspects of molecular diffusion, such as in neurotransmission over the synaptic cleft. (1)

18. In the central nervous system, what are white and grey matter predominantly comprised of? (2)

19. Give four forms of physical and immunological protection for the brain. (2)

20. How many layers does one normally differentiate within human neocortex? (1)

21. Draw and label a cross-section of the spinal cord. (3)

22. Where in the cell does glycolysis take place? (1)

23. Where, and by what mechanisms, does the neurone produce a supply of ATP adequate for its energy needs? (2)

24. Give three aspects of neurones that are *exclusive* to this cell type. (1)

25. A vesicle containing a neuropeptide neurotransmitter has been seen to travel at 100 mm/day to an axon terminal.

    a. What is the term given to this movement? (1)

    b. Which neuronal protein motor is most likely to be the carrying the vesicle? (1)

    c. What is the name given to the vesicle containing the neuropeptide? (1)

    d. From which cellular organelle are such vesicles usually derived? (1)

26. Where in the neurone are there no chemical synapses? (1)

27. In multiple sclerosis, oligodendrocytes are lost. What would you expect to be the result of such loss? (2)

28. Give three applications of ATPases in neurones (2)

29. Give two proposed mechanisms for endocytosis, and describe the difference. (3)

30. What is the precursor of the catecholamines? (1)

31. Give two examples of the physiological importance of calcium in neurotransmission. (2)

32. In astrocytes, in what structure would you expect to find glial fibrillary acidic protein? (1)

33. Describe (in words or with the help of a drawing) some of the consequences for the brain following cerebral ischemia. (4)

34. Give three features in which a metabotropic receptor differs from ionotropic receptors. (2)

35. What is a connexon? (1)

36. Make a drawing of a glutamatergic synapse illustrating the elements relevant for neurotransmission. (4)

37. Briefly describe in a sentence how long-term potentiation can be induced. (2)

38. Give three postsynaptic features of late long term potentiation. (3)

39. In connection with neurotransmission, what is meant by the term "summation"? (1)

40. In neuronal-glial interaction, astrocytes are particularly important in connection with the amino acid glutamate. Give three important examples. (3)

41. During cerebral ischaemia, the loss of ionic and chemical gradients leads to water imbalance. What is this condition called? (1)

42. Several mechanisms normally help control water regulation in the brain. Mention three. (3)

43. Which two factors influence the flux of an ion across a membrane? (1)

44. What are the nodes of Ranvier and what is their role? (2)

45. Give three characteristics of sensory C fibres. (2)

46. Which of the following substances are called catecholamines? (1)
a. noradrenaline, b. dopamine, c. histamine, d. serotonin, e. adrenaline

47. How many ions of which type are transported in/out of a cell by the Na^+/K^+ pump in response to the hydrolysation of one ATP molecule? (1)

48. How would a lower motor neuron lesion affect a muscle in terms of reflexes? (1)

49. What is the size principle of recruitment in terms of the motor system? What is the purpose of it? (2)

50. What mechanisms prevent a sub-threshold depolarisation of a neuron from cascading into an action potential? (1)

51. Name two purely sensory cranial nerves with their number. (2)

52. Give a short but complete functional definition of primary somatosensory cortex. (1)

53. What are intrafusal muscle fibres? How are they innervated? (3)

54. What is meant by transduction in terms of the sensory system? (1)

55. The developing neural tube initially differentiates into four different domains or plates that eventually form the final functional components seen in the spinal cord and brainstem. Name the plate from which motor neurons in the spinal cord derive. (1)

56. What is meant by the statement that cortex develops in an inside-out manner? (2)

57. The prosencephalon of the vertebrate brain differentiates into two brain parts (secondary brain vesicles), called ..... and ..... (1)

58. The diencephalon is generally divided into two main structures. What are these called? (1)

59. Where in the spinal cord do we find the cells of origin of part of the parasympathetic component of the autonomic nervous system? (1)

60. Where in the cortex of the hemisphere do we find the primary representation of visual information? Describe or make a drawing. (1)