

Date 20 December 2012

Examination NEVR2010

There are two types of questions.

SHORT ANSWER QUESTIONS and TRUE or FALSE questions.

Each short answer question requires only a short answer and behind each question is indicated how many points you will get in case of a correct answer. **Simple questions will yield 1 point** and a **higher number of points** indicate that a **more complex** and/or **elaborate** answer is required.

True or false questions always **score 1 point**. You are required to clearly indicate the right answer by writing either **True or False** on your answer document. **Do not add** to the answer in any way, because that may influence the mark you will get.

The exam comprises a total of 71 questions (100 points) on 7 pages (including the cover page).

You have 6 hours to complete the exam.

Use of dictionaries and other tools of assistance. You are allowed ONE dictionary that translates standard language from your mother tongue to English, i.e. French-English, German-English etc. NO SPECIALIZED DICTIONARIES WILL BE ALLOWED, such as English-English dictionaries that provide definitions, or medical dictionaries of any description. Native English or Norwegian speakers are not allowed any dictionary.

SHORT ANSWER QUESTIONS

1. What is meant by the 'EC₅₀ concentration of a drug'? (1)
2. Why is the baseline/control condition so important in fMRI experiments? (1)
3. What are Event-Related Potentials? (1)
4. Name one advantage and one disadvantage of lesion studies as a method for mapping brain functions. (2)
5. What is a genetic polymorphism? (1)
6. What is a chromosome? (1)
7. Spiral ganglion cells are bipolar cells that innervate peripheral sensory cells (hair cells in the inner ear) and send an axon into the 8th cranial nerve. In which ganglia do we find comparable neurons that mediate the transfer of touch information? (1)
8. Besides transmitting vibrations from the ear drum to the inner ear what is the function of the middle ear bones malleus, incus and stapes? (2)
9. Alcohol and benzodiazepines, used to medicate anxiety, act predominantly by binding to receptors for a particular transmitter. Which transmitter is this? (1)
10. Bodily symptoms of anxiety can be explained fully by an increased activity in a particular part of the autonomic nervous system. Which part is that? (1)
11. What is the largest commissure in the brain called? (1)
12. Name two brain regions that are targeted by the olfactory tract, i.e. the pathway made up by axons of the second order neurons? (2)
13. Describe the structure of the olfactory sensory neuron. (2)
14. Why do neurons need astrocytes? (2)
15. Which transporters are necessary for the operation of the glutamate-glutamine cycle ? (1)
16. Where in the spinal cord do we find the neurons that originate part of the parasympathetic component of the autonomic nervous system? (1)
17. Give a short definition of a motor unit. (1)
18. Give the name of at least one cranial nerve that controls the movement of the eye. (1)

19. Describe the main mechanisms that are responsible for the resting membrane potential (ca. – 65 mV) in neurons. (2)
20. Why does an action potential normally travel only in one direction that is away from the soma? (1)
21. The perceptual thresholds for detecting bitter and sweet substances are substantially different. Which one of these basic tastes has the highest threshold? (1)
22. Different tastes essentially use two different primary mechanisms to initiate a response in the taste cell. Describe these two mechanisms. (2)
23. Name the three cranial nerves that are involved in the transmission of taste information to the CNS. (3)
24. Within the ascending pathways of the spinal cord that carry somatosensory information to the brain, two different components are differentiated. Describe the main differences between these two with respect to type of information carried by them and their routes by which they reach the somatosensory cortex. (4)
25. Name the structure in the developing brain from which the interneurons in the cortex originate. (1)
26. During the formation of the neural tube, a number of embryonic cells differentiate into the so-called neural crest. Name two derivatives of neural crest cells. (2)
27. The prosencephalon of the vertebrate brain differentiates into two brain parts (secondary brain vesicles). What are these two secondary brain vesicles called? (2)
28. Describe one main role of the hypothalamus and the main output pathway through which this is mediated. (2)
29. What are the three most important sensory systems for balance control? (3)
30. Which part of the central nervous system is characteristically affected in Parkinson's disease? (1)
31. Which role has the cerebellum in controlling movements? (2)
32. Describe briefly the functional difference between the anteromedial (ventral) and lateral corticospinal tracts. (2)
33. Give the name and origin in the brain of three modulatory systems. (3)

34. What is meant by saying that an animal habituates to a sensory stimulus? **(1)**
35. LTP has been postulated as a mechanism for memory. Describe briefly one type of experimental approach that supports this concept **(3)**
36. Give one piece of evidence for hemispheric lateralization of language. **(2)**
37. Give a short definition of aphasia. **(1)**
38. What is the name of the thalamic nucleus that defines the prefrontal cortex? **(1)**
39. Describe two common symptoms in patients suffering from Alzheimer's disease. **(2)**
40. What is the neural process underlying attention according to Lamme? **(3)**
41. List three basic positions in the free will debate. **(3)**

TRUE/FALSE QUESTIONS

1. Glycolysis occurs in the cytosol of the cell. **True or false.**
2. The Golgi complex is the primary site of protein synthesis. **True or false.**
3. In a chemical synapse using the neurotransmitter GABA, the postsynaptic membrane potential is altered by the opening of receptors which let pass Ca^{2+} .
True or False
4. Propofol enhances the action of GABA. **True or False**
5. DNA has equal number of adenine and thymidine residues. **True or False.**
6. The genome of an organism is the complete set of expressed genes in a cell. **True or False.**
7. The sympathetic cell bodies that provide the major sympathetic innervation of the heart are located in the brainstem. **True or False**
8. The order, or sequence, of the bases determines what biological instructions are contained in a strand of DNA. **True or False**
9. Glutamine is a neurotransmitter. **True or False**
10. The cortex of the brain is defined as the outer portion that is covered by meningeal layers. **True or False**
11. The two vertebral arteries are the main blood supply of the forebrain. **True or False**
12. The pineal gland or epiphysis is the main clock structure that controls circadian rhythms. **True or False**
13. The primary visual cortex is involved in color perception. **True or False**
14. The apex of the basilar membrane (the part furthest away from the cochlea) is specifically tuned to low frequencies. **True or False**
15. Taste buds in humans are present outside of the tongue. **True or False**
16. Spinal cord segments at the lumbar level contain neurons that originate part of the parasympathetic nervous system. **True or False**
17. During the generation of a neuronal action potential voltage gated K^{+} -channels open first, before voltage Na^{+} -channels. **True or False**
18. Fluorine-18 is used in PET imaging to measure glucose metabolism. **True or False**

19. Action potentials do not contribute to scalp-recordings of the EEG signal. **True or False**
20. Evaluation of localization (define the direction to a sound source) is done by the Medial Superior Olive (MSO). **True or False**
21. Hair cells are organized in two rows, i.e. inner and outer haircells. **True or False**
22. Diseases involving emotions affect the level of cortisol. **True or False**
23. Emotions are linked to activity in the occipital region. **True or False**
24. The higher olfactory centers of the human brain include the orbitofrontal cortex. **True or False**
25. Olfactory sensory neurons project directly to the entorhinal cortex. **True or False**
26. In the 6 layered cortex, neurons in layer 2 are the oldest neurons (outside-in migration). **True or False**
27. Motor neurons in the ventral horn of the spinal cord develop from the floor plate. **True or False**
28. Neurons release glutamine. **True or False**
29. Neurons contain phosphate activated glutaminase. **True or False**
30. Most of the cases of Alzheimer's disease are caused by a mutation in a specific gene. **True or False**