

Date 19 December 2011

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 67 questions (100 points) on 7 pages (including this 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. Give a short description of two of the most important receptors involved in the mechanism of general anesthetics. (2)
2. Why are isomers interesting when studying the mechanism of drugs? (2)
3. What are the four major elements of a modeling process? (2)
4. What is a genetic polymorphism? (1)
5. Describe the significance of 'Griffith's experiment' for the development of molecular biology. (2)
6. The auditory neural system is "tonotopically organized". What does this mean? (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 8<sup>th</sup> cranial nerve. In which ganglia do we find comparable neurons that mediate the transfer of touch information? (1)
8. Give one brief example of how learning can be studied in the sea slug *Aplysia*. (1)
9. Which role has the cerebellum in controlling movements? (2)
10. Describe briefly the functional relevance of the muscle spindle. (2)
11. Describe the pathways that mediate temperature information from the hand to the primary somatosensory cortex. (3)

12. Name a transmitter system in the brain that is preferentially targeted in the treatment of depression. (1)
13. What is the name of the enzyme converting glutamate to GABA? (1)
14. How is glutamate removed from the synaptic cleft? (2)
15. What is a *mental mechanism* according to Bechtel? How does such a mechanism differ from other biological mechanisms? (3)
16. Can research into the brain show that we do not really have free will or that we should not be held responsible for our actions? (4)
17. Give one piece of evidence for hemispheric lateralization of language. (2)
18. Give a short definition of aphasia. (1)
19. Describe two common symptoms in patients suffering from Alzheimer's disease. (2)
20. Describe one functional outcome parameter/test commonly used to assess the function of the prefrontal cortex. (2)
21. What is the name of the brainstem nucleus that receives direct projections from the primary sensory axons in the gustatory system? (1)
22. The taste buds are organized in structures called papillae. Provide the name of the three different kinds of papillae. (3)
23. Explain the transduction mechanism of the olfactory sensory neurons, i.e. how the neurons transform chemical energy to electric signals. (3)

24. What is the name of the thalamic nucleus that defines the prefrontal cortex? (1)
25. What is the name of the nucleus that provides the main control over our circadian rhythm and where in the brain is this nucleus located? (2)
26. Which structure in the brain is most important for procedural learning? (1)
27. Name the subcortical structure in the brain most strongly associated with fear perception. (1)
28. What is actually measured with BOLD fMRI? (1)
29. Why does an axon potential normally travel only in one direction that is away from the soma? (1)
30. Describe the main mechanisms that are responsible for the resting membrane potential (ca.  $-65$  mV) in neurons. (3)
31. There are three light sensitive elements in the retina. Briefly describe their main functional and organizational differences. (3)
32. What is the name of the cranial nerve that innervates the liver? (1)
33. Give a short but complete definition of cortex in the central nervous system. (1)
34. Name three sensory systems that are involved in balance control. (3)
35. Name a diencephalic structure that is strongly involved in coupling sleep and circadian rhythms. (1)

36. Name the two main inputs to the reticular nucleus of the thalamus. (2)
37. What are the five chemical modulatory systems in the brain and what are the main locations of the originating neurons? (5)

Total 70

### TRUE/FALSE QUESTIONS

1. Spinal mechanisms are involved in muscular defence reactions during general anesthesia.  
**True/false**
2. The order, or sequence, of the bases determines what biological instructions are contained in a strand of DNA. **True/false**
3. DNA has equal numbers of adenine and thymine residues ( $A=T$ ). **True/false**
4. Astrocytes contain glycogen. **True/false**
5. Glutamine is a neurotransmitter. **True/false**
6. In mammals, chromosomes are present in the nucleus. **True/false**
7. The inner ear contains the three auditory ossicles. **True/false**
8. The organ of Corti in the inner ear sits on Reissner's membrane. **True/false**
9. Classical conditioning is a form of non-associative learning. **True/false**

10. Signing by deaf people depends on the left frontal lobe. **True/false**
11. The Wada test is used to test language fluency. **True/false**
12. Split-brain patients are able to name objects held in the right hand without difficulty.  
**True/false**
13. In the early stages of Alzheimer's disease a volume reduction can be seen in the cerebellum. **True/false**
14. The bitter taste is exclusively detected at the posterior portion of the tongue. **True/false**
15. The primary gustatory cortex is located in the anterior cingulate cortex. **True/false**
16. The notochord contains the signal to induce the folding of the neural tube. **True/false**
17. In the 6 layered cortex, neurons in layer 2 are the oldest neurons (outside in migration).  
**True/false**
18. The olfactory sensory neurons project directly to the brain. **True/false**
19. The vomeronasal system is mainly devoted to processing odor information about food.  
**True/false**
20. The muscle spindle is solely composed of nerve tissue. **True/false**
21. The superior colliculus is relevant for vestibulo-ocular reflexes. **True/false**
22. Food intake is strongly regulated by nuclei in the hypothalamus. **True/false**
23. The amygdala is essential for episodic memory. **True/false**

24. The membrane of a presynaptic element of a chemical synapse does contain receptor molecules. **True/false**
25. The two internal carotid arteries are the main blood supply of the brainstem. **True/false**
26. Energy is needed to maintain the resting membrane potential. **True/false**
27. LTP induction normally depends on NMDA receptors. **True/false**
28. Spontaneously rhythmic cells are only present in the brain. **True/false**
29. Clock genes are only expressed in neurons in the tuberomammillary nucleus. **True/false**
30. The pineal gland is the major source of melatonin. **True/false**

Total 30

