Department of Neuroscience

NTNU – Trondheim
Norwegian University of
Science and Technology

EXAMINATION FOR THE COURSE:
NEVR3003 – Behavioral and Cognitive Neuroscience

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Examination date: 15 March 2013
Examination time: 9 am. – 1 pm.
ECTS-credits: 7.5

Supporting materials:
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 are allowed such as English-English dictionaries that provide definitions. Or medical dictionaries of any kind- native English of Norwegian speakers are not allowed any dictionary.

Language of examination: English
Number of pages: 3 (including front page).

Examination results will be made available on StudentWeb within the end of:
10 April 2013

Short answer questions (1 point each):

1. Which cortical layer do thalamic relay neurons in primary (lower order) nuclei primarily project to?

2. What is the (strong) excitatory input that forms a synaptic glomerulus onto thalamic relay cells called?

3. What other transmission mode do diffuse modulatory systems often use besides synaptic transmission?

4. Are the CB1 receptors that mediate depolarization-induced suppression of inhibition (DSI) located presynaptically?

5. Where would you find Betz cells in the neocortex?

6. The somatotopic representations in M1 can change dynamically. On the order of seconds, hours or weeks?

7. What does 'orexigenic effect' mean?

8. Which hormone is released by empty stomach causing strong sensation of hunger?

9. Explain what is meant by retinotopy in V1 (striate cortex).

10. Describe or draw length summation performed by simple cells in V1.

11. What effect do tricyclic antidepressants have on the metabolism of monoamines?

12. Which neocortical layers contain pyramidal cells?

13. Do EEG signals mostly reflect inhibitory or excitatory cell activity?

14. What is the most common cell type in the striatum?

15. There are several factors which distinguish short-lasting (E-LTP) from long-lasting (L-LTP). Name one.

16. Do sign language and spoken language depend on the same brain structures?

17. What is theta phase precession?

18. What is the main message of the synaptic homeostasis hypothesis of sleep?

19. Is there a good correspondence between Brodmann's original 47 (human) cortical areas and modern functionally defined areas?

20. The anterior to posterior hippocampus in human corresponds to the _____ to _____ hippocampus in rat (fill out)

Long answer questions (8 points each):

1. Can you mention one important neurotrophic factor in the brain and describe how this factor is related to depression?

2. In the lecture, several key experiments were discussed which suggest a direct linkage between LTP and hippocampal memory. Briefly describe 3 such experiments, and mention *why* they are significant in establishing a mechanistic connection between synaptic plasticity and memory.

3. Describe the Leptin signaling pathway (where does it originate, where does it act in the brain, what effects does it elicit)

4. In what ways can our normal sleep/wake rhythms be changed or offset, and how does the brain cope?

5. Describe how information is transmitted between neocortical areas

6. What is a 'reward prediction error' signal, and which neurons are thought to encode this signal?

7. What is meant by a temporal (timing) code, and how can a rate code be converted to a temporal code?

8. Language, like other cognitive functions, likely has an evolutionary origin. If this is true, we should find rudimentary language functions in other species. Discuss if we can use animal models in the study of language. Include examples

9. How is the brain's spatial map organized?

10. How is information transferred to the neocortex during sleep?

ALL QUESTIONS ARE TO BE ANSWERED