Psychology 320: Topics in Physiological Psychology
Lecture Exam 2: March 19th, 2003

Name: _________________________    Student #: __________________________

BEFORE YOU BEGIN!!!

1) Count the number of pages in your exam. The exam is 8 pages long; if you do not have this many pages, ask for another exam.

2) Write your name and College ID number in the spaces provided at the top of this page.

3) Before you begin each section, read the instructions carefully. If you do not understand the instructions or a specific question, or if you are unable to decipher the diagram provided, ask for assistance.

4) Good Luck!

Answers for Multiple-Multiple Choice Section:

1. _______  6. _______  11. _______
2. _______  7. _______  12. _______
3. _______  8. _______  13. _______
4. _______  9. _______  14. _______
5. _______  10. _______  15. _______

Total: Section I. Multiple-Multiple Choice Section   ________/30
Section II. Modified True/False and Fill-in-the-Blank   ________/30
Section III. Identification   ________/10
Section IV. Essay Question   ________/30
Section I. Multiple-Multiple Choice Questions. For each question, circle the correct answer or answers and then write your response on the face page of this examination. Remember, there may be more than one correct answer. If you have any questions, feel free to ask me for clarification. (2 points each; 30 points total)

1. The 8-arm radial maze is a cognitive task that has been used successfully to:
   a. study the animal equivalent of working memory.
   b. study the animal equivalent of declarative memory.
   c. study the animal equivalent of procedural memory.
   d. study the effects of lesions to the hippocampus on cognitive behavior in rats.

2. During the induction of LTP, Ca2+ entering neurons via NMDA-type glutamate receptors causes:
   a. new NMDA-type receptors to be inserted in the postsynaptic membrane.
   b. new AMPA-type receptors to be inserted in the postsynaptic membrane.
   c. Activation of protein kinases which cause phosphate groups to be added to existing glutamate receptors, increasing their ability to depolarize the neuron.
   d. Activation of protein phosphatases which cause phosphate groups to be removed from existing glutamate receptors, increasing their ability to depolarize the neuron.

3. The hippocampus and the medial prefrontal cortex:
   a. receive inputs for all sensory modalities.
   b. are both intimately involved in procedural memory formation.
   c. are both intimately involved in declarative memory formation.
   d. are both part of the memory system that specializes in tasks like the delayed-non-matching-to-sample (e.g., object recognition).

4. When one is talking about the neural bases of attention, orienting to specific sensory stimuli is mediated by a system that includes the:
   a. posterior parietal lobe.
   b. hippocampus.
   c. superior colliculus.
   d. right frontal lobe.

5. The diathesis-stress model of mental illness predicts that:
   a. the concordance rate for schizophrenia between monozygotic (identical) twins should be 100%.
   b. mental illness results when environmental factors allow the expression of genes that predispose an individual to the development of mental illness.
   c. mental illness is due to prenatal exposure to some kind of a virus.
   d. mental illness is due, in part, to problems in the normal function of the HPA axis.

6. Which of the following behavioral paradigms would be MOST useful for studying memory processes related to the hippocampus?
   a. the Morris Water maze.
   b. the self-administration paradigm.
   c. the delayed-non-matching-to-sample task
   d. the nonsense syllable task (7 +/- 2)
7. Deficits in **working memory** are:
   a. caused by damage to the prefrontal cortex.
   b. obvious when a subject has to keep track of ordered information (e.g., Did you see this object before or after that object?).
   c. rarely seen in human subjects.
   d. caused by damage to the entorhinal cortex.

8. **Anxiety disorders** can be treated with drugs that:
   a. act as antagonists at D-2 dopamine receptors.
   b. at as antagonists at 5-HT receptors.
   c. act as agonists at GABA receptors.
   d. act as agonists at 5-HT receptors.

9. Attentional mechanisms used to direct our **attention to specific target events** are:
   a. rarely used as we have unlimited attentional capacity.
   b. used in a flexible way, so that “new” targets can be attended to if the need arises (e.g., Your friend’s conversation is really interesting, but you’d just as soon NOT step into the path of that oncoming car.)
   c. associated with activity in the locus coeruleus, in the brainstem.
   d. associated with activity in the frontal lobes and anterior part of the cingulate gyrus.

10. In the Moser et al. target article that we discussed in class, **saturation of LTP** in the hippocampus of rats was:
    a. shown to increase learning in one version of the Morris Water maze.
    b. shown to decrease learning in one version of the Morris Water maze.
    c. shown to depend upon activation of serotonergic interneurons.
    d. shown to decrease synaptic plasticity in the hippocampus.

11. According to your lecture notes, the **symptoms of schizophrenia** can be elicited by:
    a. chronic consumption of psychostimulant drugs.
    b. administration of small doses of psychostimulants to schizophrenic patients.
    c. the occurrence of stressful events to someone with the genetic predisposition for the disease.
    d. stimulation of GABAergic synaptic transmission.

12. According to your text, **affective illness** may be due to:
    a. excessive hippocampal inhibition of the HPA axis.
    b. a lack of hippocampal inhibition of the HPA axis.
    c. unusually high concentrations of glucocorticoid receptors in the hippocampus.
    d. unusually low concentrations of glucocorticoid receptors in the hippocampus.
13. The Martin et al. article focusing on **brain changes** produced by the use of **IPT or pharmacotherapy** with depressed patients was limited by:

   a. the inclusion of male and female subjects suffering from depression.
   b. a relatively short observation period.
   c. the use of a single IPT clinician.
   d. a relatively small sample size (statistically speaking).

14. **D.O. Hebb** greatly influenced current thinking about the **neural bases of learning and memory** by:

   a. hypothesizing about the existence of the engram.
   b. hypothesizing about the existence of reverberating circuits.
   c. hypothesizing about activity-dependent changes in synaptic connectivity.
   d. hypothesizing about the role of hippocampus in spatial memory.

15. According to your text and lecture notes, **anxiety disorders** are:

   a. often overdiagnosed due to the stressful society we live in.
   b. often self-medicated by people suffering from the disorder.
   c. the most common form of psychological disorder.
   d. due to perturbations in glutamatergic synaptic transmission.

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**Section II. Fill-in-the-Blank and Modified True/False.** Please read each statement carefully. For the True-False questions, you will not receive any credit for simply stating that the answer is false; you must also provide the correct term that could be substituted to make the statement correct. For the Fill-in-the-Blank questions, provide the best answer possible that will make the statement correct. If you do not understand a statement, ask your instructor for clarification. (2 points each; 30 points total)

1. Lashley’s inability to find the ______________ may have been due to the fact that memories appeared to be stored in a distributed manner across multiple cortical areas.

2. True or False: Drugs that decrease **GABAergic** synaptic transmission are clinically effective in the treatment of schizophrenia.

   A: ____________________________________________________________________

3. According to your text, the occurrence of stressful events early in development might contribute to the later development of affective illness by decreasing inhibitory control of the HPA axis by the ________________ or by increasing excitation of the HPA axis by the ________________.

4. According to your lecture notes, a high level of alertness or vigilance is due to increased activity in the ________________ and the right ________________.

5. Hippocampal neurons that increase their firing rate as a rat walks into a particular location in a maze are called ________________.
6. According to your lecture notes, the development of LTP requires ________________
   between many different presynaptic inputs onto a postsynaptic neuron.

7. During our discussion of anxiety disorders, we noted the fact that the GABA receptor is, in truth, a
   receptor complex that includes binding sites for drugs such as ________________
   and ________________.

8. Although HM’s memory deficits were originally thought to be due solely to bilateral damage to the
   hippocampus, subsequent research revealed that damage to structures such as the
   ________________ and the ________________ were also important,
   depending upon the type of memory deficit that was being studied.

9. **True or False:** According to the relational memory hypothesis, the striatum’s role in memory
   formation may be to integrate highly processed information from multiple modalities.
   A: ____________________________

10. According to your text, one task that reveals problems associated with prefrontal cortex damage is the
    ________________.

11. In the target article by Moser et al., the authors suggested that earlier attempts to saturate synaptic
    plasticity in the hippocampus failed because previous researchers had only stimulated a subset of axons
    in the ________________ path input to the hippocampus.

12. According to Hebb, the group of neurons that are activated by a particular stimulus configuration
    should be referred to as a ________________ circuit.

13. In class, we noted anatomical similarities between the neural circuitry that underlies the phenomenon
    of ________________ and the neural circuitry that allows us to orient to
    specific stimuli in the environment.

14. **True or False:** Traditional antianxiety drugs like Valium begin to exert a clinical improvement of
    symptoms **after 2-3 weeks of administration.**
    A: ____________________________

15. According to your text, drugs that are effective against the symptoms of schizophrenia in the absence
    of a simple antagonism of D-2 receptors in the brain, are called ________________
    neuroleptics.
Section III. Diagram. Examine the illustration of the brain that is provided, and then match each statement to the letter of the appropriate brain structure. Note that there may be more than 1 correct letter for each statement. (10 points)

Figure 21.3

Statement 1: This brain region is active when a person is trying to detect specific target events occurring in their environment. ______

Statement 2: This brain region inhibits the activity of the HPA axis. ______

Statement 3: This brain region allows a person to remember the temporal sequence of events. ______

Statement 4: This brain region increases the activity of the HPA axis. ______

Statement 5: This brain region releases ACTH into the bloodstream and stimulates the release of corticosterone from the adrenal glands. ______

Statement 6: This brain region was removed in patient HM. ______

Statement 7: Damage to this brain region prevents a person’s gaze from shifting from a fixation point to targets located in the contralateral visual field. ______

Statement 8: This brain region is damaged in patients with Wernicke-Korsakoff’s syndrome. ______

Statement 9: This brain region may be damaged in patients suffering from schizophrenia. ______

Statement 10: Neurons in this brain region die if an animal is exposed to chronic stress. ______
Section IV. Essay Question. Complete ONE of the following essay questions; your answer should be about 1.5 – 2 pages long, neatly spaced, and written in your best prose (e.g., full sentences; paragraphs; tell me a story!). Worth 30 points.

1. Compare and contrast the role of the prefrontal cortex, the striatum, and the hippocampus in cognitive function. Include the types of behavioral paradigms you would use to assess the cognitive function of each “system”; the types of deficits that are produced by lesions in these 3 regions; and which system is most important (and why you believe this to be true).

2. Discuss the diathesis-stress model of mental illness within the context of any of the 3 mental illnesses that were discussed. Include a basic outline of the function of the HPA axis and the role that stress-induced changes there might have in the etiology of the mental illness that you are writing about.