1. The _____ is a limbic structure that is particularly susceptible to anoxic injury.
   A. hippocampus ✓
   B. anterior nucleus of the thalamus ×
   C. cingulate gyrus ✓
   D. amygdala ✓
   E. putamen ×

2. The following correctly describes a typical frontal-subcortical circuit:
   A. striatum → frontal cortex → globus pallidus → thalamus → striatum
   B. frontal cortex → amygdala → fornix → hippocampus → frontal cortex
   C. striatum → putamen → substantia nigra → thalamus → striatum
   D. frontal cortex → striatum → globus pallidus → thalamus → frontal cortex
   E. frontal cortex → motor cortex → spinal cord → frontal cortex

3. Interruption of blood flow through the following vessel would likely lead to deficits including specific problems with episodic memory formation:
   A. anterior cerebral artery ×
   B. posterior cerebral artery ✓
   C. posterior inferior cerebellar artery ×
   D. anterior spinal artery ×
   E. ophthalmic artery ×

4. You are consulted on a patient who appears awake, but seems incapable of responding to questions or following commands. Upon further examination, it becomes clear that she is aware of her environment but is having difficulty generating spontaneous actions. You decide that her disorder may be due to damage to the

   A. amygdala
   B. mammillary bodies ×
   C. hippocampus ×
   D. septal nuclei ×
   E. anterior cingulate gyrus apathy

   [Handwritten notes: amnesia, akathetic mutism, bulbar]
5. The rate limiting enzyme in dopamine synthesis is:
   A. phenylalanine hydroxylase
   B. DOPA decarboxylase
   C. tyrosine hydroxylase
   D. choline acetyltransferase
   E. monamine oxidase

6. Clozapine, an atypical neuroleptic, exhibits only minimal extrapyramidal side effects because:
   A. It is a monoamine oxidase inhibitor ✗
   B. It is a weak antagonist at D1 and D2 receptors ✓
   C. It is an antagonist at 5-HT₂A receptors ✓
   D. A and B only ✗
   E. B and C only

7. Which of the following neurotransmitter/primary cell body pairs is INCORRECT?
   A. norepinephrine/ globus pallidus ✓
   B. dopamine/ substantia nigra ✗
   C. serotonin/ dorsal raphe area ✗
   D. acetylcholine/ nucleus basalis of Meynert ✗
   E. glutamate/ cerebral cortex ✗

8. Glutamic acid decarboxylase (GAD) is necessary for:
   A. Synthesis of glutamate ✗
   B. Synthesis of GABA ✓
   C. Synthesis of acetylcholine
   D. Synaptic degradation of GABA
   E. Limiting the toxic effects of certain drugs

9. Antidepressants like fluoxetine (Prozac) act by:
   A. inhibition of synaptic neurotransmitter enzymatic degradation
   B. blocking serotonin synthesis
   C. boosting serotonin synthesis
   D. directly stimulating norepinephrine receptors
   E. blocking synaptic reuptake of serotonin ✓

10. The key action of which neurotransmitter directly involves opening of a chloride channel?
    A. Glutamate
    B. GABA ✓
C. Dopamine  
D. Norepinephrine  
E. Serotonin  

11. Which of the following neurotransmitters activate neurotransmitter-gated ion channels? 
A. Nitric Oxide (NO)  
B. GABA  
C. Dopamine  
D. A and B only  
E. A, B, and C  

12. Sildenafil (Viagra) is effective because it: 
A. activates nitric oxide synthetase  
B. prevents NO-mediated vasodilation  
C. causes erection even in the absence of sexual stimulation  
D. activates voltage-gated sodium channels  
E. inhibits cGMP phosphodiesterase  

13. A recent T2-weighted MR scan on a patient shows that the ventricles appear bright, while many other structures look darker. This is probably because 
A. The MR scan was performed incorrectly.  
B. The patient has an infection involving the ventricles.  
C. The patient has metastatic brain cancer.  
D. The patient has cerebral spinal fluid in his ventricles.  
E. The patient’s ventricles are full of clotted blood from a recent subarachnoid hemorrhage.  

14. The best imaging modality for detecting a possible acute cerebral hemorrhage in a patient presenting to the emergency room is: 
A. CT without contrast  
B. CT with contrast  
C. T1-weighted MR  
D. T2-weighted MR  
E. SPECT  

15. Gadolinium is: 
A. An anxiolytic agent used to relax patients before imaging procedures  
B. A contrast agent used for MR scans  
C. A contrast agent used for CT scans  
D. The substance that makes bone appear bright on CT  
E. None of the above
16. This brain region has recently been most strongly implicated in OCD:
   A. putamen ✓
   B. occipital cortex
   C. medial temporal lobe
   D. orbitofrontal cortex ✓
   E. pons

17. Alzheimer’s disease (AD) differs from frontal type dementia in all of the following ways EXCEPT:
   A. AD is characterized by generalized and hippocampal atrophy ✓
   B. Neuropsychological testing will often reveal frank amnesia in AD patients ✓
   C. There’s less atrophy in the frontal lobe early on in AD ✓
   D. Behavioral and personality changes show up earlier in AD patients ✗
   E. None of the above

18. Patients with dorsolateral dysfunction may show the following symptoms:
   A. Perseveration, poor judgement, and difficulty integrating sensory information ✓
   B. Marked short term memory loss ✓
   C. Emotional volatility and difficulty in naming objects ✗
   D. Akinetic mutism and seizures ✗
   E. None of the above

19. Which of the following statements is true?
   A. There are few direct connections between the cortex and subcortical areas ✗
   B. Small subcortical lesions can mimic large cortical lesions ✓
   C. Excitability and hyperactivity are key features of subcortical damage ✓
   D. A and B only ✗
   E. B and C only ✓

20. Smell discrimination is mostly closely associated with which region?
   A. Dorsolateral frontal
   B. Subcortical regions (including thalamus)
   C. Cingulate gyrus
   D. Mesial frontal cortex
   E. Orbital Frontal cortex ✓
21. Which of the following drugs can induce schizophrenia-like psychotic symptoms?
A. Amphetamines ✓
B. Ketamine ✓
C. Phencyclidine (PCP) ✓
D. A and C only
E. A, B, and C

22. Sadness and depression are most closely associated with which of the following?
A. Increased levels of serotonin ✗
B. Increased levels of norepinephrine ✗
C. Reduced activity of the hypothalamic-pituitary axis ✗
D. Decreases in dorsal limbic activity ✓
E. All of the above

23. A common characteristic of antidepressant drugs is that:
A. They usually work by suppressing catecholamines ✓
B. It may take days or weeks before the therapeutic effect is obvious ✓
C. They do not typically cross the blood-brain barrier ✗
D. They really don’t help relieve depression in most patients ✗
E. None of the above

24. True or False: “Affect” is the subjective experience that a patient can describe to you, while “mood” is your description of how they appear to feel.
A. True ✓
B. False ✗

25. All of the following neurotransmitters and hormones are thought to be involved in the development of depression EXCEPT-
A. Serotonin ✓
B. Thyroid hormone ✓
C. Growth hormone ✓
D. Norepinephrine ✓
E. No exceptions- ALL of the above may be involved in depression

26. Which of the following could result in obesity?
A. Low circulating levels of leptin ✓
B. Development of a tumor in the third ventricle ✓
C. Inhibition of neuropeptide Y activity ✗
D. A and B ✓
E. A, B, and C
27. All of the following factors are important in short-term control of meal size EXCEPT:
A. Taste and smell
B. Minute-to-minute changes in blood leptin levels ✗
C. Minute-to-minute changes in blood glucose levels
D. CCK activation of the vagus nerve ✓
E. Gastroesophageal distension ✓

28. Eating behavior is affected by:
A. Hypothalamic glucose receptors ✓
B. Positively reinforced sensory stimuli ✓
C. Negatively reinforced sensory stimuli ✓
D. A and B
E. A, B, and C

29. True or False: Because they are essentially contradictory, the lipostatic hypothesis and the glucostatic hypothesis cannot both be correct.
A. True
B. False

30. True or false. A rat that repeatedly presses a lever to stimulate an electrode in its nucleus accumbens will no longer be driven to do this if a dopamine antagonist is administered.
A. True ✓
B. False

31. True or false. As a general rule, the intrinsic characteristics of the drug determine how addictive it will be, while how the drug is administered doesn't really play a role.
A. True
B. False
32. Which of the following products most closely mimics the nicotine spike delivered by cigarettes?
A. Nicorette (gum)
B. Nicoderm (patch)
C. Nicotine nasal spray ✓
D. Zyban (Bruprion)
E. Nicotine vapor inhaler
33. One key effect of nicotine that may contribute to dependence is:

A. Increased activity of synaptic nicotine reuptake mechanisms
B. Inhibition of monoamine oxidase enzymes ✓
C. Chronic damage to the locus ceruleus
D. Long-term suppression of adrenal steroids ✗
E. None of the above

34. True or False: Patients with impaired episodic memory may display a temporal gradient of memory loss (i.e. older memories may be relatively preserved).

A. True
B. False

35. Remembering what you had for breakfast this morning involves:

A. Declarative memory ✓
B. Procedural memory
C. Episodic memory ✓
D. A and C
E. None of the above

36. Which of the following statements is FALSE?

A. Semantic memory is impaired in Alzheimer’s Disease patients ✓
B. Skill learning is intact in Alzheimer’s Disease patients ✓
C. Semantic memory is intact in Huntington’s Disease patients ✓
D. Central executive function is intact in Huntington’s Disease patients ✗
E. Semantic memory is impaired in patients with midline, prefrontal cortex damage following closed head injury ✓

37. True or false- The existence of selective impairments in semantic memory (such as the inability to remember inanimate objects) suggests that semantic memory is stored in specific, discrete brain regions.

A. True
B. False
38. OCD patients frequently have which of the following kinds of additional problems?
A. depressive symptoms
B. panic and other anxiety symptoms
C. tics or tic disorders
D. B and C only
E. A, B, and C

39. True or false: A lesion of the ventral medial hypothalamic nucleus can lead to hyperphagia and obesity.
A. True
B. False

40. Nicotine is associated with all of the following physiological effects EXCEPT:
A. Increased heart rate
B. Lipolysis
C. Vasodilation
D. Skeletal muscle relaxation
E. Increased metabolic rate

41. An older physician colleague comes to your office to discuss your research. When you mention a recent dramatic case that he had referred to you, you are surprised that he doesn’t recall the patient at all. When you remind him of the diagnosis, however, he is able to describe many of the pertinent details of the case. You notice that he describes the information out of order, and has trouble remembering the sequence of episodes in this patient’s history. Your colleague is mostly likely experiencing:
A. Medial temporal lobe amnesia
B. Alzheimer’s disease
C. Wemicke-Korsakoff syndrome
D. Frontal-lobe amnesia
E. Herpes encephalitis

42. The dorsolateral frontal lobe area is primarily involved in what functions?
A. inhibition/modulation of impulses and emotions
B. executive abilities
C. motivation and drive
D. addictive behavior
E. none of above
43. The most likely diagnosis for the patient depicted in figure 1 (above) is:
A. Pick's Disease ×
B. Herpes encephalitis
C. Acute MCA infarct
D. Alzheimer's Disease
E. stroke in the left hippocampus

44. Which of the following symptoms would be most typical for the patient depicted in figure 1?
A. Severe, early emotional changes
B. Contralateral hemiparesis
C. Impaired skill-learning
D. A pattern of waxing and waning motor and sensory deficits
E. Impaired episodic memory ✓

45. One structure which appears particularly atrophic in figure 1 is:
A. Amygdala
B. Hippocampus ✓
C. Mammillary bodies
D. Pons
E. Subcortical white matter

46. The image depicted in figure 1 is best described as a:
A. MR, T1 type, coronal plane
B. MR, T1 type, sagittal plane
C. MR, T2 type, coronal plane
D. MR, T2 type, sagittal plane
E. none of above
E. none of the above

![MRI image]

Figure 2

47. The image shown in figure 2 is what type of imaging modality?
A. CT scan without contrast
B. MR scan, T1-weighted
C. MR scan, T2-weighted
D. PET scan
E. SPECT scan

48. For a 30 year old woman in generally good health, presenting with bilateral leg weakness, the most likely diagnosis for the image shown in figure 2 is:
A. MCA infarct
B. Herpes encephalitis
C. Multiple Sclerosis
D. Toxoplasmosis
E. Subdural hematoma

49. Continued, severe progression of subcortical damage of the type shown in figure 2 would most likely lead to:
A. cognitive slowing, impaired memory retrieval and depression
B. violent, flinging motions of the arms and legs
C. Hyperactivity and attentional problems
D. Severe episodic memory deficits with intact procedural memory
E. none of the above

50. The findings in figure 2 could best be described as:
A. two large, confluent areas of high signal adjacent to the lateral ventricles
B. two large, confluent areas of low signal adjacent to the lateral ventricles
C. high signal filling prominent sulci in a diffuse pattern
D. multiple punctate areas of high signal in subcortical white matter
E. C and D only
51. Choose the best description for the findings in Figure 3a:
A. marked cerebellar and pontine atrophy
B. large area of high signal in the epidural space
C. dramatic hydrocephalus
D. large atrophic area, predominantly affecting the frontal lobe
E. no abnormalities apparent on imaging

52. Which type of images are figures 3a and 3b?
A. 3a-MR T1  3b- MR T2
B. 3a-MR T2  3b- MR T1
C. 3a-CT scan  3b- MR T1
D. 3a-MRT1  3b- SPECT
E. 3a-MR T2  3b- SPECT

53. The most likely diagnosis for the patient depicted in figure 3 (above) is:
A. Pick’s Disease
B. Herpes encephalitis
C. Obsessive-compulsive disorder
D. Alzheimer’s Disease
E. Multiple sclerosis

54. Typical symptoms in the patient depicted above include:
A. Obsessions and compulsions
B. Marked “subcortical slowing” due to white matter damage
C. Severe, early deficiencies of episodic memory
D. Emotional lability and impaired insight
E. Severe, early deficiencies of procedural memory
55. A 40 y/o male patient in previously good health presents to the ER with partial complex seizures and a low grade fever. Based on the image shown in figure 4, what is the most likely diagnosis?
A. Toxoplasmosis
B. Hemorrhage of the middle-meningeal artery
C. Multiple Sclerosis
D. Herpes encephalitis ✓
E. Infarct in the territory of the anterior cerebral artery

56. Given that the lesion shown is a right-sided lesion. The expected behavioral abnormalities or mental deficits in this patient would be:
A. Perseveration and disinhibition
B. Impairment of spatial memory ✓
C. Impairment of verbal memory
D. Impairment of working memory
E. Left-sided hemi-neglect syndrome

57. This T2-weighted MR scan shows:
A. a fairly large area of confluent high signal in the medial temporal lobe ✓
B. a fairly large area of confluent low signal in the medial temporal lobe
C. a ring enhancing lesion in the left medial temporal lobe
D. a large area of high signal in the right occipital lobe
E. multiple punctate areas of high signal in the right and left hippocampi
58. A patient with dorsolateral dysfunction will mostly likely exhibit:
A. Hemiplegia 
B. Poor visual search
C. Apathy
D. Socially inappropriate behavior 
E. Perseveration

59. A patient with orbitofrontal dysfunction will mostly likely exhibit:
A. Hemiplegia
B. Poor visual search
C. Apathy
D. Socially inappropriate behavior
E. Perseveration

60. Frontal-subcortical connections are thought to play a role in obsessive-compulsive disorder. Which one of the following connections are most likely to contribute to OCD?
A. excitatory pathway from orbitofrontal cortex to basal ganglia
B. excitatory pathway from thalamus to orbitofrontal cortex
C. inhibitory pathway from caudate to orbitofrontal cortex
D. A and B only
E. B and C only

61. What drives nicotine addicts to have the first cigarette of the morning?
A. high plasma nicotine levels and sensitized nAChRs
B. high plasma nicotine levels and desensitized nAChRs
C. low plasma nicotine levels and sensitized nAChRs
D. low plasma nicotine levels and densitized nAChRs
E. tolerance effects are most dramatic in the morning
The following questions (62-72) refer to Figure 5, located on the last page.

62. The function of structure “A” could best be described as:
A. Modulation of behaviors and memories associated with fear and anxiety
B. Regulation of motivation and drive
C. Primary processing of olfactory signals
D. Consolidation of episodic memories
E. None of the above

63. Hyperactivity in the area marked “B” are most closely associated with:
A. Lip-smacking and olfactory hallucinations
B. Fear and depersonalization
C. The positive symptoms of schizophrenia
D. Obsessions and compulsions
E. Temporally-graded retrograde amnesia

64. The structure marked “C” could best be described as:
A. A posterior nucleus of the hypothalamus
B. A posterior nucleus of the thalamus
C. A ventral process of the midbrain
D. A portion of the medial temporal lobe
E. A key pontine white-matter tract

65. The key neurotransmitter associated with structure “D” is:
A. Norepinephrine
B. Serotonin
C. Acetylcholine
D. GABA
E. Dopamine

66. Structure “D” is primarily involved in which of the following functions?
A. Modulation of emotional behavior
B. Direct activation of the cortical spinal tract
C. Initiation of movement and regulation of motor tone
D. The “reward” pathway in substance abuse
E. Motivation and drive

67. Which of the following drugs would have the strongest effect on the function of pathways beginning at structure “D”? (X)
A. Clozapine
B. Imipramine
C. Fluoxetine
D. Haloperidol
E. Benzodiazepines

68. Damage to structure “C” is most closely associated with which of the following conditions?
   A. Alzheimer’s Disease
   B. Wernicke-Korsakoff syndrome
   C. Kluver-Bucy Syndrome
   D. Herpes encephalitis
   E. Parkinson’s Disease

69. The fornix connects which two structures in figure 5?
   A. Structure A and B
   B. Structure B and C
   C. Structure C and D
   D. Structure A and C
   E. none of the above

70. Structure E contains primary cell bodies for which neurotransmitter?
   A. Norepinephrine
   B. Serotonin
   C. Acetylcholine
   D. GABA
   E. Dopamine

71. Abnormalities in this neurotransmitter (the one associated with structure E) are most closely associated with which condition?
   A. Alzheimer’s Disease
   B. Parkinson’s Disease
   C. Huntington’s Disease
   D. Depression
   E. C and D only

72. The drug which most selectively affects the neurotransmitter in structure E is:
   A. Tacrine
   B. Haloperidol
   C. Fluoxetine
   D. L-dopa
   E. Nicotine

YOU JUST FINISHED YOUR FINAL EXAM OF FIRST YEAR!

ENJOY THE SUMMER!!!