Biomed 370 – Brain and Behavior
Final Exam - Spring, 2002

Questions 1-3. A 27-year old prostitute presents to the Emergency Room after a car accident. She is conscious, but has multiple bruises including a small laceration on her forehead. She is uncooperative and won’t provide a medical history, but this is her 2nd car accident during the last month. Physical exam reveals some left-sided clumsiness and sensori-motor deficits. The ER resident orders a neuroimaging scan, shown in Figure 1.

1. Choose the best description for the image shown in figure 1.
   a. CT scan with contrast
   b. T2 weighted MR without contrast
   c. T1 weighted MR with contrast
   d. T2 weighted MR with contrast
   e. CT scan with contrast

2. The lesion shown in figure 1 is best described as:
   a. a left-sided wedge-shaped hypointense region
   b. a right-sided wedge-shaped hypointense region
   c. a left-sided ring-enhancing lesion
   d. a right-sided ring-enhancing lesion surrounded by a large hypodense area
   e. a right-sided ring-enhancing lesion surrounded by a large hyperdense area

*note: 1 additional wrong answer between 45 & 71

Name: ____________________________
3. The most likely diagnosis for the patient described in the vignette, based on the findings in figure 1 is:
   a. Epidural hematoma
   b. Subdural hematoma
   C. Cerebral abscess
   d. Anterior cerebral artery infarct
   e. Multiple Sclerosis

4. Wernicke-Korsakoff syndrome is due to a dietary deficiency of which of the following compounds?
   a. Vitamin A
   b. Calcium
   c. Thiamine
   d. Folate
   e. Ketchup

5. Wernicke-Korsakoff syndrome involves direct damage to which structure(s)?
   a. amygdala
   b. mammillary bodies
   c. caudate
   d. a and b only
   e. b and c only

6. Substances which appear dark on a CT scan include:
   a. water
   b. old blood (i.e. from a hemorrhage that occurred 4 weeks ago)
   c. virtually anything that is very dense
   d. a and b only
   e. a, b, and c

7. Currently the most practical screen in the emergency room for an acute cerebral hemorrhage would be:
   a. CT with contrast
   b. CT without contrast
   c. MR with contrast
   d. MR without contrast
   e. none of the above can identify an acute cerebral bleed
Questions 8-11: A 45 year old female with a history of hypertension and alcohol use presents to the doctor with a 2 year history of intermittent sensori-motor problems. She states that she briefly lost hearing in her left ear for about 2 months last year. She also occasionally notices tingling in her right hand, which may last several weeks. The physician orders a number of tests, including the scan shown in figure 2.

8. The image shown in figure 2 is best described as:
   a. T2-weighted MR scan
   b. FLAIR MR scan without contrast
   c. CT scan without contrast
   d. CT scan with contrast
   e. None of the above

9. Disadvantages to this particular imaging technique include:
   a. Cost- it’s fairly expensive
   b. Poor visualization of white matter disease
   c. Poor visualization of the posterior fossa
   d. A and B only
   e. B and C only
10. Choose the best description of the findings shown in figure 2:
   a. Multiple small hyperintense lesions in the gray matter
   b. Multiple small hyperintense lesions in the white matter
   c. Multiple small hypointense lesions in the white matter
   d. Diffuse cerebral atrophy
   e. Several areas of "beam-hardening" artifact due to metal

11. The most likely diagnosis for the patient described in the clinical vignette and shown in figure 2 (on previous page) is:
   a. Toxoplasmosis
   b. Herpes encephalitis
   c. Anoxic injury
   d. Multiple Sclerosis
   e. Prior gunshot wound

![Figure 3]

Questions 12-14: A 64 year old male patient is brought to the neurologist's office by his wife who complains that her husband has not been himself lately. After taking a full history and seeing the patient during several office visits, the neurologist decides to order some neuroimaging tests. An example of the results are shown in Figure 3.

12. Select the best description for the findings shown in this image:
   a. Hypointense regions in the basal ganglia
   b. Subdural hematoma
   c. Diffuse cerebral and cerebellar atrophy
   d. Cerebral atrophy that is most notable in frontal regions
   e. Large hypodense region in middle cerebral artery territory
13. Which symptoms would most likely be associated with the neuroimaging findings in figure 3?
   a. Panic attacks and hyperorality
   b. Severely impaired semantic memory
   c. Personality changes and impaired metamemory judgements
   d. Impaired skill-learning
   e. None of the above

14. The findings in figure 3 are most characteristic of which disease process?
   a. Pick’s disease
   b. Huntington’s disease
   c. Wemicke-Korsakoff syndrome
   d. Alzheimer’s disease
   e. Parkinson’s disease

15. Over the past three years, several colleagues have remarked that a 70-year old school superintendent has begun acting oddly. During school board meeting he occasionally makes off-color remarks, and he seems now and then to tell stories that are just not true. Damage to which brain region might produce such characteristic behavior?
   a. Dorsolateral cortex
   b. Cingulate gyrus
   c. Globus pallidus
   d. Orbitofrontal cortex
   e. Hippocampus

16. The principal of the high school starts acting strangely after a stroke. Visitors note that she “just kind of sits there”. She appears fully alert, but does not talk or move very much (sounds like a medical student, huh?). These symptoms are characteristic of damage to which brain region?
   a. Dorsolateral cortex
   b. Cingulate gyrus
   c. Amygdala
   d. Orbitofrontal cortex
   e. Hippocampus

17. All the following neurotransmitters are metabolized by MAO except:
   a. Acetylcholine
   b. Catecholamines
   c. Dopamine
   d. Norepinephrine
   e. Serotonin
18. Serotonin syndrome usually presents clinically with:
   a. Chorea
   b. Confusion, agitation, obtundation
   c. Panic disorder
   d. Hyporreflexia
   e. Impaired learning and memory

19. Clozapine, an atypical antipsychotic drug, is different from classical (typical) antipsychotics because:
   a. It has greater specificity for D2 receptors
   b. It has greater D2 receptor occupancy
   c. It does not act at alpha-adrenergic, muscarinic, and histamine receptors
   d. It has greater efficacy for negative symptoms
   e. It is less efficacious against psychotic symptoms

20. Symptoms of major depression include all of the following EXCEPT:
   a. Large increase or decrease in appetite
   b. Fatigue or loss of energy
   c. Loss of long-term memory
   d. Inability to sleep or excessive sleeping
   e. Inappropriate guilt

21. In temporally-graded retrograde amnesia, it is more difficult to retrieve older memories than more recent ones.
   a. True
   b. False

22. Excessive or ritualized hand-washing is an example of an obsession.
   a. True
   b. False

23. Which of the following would increase feeding behavior?
   →a. increase in NPY levels
   b. lesion in the lateral hypothalamus
   c. lesion in the ventromedial hypothalamus
   d. A & B only
   e. A & C only
24. Injection of leptin into the ventricles of a rat would have the following effect:
   a. ↑NPY, ↑feeding behavior
   b. ↓NPY, ↓feeding behavior
   c. ↑NPY, ↓feeding behavior
   d. ↓NPY, ↑feeding behavior
   e. none of the above

25. Although cocaine has effects in numerous brain regions, the *stereotypic behaviors* following cocaine use (pacing, nailbiting, etc.) are best explained by cocaine’s effect on the:
   a. nucleus accumbens
   b. ventral tegmental area
   c. caudate and putamen
   d. prefrontal cortex
   e. A, B, & D

26. Which of the following is NOT true of nicotine action in the CNS?
   a. nicotinic receptors in the brain induce dopamine release
   b. nicotinic receptors are down-regulated during periods of low nicotine
   c. nicotinic receptors are desensitized in response to high levels of nicotine
   d. with prolonged use, more nicotine may be required to achieve desired effects (tolerance)

27. Injury to the basal ganglia would most likely impair:
   a. semantic memory
   b. short-term memory
   c. episodic memory
   d. procedural memory
   e. All of the above

28. Which neuroendocrine changes have been implicated in depression?
   a. decreased levels of thyroid stimulating hormones
   b. increased NE influence on corticotropin releasing factor
   c. increased responsiveness to growth hormones
   d. increased serotonin influence on attention and memory
   e. overactive hypothalamic-pituitary-adrenal axis
29. Dementia of the frontal lobe commonly presents with the following EXCEPT:
   a. Severe episodic memory deficits
   b. Early changes in personality
   c. Deficits in inhibitory functions
   d. Deficits in executive functions

30. In the cognitive belt, the cingulum bundle connects the anterior cingulate to which of the following structures labeled in figure 4?
   a. Region A
   b. Region B
   c. Region C
   d. Region D
   e. None of the above

31. Structure C in figure 4 is the outflow track of which structure(s)?
   a. Hippocampus
   b. Septal Nuclei
   c. Amygdala
   d. A and B only
   e. A and C only
32. Which of the following regions in figure 4 are most likely to be damaged by a vitamin deficiency in alcoholism?
   a. Region A
   b. Region B
   c. Region C
   d. Region D
   e. Region E

33. In the cognitive belt, structure E sends nerve fibers to which structure?
   a. Hippocampus
   b. Septal Nuclei
   c. Amygdala
   d. Anterior nucleus of the thalamus
   e. Anterior cingulate gyrus

34. Which of the following neurological abnormalities are thought to contribute to depression?
   a. Decreased dorsal limbic activity
   b. Decreased ventral limbic activity
   c. Increased ventral limbic activity
   d. A and B only
   e. A and C only

35. Abnormalities of which of the following neuroendocrine systems are thought to contribute to depression?
   a. Hypothalamic-pituitary-adrenal (HPA) axis
   b. Growth hormone and gonadotropins
   c. Hypothalamic-pituitary-thyroid (HPT) axis
   d. All of the above
   e. A and C only

36. The lipostatic hypothesis of feeding control states that:
   a. the brain regulates feeding based on circulating factors which signal the size of the body’s fat mass
   b. the brain regulates feeding based on circulating levels of glucose
   c. ventromedial hypothalamic lesions must increase the body’s fat mass
   d. dilation of the esophagus directly stimulates feeding behavior
   e. the amount of fat mass an individual is born with must stay constant throughout that individual’s lifetime
37. Positive symptoms of schizophrenia include all of the following EXCEPT:
   a. visual hallucinations
   b. auditory hallucinations
   c. delusions
   d. bizarre behavior
   e. anhedonia

38. The major structures of the reward pathway include:
   a. anterior cingulate, midbrain tectum, and basal ganglia
   b. anterior cingulate, midbrain tectum, and septal nuclei
   c. ventral tegmental area, nucleus accumbens, and prefrontal cortex
   d. ventral tegmental area, midbrain tectum, and basal ganglia
   e. none of the above

39. In addition to the hippocampus, other structures that are particularly prone to
damage in Alzheimer’s Disease include:
   a. mamillary bodies and thalamus
   b. septal nuclei and temporoparietal association cortices
   c. Stria terminalis and fornix
   d. Cingulum and amygdala
   e. All major white matter tracts

40. Which of the following would logically be the most effective treatment for
Alzheimer’s Disease?
   a. A monoamine oxidase inhibitor (MAOI)
   b. A drug which increases synthesis of norepinephrine
   c. A drug which blocks norepinephrine reuptake
   d. A drug which blocks enzymatic breakdown of acetylcholine
   e. A drug which blocks synaptic reuptake of dopamine

41. Which of the following is a key locus of serotonergic cell bodies?
   a. Locus ceruleus
   b. Nucleus basalis of meynert
   c. Dorsal raphe nuclei
   d. Caudate nucleus
   e. Ventral tegmental area
42. One of the similarities between barbiturates and alcohol is:
   a. Both markedly increase the activity of acetylcholine
   b. Abuse of either substance is thought to lead to schizophrenia
   c. Abuse of either substance usually results in seizures
   d. Both drugs facilitate the opening of a chloride channel at GABA A receptors
   e. The effects of both drugs can be blocked by atropine

43. Three structures located within the medial temporal lobe include:
   a. hippocampus, striatum, and thalamus
   b. hippocampus, amygdala, and olfactory cortex
   c. fornix, cingulum, and olfactory cortex
   d. locus ceruleus, raphe nuclei, caudate
   e. septal nuclei, mamillary bodies, raphe nuclei

44. Blockage of which artery or arteries would most likely affect the hippocampus?
   a. anterior cerebral artery
   b. middle cerebral artery
   c. posterior cerebral artery
   d. anterior choroidal artery
   e. B and C only

45. SPECT neuroimaging would be particularly useful if you wanted to:
   a. Identify small anatomic abnormalities in the basal ganglia
   b. Identify a skull fracture
   c. Rule out an acute bleed
   d. Study patterns of neuronal activity and metabolism within the brain
   e. Diagnose an individual with schizophrenia

46. Which of the following most accurately describes working memory?
   a. Limited capacity, long term, involves hippocampus
   b. Limited capacity, short term, involves hippocampus
   c. Limited capacity, short term, involves prefrontal cortex
   d. Unlimited capacity, long term, involves prefrontal cortex
   e. Unlimited capacity, short term, involves prefrontal cortex

47. The addictive capacity of heroin, cocaine, and nicotine most likely stems from the ability of these substances to:
   a. activate nicotinic acetylcholine receptors
   b. inhibit GABA activity
   c. activate certain neuronal groups in the ventral tegmental area and n. accumbens
   d. inhibit the hippocampus
   e. circulate for hours in the bloodstream without being broken down
Vignette- Questions 48-53: A 26 year old female goes to the OB/GYN for a prescription for oral contraceptives. She began smoking only socially at age 15, but is now up to one and a half packs-per-day. You explain to her that smoking is a contraindication for oral contraceptives, and she admits that she has tried to quit smoking in the past but hasn’t been successful, because she finds that she craves that first-morning cigarette just too much. She would, however, like to quit, and asks for your advice.

48. What is the physiologic mechanism behind her early morning cravings?
   a. In the daytime, nicotinic receptors are upregulated, and overnight they are reactivated
   b. In the daytime, nicotinic receptors are upregulated, and overnight they are inactivated
   c. In the daytime, nicotinic receptors are down-regulated and overnight they are reactivated
   d. In the daytime, nicotinic receptors and down-regulated and overnight they are inactivated
   e. Overnight, nicotinic receptors are both upregulated and reactivated

49. Which of the following nicotine replacement therapies would most mimic the nicotine spike that occurs with cigarettes?
   a. inhaler alone
   b. inhaler and gum
   c. gum alone
   d. nicotine patch
   e. nasal spray

Nicotine can affect many neurotransmitters in the CNS. Match the following effects of nicotine with the NT it is associated with. (Some answers may be used more than once or not at all):

50. improving short term memory ———— A. Acetylcholine
51. stress reduction ———— B. Dopamine
52. ↑ arousal, stimulation ———— C. Norepinephrine
53. activation of reward pathways ———— D. Endogenous opioids
Vignette- Questions 54-56: A 22 year old man was brought into the emergency room because he was found yelling obscenities and mumbling to himself on the Terrace outside the Biomedical Center. When interviewed, he claims that a TV program he watched warned him that his anatomy lab partners are trying to hurt him. His roommate has been holed up in the Sciences Library, and does not know how long these symptoms have been going on. The patient seems very withdrawn, and you suspect that he was not going to head over to Max's to socialize after exams.

54. In schizophrenia, decreased mesocortical activity is associated with all of the following symptoms EXCEPT:
   a. Ahedonia
   b. Alogia
   c. Apraxia
   d. Avolition
   e. Attention Impairment

55. If this were an acute event brought on by drug abuse, which of the following drugs is LEAST likely to have precipitated the event?
   a. Ketamine
   b. PCP
   c. LSD
   d. Clozapine
   e. Amphetamines

56. The cortex primarily involved in schizophrenia is also involved in integrating multimodal sensory information for memory storage and retrieval
   a. True
   b. False

57. Which of the following statement is NOT true regarding OCD?
   a. the age of onset is typically earlier than 25 years old
   b. males tend to have earlier onset
   c. males typically have more severe/refractory symptoms
   d. there is little evidence to support the role of genetics in OCD
   e. more than half of OCD patients also have depression
58. Imaging studies in OCD have supported which of the following statements:
   a. OCD is characterized by orbitofrontal hyperactivity
   b. OCD is characterized by orbitofrontal hypoactivity
   c. OCD patients have less overall brain activity than normal individuals
   d. there are no identifiable differences between OCD patients and controls
   e. b and c only

59. Which of the following drugs would be most appropriate for OCD therapy?
   a. L-dopa
   b. haloperidol
   c. chlorpromazine
   d. fluoxetine
   e. clonidine

60. A patient with Parkinson's Disease undergoes a battery of neurological testing—which of the following results is most likely?
   a. patient is able to learn and master new motor tasks, but later doesn't recall ever learning them
   b. patient has difficulty learning and mastering new motor tasks, and later cannot recall ever learning them
   c. patient has difficulty learning and mastering new motor tasks, but recalls being taught each task
   d. patient does not have the attention span to learn new motor tasks
   e. none of the above possibilities are likely

61. The primary site of degeneration in Parkinson's disease is located in the:
   a. cortex
   b. thalamus
   c. midbrain
   d. pons
   e. cerebellum

62. Which of the following does NOT play a role in short-term control of feeding?
   a. insulin
   b. leptin
   c. CCK
   d. smell
   e. bowel distension
63. Which of the following is true of depression?
   a. there is minimal evidence that genetic factors play a role in the disorder
   b. research has identified the gene locus that predisposes people to depression
   c. having a first-degree relative with depression increases your own risk for developing depression by threefold
   d. severe stress cannot trigger depression in the absence of genetic risk factors
   e. none of the above

64. Which of the following contributes to the addictiveness of cigarettes?
   a. nicotine has a relatively short half-life in the blood stream
   b. they produce a relaxed feeling by reducing heart rate
   c. nicotine increases the activity of the MAO enzymes
   d. receptors become increasingly sensitive to nicotine with repeated exposure
   e. they release a slow and constant level of nicotine into the blood

65. Which of the following is true of MRI neuroimaging?
   a. MRI is fast and relatively inexpensive
   b. the contrast used for MRI is nephrotoxic and is therefore rarely used
   c. MRI scanners work by detecting the differing behavior of hydrogen protons in various tissues
   d. b and c only
   e. none of the above

66. Which of the following drugs effectively halt the progression of the illness they are used to treat?
   a. L-dopa
   b. Carbidopa
   c. Aricept (an acetylcholinesterase inhibitor)
   d. A and B only
   e. none of the above

67. All of the following are enzymes involved in neurotransmitter synthesis
    EXCEPT:
    a. tryptophan hydroxylase
    b. dopa decarboxylase
    c. tyrosine hydroxylase
    d. monoamine oxidase
    e. choline acetyltransferase
68. Which of the following are true of declarative and semantic memory types?
   a. declarative memory is more "long-term" than semantic memory
   b. declarative memory is "knowing that", semantic memory is "knowing why"
   c. semantic memory is a type of declarative memory
   d. declarative memories stored in the hippocampus are called "semantic"
   e. declarative memory and semantic memory are essentially unrelated

Vignette- Questions 69-71: A 21 year old Brown graduate student is brought to the Health Clinic by her roommate because of a progressive decline in weight and preoccupation with being fat. She is 5' 3" and weighs 80 lbs. She reluctantly tells you that she has been working hard to keep her weight at 80 for more than 5 years and she panics if it is any higher. You make a diagnosis of anorexia nervosa.

69. Her weight loss could be due to:
   a. decreased leptin levels
   b. decrease in neuropeptide Y
   c. medications that stimulate the ventromedial hypothalamus
   d. a and b
   e. b and c

70. You learned in med school that anorexia nervosa can be lethal. If she refuses further care including having laboratory tests done you should:
   a. Explain your initial diagnosis of anorexia nervosa and strongly encourage her to complete the work-up and get treatment.
   b. Ask her permission to contact her parents and school supervisor, if appropriate
   c. Ask the med student rotating with you to help restrain her while you draw her blood for Chem-7, call the police, and arrange for an emergency admission to Butler Hospital.
   d. a and b
   e. a, b, and c

71. The best treatment for this student is:
   a. A serotonin reuptake inhibitor, like Prozac
   b. Behavioral therapy that focuses on changing eating habits and gaining weight
   c. A long-term rehabilitative approach that includes education about the illness and support for the patient and people close to her
   d. Inpatient hospitalization or day treatment to initiate a meaningful treatment regimen
   e. All of the above

congratulations- you're finished with 1st year!!!!!