Ahmedabad University

School of Arts and Sciences

BIO 250 Brain and Behaviour

Psychology (core) and campus-wide GER
End Term Examination 2024 (Winter Semester)

Total Marks: 90 points **Time: 1 hour, 40 minutes**

Name & Enrolment Number:

Date: April 22, 2024
No. of printed pages: 14

Instructions: This is a closed book exam. There is only one correct answer for each question. Circle or check the correct option and return the answer script to the examiners. Answer scripts without name or ID will be rejected. Answer scripts that are returned after the exam or after you have left the class, will not be accepted.

1. The term Diaschisis refers to:

a. the increased activity of surviving neurons after damage to surrounding neurons.
b. the decreased activity of surviving neurons after damage to surrounding neurons.
c. the increased activity of surrounding neurons after damage to an area
d. the decreased activity of surrounding neurons after damage to an area

2. Connections in the brain

a. are plastic during pre-natal development, and unchanging post-natally
b. are plastic till the age of five and unchanging afterwards
c. are plastic till early adulthood and unchanging afterwards
d. remain plastic throughout life

3. The opponent-process theory suggests that we perceive

a. color in terms of paired opposites
b. taste in terms of paired opposites
c. smell in terms of paired opposites
d. sound pitch in terms of paired opposites

4. The brain is most plastic

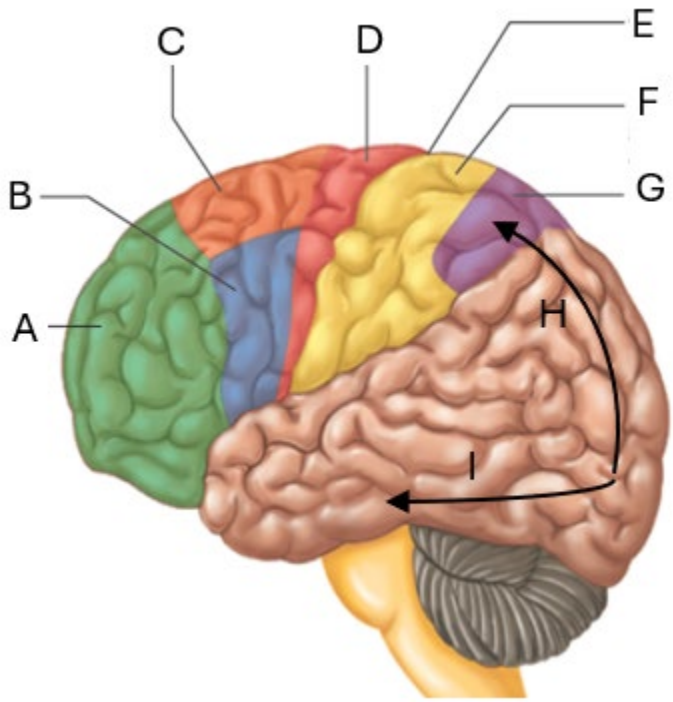
a. after about 60 days follows a stroke

b. after about 30 days follows a stroke

c. after about 15 days follows a stroke

d. immediately after a stroke

Questions 5 to 13 refer to the Principal Motor Areas and the major processing streams in visual processing. Identify each question the corresponding letter provided in the figure



5. Premotor cortex

6. Primary motor cortex

7. Dorsal stream

8. Central sulcus

9. Supplementary motor cortex

10. Posterior parietal cortex

11. Primary somatosensory cortex

12. Ventral stream

13. Prefrontal cortex

14. Color vision deficiency is contained in a gene located on
a. Chromosome 18
b. Chromosome 21
c. Chromosome X
d. Chromosome Y

15. The Law of specific nerve energies states that
a. activity in a particular part of the brain is devoted to a particular function
b. activity in a sensory nerve carries information to the brain stem
c. activity in a specific nerve always conveys the same kind of information to the brain
d. activity in various parts of the brain are independent of activity in other parts.

16. Which of the following is NOT true about the hormone CCK (cholecystokinin)?
a. The duodenum releases CCK when food distends the duodenum.
b. CCK tightens the sphincter muscle between the stomach and duodenum.
c. CCK crosses the blood-brain barrier and inhibits cells in the hypothalamus.
d. CCK stimulates the vagus nerve and causes cells in the hypothalamus to release CCK as a neurotransmitter.

17. The intensity of a sensory stimulus, including pain is coded by
a. an increase in the duration of an action potential
b. an increase in the amplitude of an action potential
c. an increase in the rate of action potentials
d. an increase in the number of synapses activated by a stimulus

18. The most common form of color deficiency is the inability to distinguish between
a. yellow and blue
b. yellow and red
c. green and blue
d. red and green

19. The Retinex theory suggests that
a. the retina compares information between neighboring receptors to determine brightness
b. the retina compares information between neighboring receptors to determine color
c. the cortex compares information from various parts of the retina to determine brightness and color
d. the cortex compares information from various parts of the visual cortex to determine brightness and color

20. The vomeronasal organ (VNO) is a set of receptors located:
a. in the inner ear.
b. near, but separate from, the olfactory receptors.
c. in the posterior one-third portion of the tongue
d. in the nasopharynx.

21. By what means does the brain find out about the nutrient content of food in the stomach?
a. Hormones
b. Activity of the vagus nerve
c. Activity of the splanchnic nerves
d. The duodenum

22. Which of the following senses sends input only to the ipsilateral hemisphere?
a. hearing
b. vision
c. smell
d. touch

23. The area that is activated by feeling disgusted is the same area of the brain responsible for:
a. sight.
b. smell.
c. taste.
d. hearing.

24. If we compare either different species or different ages, what trend emerges?
a. The less total sleep, the higher the percentage of REM sleep
b. The more total sleep, the higher the percentage of REM sleep
c. The more activity during wakefulness, the higher the percentage of REM sleep
d. The more activity during wakefulness, the lower the percentage of REM sleep

25. When do the secretions of melatonin begin?
a. just before a person awakens
b. when body temperature is at its lowest
c. when body temperature is at its highest
d. a couple of hours before a person naturally falls asleep

26. Specialized neurons for detecting osmotic pressure are found in the brain areas surrounding which structure?
a. third ventricle
b. nucleus dorsalis
c. pituitary gland
d. Hypothalamus

27. What is the first point in the digestive system where enzymes begin to break down food?
a. Mouth
b. Esophagus
c. Stomach
d. Small intestine

28. Humans expend most of their energy on what activity?
a. walking, running, and other forms of locomotion
b. in the beating of their hearts and blood circulation
c. propagating action potentials in the billions of neurons in the nervous system
d. maintaining basal metabolism

29. Some set points may vary considerably over time in order to respond to changes in the environment. This adaptability is known as:
a. homeostasis.
b. allostasis.
c. negative feedback.
d. homeothermic.

30. When a motor axon releases a neurotransmitter at the neuromuscular junction, the response of the muscle is to:
a. always relax.
b. always contract.
c. relax or contract, depending on the neurotransmitter.
d. relax or contract, depending on the muscle.

31. Poikilothermic organisms include
a. humans.
b. most mammals.
c. amphibians and reptiles.
d. all mammals and all fish.

32. Chemicals known as ____ and ____ guide neuron migration.
a. immunoglobulins; sodium
b. glia; neurotrophins
c. immunoglobulins; chemokines
d. chemokines; neurotrophins

33. Which statement is true about sound vibrations as they are transmitted from the outer ear to the oval window of the inner ear?
a. The force at the oval window is increased.
b. The pressure at the oval window is increased.
c. The velocity of oval window vibrations is increased to maintain pressure.
d. The velocity of oval window vibrations is reduced to maintain pressure

34. What process is predicted by the gate theory of pain?
a. Pain information grows more intense as it passes each synapse on its way to the brain.
b. Non-pain information can inhibit pain information.
c. Intense pain can shut out all other sensory information.
d. The intensity of pain experience depends entirely on the excitability of pain receptors.

35. The brain chemicals known as endorphins and enkephalins produce effects similar to which substance?
a. cannabinoids
b. barbiturates
c. opiates
d. amphetamines

36. A mild degree of pain releases the neurotransmitter ____. A more intense pain also releases ____.
a. glutamate, substance P
b. GABA, substance P
c. glutamate, dopamine
d. GABA, dopamine

37. A contraction of equal force in antagonist muscles of the arm would result in ____ of the arm.
a. flexion
b. extension
c. no movement
d. rotation

38. The surest way to disrupt the biological clock is to damage the:
a. substantia nigra.
b. caudate nucleus.
c. lateral hypothalamus.
d. suprachiasmatic nucleus.

39. Your posterior pituitary is most likely to release vasopressin
a. if you are very thirsty.
b. shortly after drinking a large glass of water.
c. if you are very hungry.
d. shortly after eating a large meal.

40. Compared to the earlier part, the later part of a night's sleep:
a. includes a larger percentage of REM sleep.
b. includes a lower percentage of REM sleep.
c. is characterized by declining body temperature.
d. has more slow wave sleep.

41. Why is morphine NOT used to suppress pain during surgery?
a. It is only effective while a person is conscious.
b. Its effects are local.
c. It inhibits dull pain, but not sharp pain.
d. Its effects would be too temporary.

42. What type of muscle controls movements of internal organs?
a. smooth
b. striated
c. cardiac
d. splanchnic

43. After damage to the lateral hypothalamus, animals:
a. show normal osmotic thirst but not hypovolemic thirst.
b. show normal hypovolemic thirst but not osmotic thirst.
c. eat less.
d. eat more.

44. A small branch of the optic nerve, known as the ____ extends directly from the retina to the suprachiasmatic nucleus.
a. opticthalamic path
b. retinohypothalamic path
c. retinochiasmatic path
d. retinothalamic path

45. The sequence of the bursts of neural activity during REM sleep is:
a. lateral geniculate nucleus, pons, and occipital cortex.
b. occipital cortex, pons, and lateral geniculate nucleus.
c. pons, lateral geniculate nucleus, and occipital cortex.
d. pons, occipital lobe, and lateral geniculate nucleus.

46. What is the stimulus for the Babinski reflex?
a. Stroking the sole of the foot
b. Placing an object firmly in the palm of the hand
c. Touching the cheek near the mouth
d. A loud noise

47. Under what condition does orexin motivate animals to eat?
a. Right after a meal
b. When approaching starvation
c. In the mornings
d. When insulin levels are high

48. During REM sleep, the pons sends inhibitory messages to the:
a. occipital lobe.
b. vestibular system.
c. spinal cord.
d. cerebral cortex.

49. The primary taste cortex is located in the:
a. somatosensory cortex.
b. olfactory cortex.
c. insular cortex.
d. hypothalamus.

50. Which of the following is NOT associated with REM sleep?
a. increased probability of dreaming
b. facial twitches
c. EEG pattern resembling wakefulness
d. tense and active postural muscles

51. A proprioceptor is sensitive to the:
a. degree of relaxation or contraction of smooth muscle tissue.
b. position and movement of a part of the body.
c. percentage of fibers that are contracting within a muscle bundle.
d. degree of fatigue in a muscle.

52. Which organisms, if any, use behavioral means to regulate their body temperature?
a. poikilothermic, but not homeothermic
b. homeothermic, but not poikilothermic
c. both poikilothermic and homeothermic
d. neither poikilothermic nor homeothermic

53. What insulin levels would we expect to find when an animal is putting on extra fat in preparation for migration or hibernation?
a. very low, as in diabetes
b. normal
c. high
d. unstable and rapidly fluctuating

54. The structure composed of the caudate nucleus, putamen, and globus pallidus is the:
a. basal ganglia.
b. limbic system.
c. cerebellum.
d. sympathetic nervous system.

55. Exposure to an extremely salty substance decreases sensitivity to other salty substances. What is this phenomenon called?
a. adaptation
b. sensitization
c. anesthetization
d. potentiation

56. What visual capabilities did Sperry's newt have after Sperry cut the optic nerve and rotated the eye?
a. It regained normal vision.
b. It saw the world upside down and backwards.
c. It required experience to relearn how to see.
d. It remained blind.

57. The PER and TIM proteins accumulate during the day until they cause sleepiness. What prevents them from continuing to accumulate at night?
a. Metabolic rates increase at night, so proteins are digested faster than they can be synthesized.
b. The high levels of melatonin present at night react with the proteins to disable them.
c. The proteins are unstable at the lower body temperatures that are typical at night.
d. When the proteins reach a high level, they turn off the genes that produce them.

58. Antihistamine drugs tend to ____ itching, and opiates tend to ____ itching.
a. reduce, increase
b. reduce, reduce
c. increase, increase
d. increase, reduce

59. Large-diameter pain axons
a. carry sharp pain information.
b. carry dull pain information.
c. readily respond to endorphins.
d. have very slow rate of action potential transmission

60. When traveling across time zones, adjustments are easier when traveling which direction?
a. Travel to the east is easier.
b. Travel to the west is easier.
c. There is no difference.
d. It varies greatly from person to person.

61. One of the most promising hopes for appetite control drug researchers is the:
a. melanocortin receptor.
b. orexin receptor.
c. acetylcholine receptor.
d. agoutin receptor

62. Aldosterone triggers:
a. conservation of water and retention of potassium.
b. an increased preference for salt and retention of sodium
c. avoidance of salt and excretion of sodium.
d. a decreased preference for foods with potassium.

63. Sleep spindles originate from:
a. PGO waves.
b. sudden stimuli.
c. SCN neurons.
d. interactions between the thalamus and cortex.

64. What defines a homeostatic process?
a. the regulation of blood flow
b. any process governed by hormones
c. the maintenance of certain physiological variables within a fixed range
d. the maintenance of certain physiological variables at fixed values.

65. What causes hypovolemic thirst?
a. dryness of the throat
b. low blood volume
c. increased concentration of solutes in the blood
d. too much salt in the diet

66. Compared to an olympic long-distance runner, an olympic sprinter probably has more of which kind of fibers in her legs?
a. slow-twitch
b. fast-twitch
c. smooth muscle
d. striated muscle

67. The brain finds out about the degree of stretch of the stomach from:
a. visual feedback.
b. the hormone angiotensin.
c. sensory receptors on the skin of the abdomen.
d. activity of the vagus nerve.

68. A muscle spindle responds to the:
a. tension in the muscle tendon.
b. acetylcholine concentration at the nerve-muscle junction.
c. fatigue of the muscle.
d. stretch of the muscle.

69. A motor program is a:
a. mechanism that guides movement on the basis of sensory feedback.
b. mechanism that produces an alternation between two movements.
c. plan for training a brain-damaged person to walk.
d. movement that, once triggered, continues automatically until its completion.

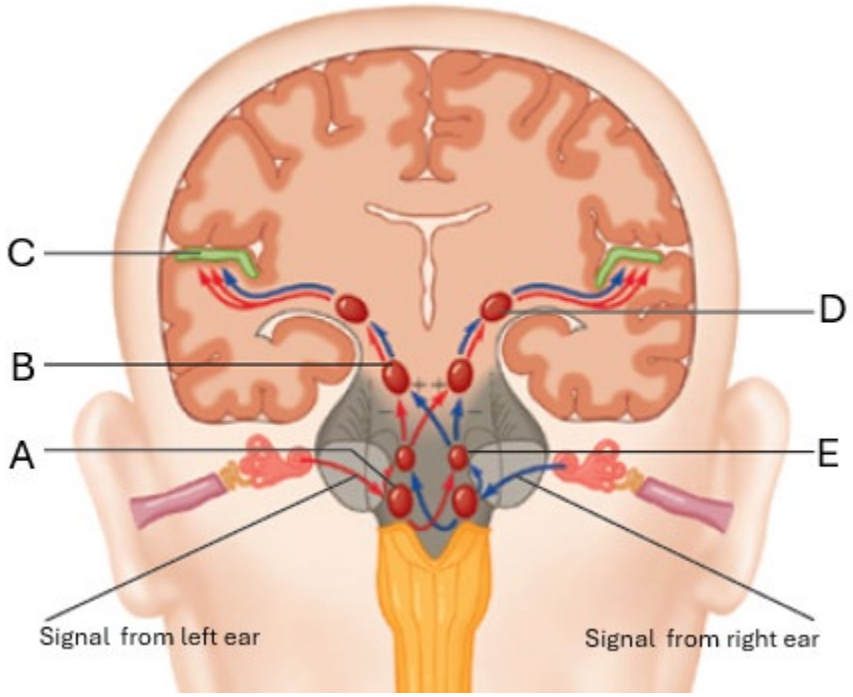
70. Axons release ____ at junctions with skeletal muscles.
a. calcium ions
b. choline
c. norepinephrine
d. acetylcholine

71. An animal knows when to stop drinking water by:
a. monitoring CCK levels.
b. how much urine is present in the bladder.
c. detecting how much water is in the stomach.
d. monitoring vasopressin levels.

72. Sleep spindles and K-complexes are most characteristic of which sleep stage?
a. stage 1
b. stage 2
c. stage 3
d. stage 4

73. A polysomnograph displays:
a. only EEG in the alert, awake state.
b. only EEG during sleep state.
c. a combination of EEG and other physiological signals like eye-movements in the alert, awake state.
d. a combination of EEG and other physiological signals like eye-movements during sleep state.

Questions 74 to 78 depicts the auditory processing areas of the brain. Each letter points to a nucleus in the auditory pathway. Identify each question the corresponding letter provided in the figure



74. Superior olive
75. Auditory cortex
76. Cochlear nucleus
77. Inferior colliculus
78. Medial geniculate nucleus

79. In Oliver Sacks book, on the story titled “The Twins”, Sacks describes the twins John and Micheal who were diagnosed as autistic or retarded or psychotic. The twins were especially gifted at
a. remembering works of art
b. identifying music
c. calculating prime numbers
d. remembering names

80. What is one of the contradictions in "paradoxical" sleep?
a. The frequency of the brain waves is low, while the amplitude is high.
b. The brain is very active, while many of the muscles are deeply relaxed.
c. Subcortical structures are very active, while the cerebral cortex is inactive.
d. Postural muscles are tense, while heart rate and breathing rate are very low.

81. The basal ganglia work together to initiate movement by:
a. ceasing to inhibit movement.
b. inhibiting thalamic nuclei.
c. exciting cerebellar nuclei.
d. exciting spinal cord nuclei.

82. Cells in the preoptic area of the hypothalamus monitor which temperatures?
a. internal organs
b. their own and the skin
c. differences between the arteries and veins
d. differences between internal organs and the skin

83. In Oliver Sacks book, on the story titled "Rebecca", he describes a young woman with a congenital condition that resulted in deficient intelligence, physical deformities, poor eyesight, and a person who appeared to be fragmented. Rebecca eventually found her true calling, and became a complete person when she took up:
a. music
b. painting
c. writing poetry
d. theater

84. In the absence of any light, dark, or time cues, human circadian rhythms would:
a. become much shorter than 24 hours.
b. become slightly longer than 24 hours.
c. become longer or shorter depending on the individual.
d. remain 24 hours.

In questions 85 to 90, match the questions to the following:
A) Melancortin, B) Leptin, C) Ghrelin, D) Orexin, E) CCK, F) Insulin

85. Hunger signal

86. Long-term satiety signal

87. Intermediate-term satiety signal

88. Increases arousal

89. Short-term satiety signal

90. Limits food intake