On this page, write your name and lab section.

On your bubble answer sheet, enter your name (last name, space, first name), internet ID (X.500 name) and student number. Please do it now!!!

Lecture 23 motor system
1. Neurons in which of the following locations synapse with skeletal muscles?
   → A. spinal cord ventral horn
   B. spinal cord dorsal horn
   C. hypothalamus
   D. sympathetic ganglion
   E. More than one of the above are correct.

2. What neurotransmitter is typically used between a somatic motor neuron and a skeletal muscle fiber?
   → A. glutamate
   B. GABA
   C. acetylcholine
   D. norepinephrine
   E. More than one of the above are possible, but only one transmitter is used in an individual synapse.

3. An adult muscle fiber has multiple nuclei. True or false?
   → A. true
   B. false

4. If you want to run a marathon, you should train by running long slow distances. This training would result in what change in your leg muscles?
   → A. The percentage of type 1 myofibers would decrease.
   B. The percentage of type 1 myofibers would increase.
   C. The percentage of type 2 myofibers would increase.
   D. The number of neuromuscular junctions per myofiber would increase.
   E. More than one of the above are correct.

5. A stroke in the precentral gyrus near the lateral (Sylvian) fissure in the left cortex is likely to result in what symptom?
   → A. uncoordinated movements of the left leg and/or foot
   B. muscle paralysis of the left leg and/or foot
   C. muscle paralysis of the right leg and/or foot
   D. muscle paralysis on the right side of the face
   E. numbness on the right side of the face
Lecture 24 basal ganglia

6. The caudate nucleus is in what part of the brain?
   A. diencephalon
   B. midbrain
   → C. telencephalon
   D. pons
   E. medulla

7. Which of the following is NOT part of the striatum?
   A. nucleus accumbens
   → B. globus pallidus
   C. caudate nucleus
   D. putamen

8. Which of the following statements regarding the basal ganglia is NOT true?
   A. A main output of the basal ganglia is from the globus pallidus internus.
   B. The main output of the basal ganglia is to thalamus.
   → C. The main output of the basal ganglia uses glutamate as the neurotransmitter and is excitatory.
   D. The main input to the basal ganglia is from neocortex.
   E. The subthalamic nucleus is part of the basal ganglia circuitry.

9. Degeneration of medium spiny neurons in the striatum can result in what symptom?
   A. resting tremor, particularly of the hands
   → B. involuntary flailing movements of the limbs
   C. even when relaxed, the muscles of the hands and arms resist being moved by another person
   D. difficulty initiating movements

10. Deep brain stimulation for the treatment of Parkinson’s disease involves placement of an electrode into the substantia nigra. True or false?
    A. true
    → B. false

Lecture 25 cerebellum

11. Motor neurons are controlled by numerous inputs. Neurons in which following regions do NOT have direct connections with motor neurons?
    A. motor cortex
    B. vestibular nuclei
    → C. dorsal root ganglion neurons
    D. cerebellum
    E. None of the above are correct as neurons in all can synapse with motor neurons.

12. Where do the axons of Purkinje cells in the vermis (midline) region of the cerebellum synapse?
    → A. interposed (deep cerebellar) nucleus
    B. inferior olivary nucleus of the medulla
    C. red nucleus of the midbrain
    D. ventrolateral nucleus of the thalamus
    E. More than one of the above are correct.
13. The basilar pons (neurons in the pontine grey) have an important role in which of the following processes?
   → A. movement planning and learned movements
   B. midcourse correction of movements and maintaining posture
   C. maintaining balance and coordinating head and eye movements
   D. perception of body position and movement
   E. reflex movements

14. What part of the nervous system is particularly sensitive to alcohol consumption (i.e. alcohol inhibits its function)?
   A. cerebral cortex and especially motor cortex
   B. striatum
   C. cerebellum
   D. spinal motor neurons
   E. superior colliculus

**Lecture 26 eye movements (from Dr. L. McLoon)**

15. Which of the following eye movements are disconjugate?
   → A. vergence
   B. optokinetic nystagmus
   C. vestibulo-ocular reflex
   D. saccades
   E. None of the above is a disconjugate eye movement.

16. Which of the following is NOT true of the vestibulo-ocular reflex?
   → A. It is a fast reflex.
   B. Visual processing is required.
   C. It allows you to see the world as stable despite head movements.
   D. Motor neurons are the final neurons to be activated.
   E. People with a disturbance in this reflex have trouble reading street signs when walking down the street.

[Everyone received credit for the following question.]

17. Which of the following is NOT true about strabismus?
   A. It is a common disorder of eye misalignment in children.
   B. If untreated, it can result in development of amblyopia or lazy eye.
   C. It can be caused by a genetic mutation in a gene that controls nerve growth in development.
   D. With adult onset it can cause diplopia or double vision.
   → E. More than one of the above are correct.

18. Which is NOT true of abducens motor neurons?
   A. When they fire, they control eye position.
   B. When they fire, they control eye velocity.
   C. When they fire, they control the direction the eye moves.
   → D. The abducens motor nerves decussate (cross the midline) before projecting to their appropriate extraocular muscle.
   E. These motor neurons are found in the brainstem.
Lecture 27 autonomics
19. Which of the following systems is NOT controlled by the autonomic nervous system?
   A. urogenital system
   B. gastrointestinal system
   C. respiratory system
   D. cardiovascular system
   → E. None of the above are correct as all are controlled by the autonomic nervous system.

20. Sympathetic neurons in the central nervous system synapse with neurons in sympathetic ganglia, and neurons in the ganglia synapse with their target tissues such as smooth muscle and glands. In contrast, parasympathetic neurons in the central nervous system send their axons to and synapse directly with their target tissues. True or false?
   A. true
   → B. false

21. Activation of which of the following neurons is most important for getting an erection of the penis or clitoris?
   A. preganglionic sympathetic neurons in the sacral spinal cord
   → B. preganglionic parasympathetic neurons in the sacral spinal cord
   C. somatic motor neurons in the sacral spinal cord
   D. enteric neurons in the wall of the venous sinusoids

22. The conscious perception of bloatedness or gas in the colon involves sensory information relayed from the thalamus to what area of cortex?
   A. prefrontal cortex
   B. precentral gyrus
   C. postcentral gyrus
   → D. posterior parietal lobe
   E. insular cortex

Lecture 28 reticular formation & sleep (from Dr. Wessendorf)
23. The parvocellular portion of the reticular formation projects mainly to …
   A. neurons in the spinal cord.
   B. neurons in the thalamus.
   C. neurons in the cerebral cortex.
   → D. other neurons in the reticular formation.
   E. neurons in the cerebellum.

24. The baroreceptor reflex involves blood pressure and heart rate. Which of the following correctly describes it?
   → A. Increases in blood pressure cause increased firing in the nucleus of the solitary tract, which then excites inhibitory neurons in the reticular formation, reducing heart rate.
   B. Decreases in blood pressure increase firing in the nucleus of the solitary tract, which then excites inhibitory neurons in the reticular formation, reducing heart rate.
   C. Increases in blood pressure increase firing in the nucleus of the solitary tract, which then excites excitatory neurons in the reticular formation, increasing heart rate.
   D. It is mediated by afferents in the trigeminal nerve, the nucleus of the solitary tract, and the sympathetic nervous system.
   E. It does not involve the sympathetic nervous system.
25. Which of the following statements regarding REM sleep is true?
   A. Eye movements slow dramatically.
   B. Breathing ceases.
   C. High-frequency EEG events are uncommon.
   D. Muscle tone decreases.
   E. Dreams are uncommon.

26. Stimulation of the reticular formation affects the EEG in ways that appear to promote wakefulness. It does so by what means?
   A. excitation of the intralaminar nuclei
   B. excitation of the ventral anterior nucleus of the thalamus
   C. inhibition of the alpha rhythm in the EEG
   D. inhibition of the theta rhythm in the EEG
   E. facilitation of the circadian rhythm in the hypothalamus

Lecture 29 hypothalamus (from Dr. Wessendorf)

27. A major anatomical landmark divides the hypothalamus into medial and lateral parts. What is it?
   A. medial forebrain bundle
   B. habenulo-interpeduncular tract
   C. fornix
   D. mamillothalamic tract
   E. arcuate nucleus

28. Which of the following statements is FALSE?
   A. Ethanol promotes release of antidiuretic hormone (ADH; vasopressin).
   B. Corticotropin-releasing hormone causes release of adrenocorticotropic hormone.
   C. Oxytocin promotes childbirth, milk ejection from the breasts and trust.
   D. The hypothalamic-hypophyseal portal system carries hypothalamic hormones to the anterior pituitary, where they affect release of pituitary hormones.
   E. Prolactin release is initiated by thyrotropin-releasing hormone.

29. You visit central Indiana and decide to explore the caves there with some friends. You all awaken at your normal time of 7am, and you enter the cave in the morning via the mouth of the stream. By the time evening comes and you’re ready to leave, you find that your route out is blocked. Rain has flooded the stream. You trash your electronics (watches, cell-phones, etc) in the process of trying to find an alternate route out and wisely decide to play it safe. You find a surprisingly comfortable place to sleep and wait in the dark of the caved for the water to go down. Luckily, you brought extra food since the water takes a LONG time to go down. You sleep; you awaken, talk, sleep some more, awaken, and so forth. After a total of 7 sleep cycles, you finally wake up to find that the water has receded, and you leave immediately. What time do you expect it will be?
   A. about 10 pm
   B. about 7 pm
   C. about 7 am
   D. about 4 pm
   E. about 4 am
30. The hypothalamus appears to regulate feeding. Which of the following statements regarding feeding is true?
   A. Ghrelin is a hormone produced by white fat cells that creates the sensation of fullness.
   B. Leptin is a hormone synthesized by the stomach that creates a sensation of hunger.
   C. Orexin is a hormone synthesized by white fat cells that creates the sensation of hunger.
   D. Stomach filling inhibits release of ghrelin.
   E. Ghrelin, leptin and orexin are synthesized by the arcuate nucleus of the hypothalamus.

Lecture 30 limbic system (from Dr. Wessendorf)
31. Which of the following would be considered to be part of the limbic system?
   A. lateral geniculate nucleus of the thalamus
   B. cuneate nucleus in the brainstem
   C. anterior nucleus of the thalamus
   D. occipital lobe of the cerebral cortex
   E. fastigial nucleus of the cerebellum

32. Selectively lesioning the septal nuclei in a rat would be expected to have which result?
   A. The rat would lose its circadian rhythm.
   B. The rat would become hypersexual, unresponsive to threats, and would appear unable to distinguish edible items from inedible items.
   C. The rat would stop drinking.
   D. The rat would gain weight uncontrollably.
   E. The rat would become aggressive and very difficult to handle.

33. The amygdala appears to be necessary for which of the following?
   A. learning to play a piece on the piano
   B. recognizing fearful faces
   C. learning not to respond to a repeated sound
   D. recognizing when to defecate
   E. fine motor control

34. Damage to the hippocampus is associated with which of the following?
   A. not improving with practice of a motor task
   B. loss of short-term memory
   C. inability to consolidate memory
   D. inability to retrieve memory
   E. inability to understand directions related to motor tasks

35. Several different brain regions are involved in the Papez (pronounced so that it rhymes with “shapes”) circuit. These do NOT include which of the following?
   A. fornix
   B. hippocampus
   C. mammillary bodies
   D. cingulate gyrus
   E. nucleus accumbens
Laboratory #6-8 (from Dr. Nakagawa)

36. Below is an image of a coronal slice of a sheep brain. The white arrow #1 points at what structure in the image below?
   - A. putamen
   - B. thalamus
   - C. hippocampus
   - D. pons
   - E. hypothalamus

37. Above is an image of a coronal slice of a sheep brain. Which fiber tracts are labeled by the #2 and #3 white arrows in the image above?
   - A. #2=mammillothalamic tract, #3=internal capsule
   - B. #2=cerebral peduncle, #3=internal capsule
   - C. #2=anterior commissure, #3=internal capsule
   - D. #2=fornix, #3=internal capsule
   - E. #2=fornix, #3=cerebral peduncle

38. Below is an image of a coronal section of a human brainstem showing nuclei and axon tracts related to the somatosensory system. Which of the following statements is NOT true?
   - A. 4, 5, 6 are the fiber tracts that feed axons into nuclei 1, 2, and 3, respectively.
   - B. Fiber tract 4 carries information for the lower part of the body.
   - C. Fiber tract 6 carries information for the face.
   - D. Fiber tracts 4, 5, 6 all carry pain and temperature information to the brain.
   - E. Axons originating from neurons in nuclei 1 and 2 form the medial lemniscus on the contralateral side of the brainstem.
39. In a two-point discrimination test, your group of 30 students obtained the following results.
   Body part 1: mean distance 4.5mm
   Body part 2: mean distance 7.5mm
   p-value in t-test: 0.01
   Which of the following statements is NOT true regarding this data?
   → A. Body part 1 has lower receptor density on the skin.
   → B. The neurons innervating body part 2 have larger receptive fields.
   → C. Even if there is no difference between body part 1 and 2, on average, one out of 100 groups that carry out this test would see the same or a larger difference in the value.

40. Below is an image of a human brainstem. Which of the following statements is NOT true regarding this image?
   → A. This is a ventral view of the brainstem.
   → B. Neurons in structure 2 send axons to structure 1 via the fiber tract 3.
   → C. Structure 1 belongs to the diencephalon.
   → D. Structure 2 belongs to the midbrain.

The End!

Please turn in this exam and your bubble sheet in the box at the back of the room.

Double check that your name is on both.