

Objectives for Unit Eleven: Chapter 31 (31.1 (pg. 617-619)-31.3), 37, 38 (Some), 39.1

Nervous system, Senses, Muscle System, and Plant Responses

You should be able to:

1. Identify several differences in the nervous system of humans and that of other animals. (From your reading)
2. Distinguish between reception of a stimulus and perception of that stimulus.
3. List the sequence of neurons and the pathway in a typical reflex.
4. Describe how the neuron pathway differs between conscious thought and a reflex.
5. Label a diagram of a typical neuron (include dendrite, axon, cell body, axon hillock, synaptic terminal, Schwann cell, myelin sheath, Nodes of Ranvier).
6. Describe how a neuron maintains its resting potential.
7. Describe how a resting potential changes to an action potential.
8. Distinguish between depolarization, hyperpolarization, and repolarization.
9. Explain the role played by the following in resting and action potentials:
 - a. Sodium-Potassium pump
 - b. Chemically sensitive (ligand gated) ion channels
 - c. Voltage sensitive (voltage gated) ion channels
10. List the sequence of changes that occur during an action potential; identify these changes on a graph of an action potential.
11. Explain the role threshold plays in an action potential.
12. Explain how an impulse travels across a chemical synapse; by what mechanisms can a neurotransmitter be removed from a synapse?
13. Explain how a neurotransmitter can have an inhibitory effect on a neuron.
14. Explain the role of neurotransmitters and name several examples along with their main functions. (**These are neurotransmitters we have emphasized in class.)
 - a. Acetylcholine**
 - b. Epinephrine**
 - c. serotonin
 - d. dopamine**
 - e. GABA
15. Using dopamine and the reward pathway as an example, explain how various drugs (heroin, cocaine, meth) or diseases (like Parkinson's) disrupt the normal levels of dopamine in the synapses. How does repeated use of these drugs lead to down-regulation? How was the reward pathway discovered in rats?
16. How does Botox work to decrease wrinkles?
17. Explain how treatments like deep-brain stimulation and stem cell therapy may help Parkinson's patients.
18. Explain the role of the myelin sheath.
19. Explain a neuron's threshold potential. How can having neurons with different threshold provide one with more information?
20. If an action potential is an "all-or-nothing" spike, how are variations in stimulus intensity communicated?
21. Explain this statement: *Whether or not a neuron will fire depends on synaptic integration.*
22. Explain how a post-synaptic neuron does temporal summation and spatial summation. Distinguish between an EPSP and an IPSP.
23. A neurotransmitter can bind to a receptor that is an ion channel (ionotropic) or it can bind to a metabotropic receptor that activates a signal transduction pathway. Describe the steps occurring during such a signal transduction pathway. Compare the speed and duration of these two mechanisms.
24. Distinguish between a nerve and a neuron.
25. Identify the functional differences between the somatic, the sympathetic and the parasympathetic divisions of the human nervous system (*from your reading; we did not discuss this in class.*)
26. Describe the general structure of the brain and spinal cord of vertebrates. Identify the function of the following brain regions:
 - a. medulla oblongata
 - b. pons
 - c. cerebellum
 - d. cerebrum, pre-frontal cortex
 - e. thalamus
 - f. hypothalamus
 - g. corpus callosum
 - h. limbic system

27. Describe the Limbic system and how it is related to Phineas Gage; describe the importance of the corpus callosum and how cutting it in patients with epilepsy demonstrated its function.
28. Explain how brain stimulation can provide information about the functioning of the brain.
29. Identify the types of sensory receptors with examples and the type of stimulus energy each detects.
 - a. Mechanical
 - b. Chemoreceptor
 - c. Electromagnetic receptor
 - d. Thermoreceptor
 - e. Pain receptor
30. Describe the basic structure and function of the vertebrate eye. Label a diagram.
31. Describe how an eye focuses on an object and how the shape of the eyeball affects that focusing.
32. Compare the function and location of rods and cones.
33. Compare eyes (especially the size of the cornea and the appearance of the choroid coat) of nocturnal (night) and diurnal (day) animals.
34. Label a diagram of the ear and use it to explain the function of each part.
35. Explain how the ear turns sound waves into a signal the brain can perceive.
36. Explain how the ear aids the body is assessing position and balance.
37. Explain the relationship between the amount of pressure and the frequency of firing of a touch receptor.
38. Lab Activity on Vision: Explain what is happening with:
 - a. Blind spot
 - b. Accommodation
 - c. Pupillary Reflex
 - d. Night vision
 - e. Stereoscopic (3D) vision
 - f. Near- and Far-sightedness
 - g. After Image
 - h. Optical Illusions
39. Explain the relationship between taste and smell.
40. Identify several antagonistic muscle groups and their actions. Explain why skeletal muscles need to come in antagonistic pairs.
41. There are three different types (skeletal, smooth and cardiac) of muscle tissue. Identify their locations.
42. Distinguish between muscle, muscle fiber, myofibril, sarcomere, thick and thin filaments (myosin and actin).
43. Label a diagram of a sarcomere (Actin, myosin, myosin heads, Z lines).
44. Sketch a sarcomere when a muscle is contracted and one when a muscle is relaxed.
45. Explain how a muscle contracts according to the sliding filament model.
46. Explain how a motor neuron stimulates a muscle to contract (Acetylcholine, t-tubule, sarcoplasmic reticulum, ATP, Calcium, troponin, tropomyosin).
47. Identify how a muscle can exert more or less force (motor units).
48. Distinguish between oxidative & glycolytic fibers and fast twitch & slow twitch muscle fibers (See your text page 1111). Why would successful sprinters have a higher percentage of glycolytic (white) fibers and marathoners have oxidative (red) fibers?
49. Explain where, in the cycle of muscle contraction, the ATP molecules are spent. Why does a dead body enter a phase called *rigor mortis*?
50. LAB: Muscle Grip and Fatigue Rates: Design an experiment to answer questions about muscle grip strength and muscle fatigue rates.
51. Explain the concept: timing and coordination are regulated by various mechanisms are important in natural selection. Consider:
 - In phototropism in plants, changes in the light source lead to differential growth, resulting in maximum exposure of leaves to light for photosynthesis.
 - In photoperiodism in plants, changes in the length of night regulate flowering and preparation for winter. (reproduction, courtship, hibernation)
52. Describe several experiments involving young oat seedlings that led to our understanding of phototropism.
53. Describe the affects of several hormones on plant growth and development:
 - auxins (tropisms)
 - gibberellins (growth & seed germination)
 - abscisic acid – ABA - (stomates)
 - ethylene (fruit ripening)
54. Identify the effect and advantage to the plant of photo-, gravi- and thigmo- tropism on plant growth.
55. Explain the mechanism for how phototropism work.

56. Compare short day plants and long day plants. Explain why "short-day plant" is really a misnomer.
57. Describe experiments that discovered "photoperiodism is controlled mainly by the length of the night rather than the length of the day."
58. Explain the role of phytochrome as a "timer switch" for phototropism. Predict whether a short day plant will flower based on the sequence of Red /Far Red flashes of light during the dark period.
59. Explain turgor movements in plants such as that exhibited by sensitive plants.
60. Use the venus fly trap as an example of growth movements (How is a trap triggered to close? How does a trap close?) and relate carnivorous plants to nutrient supply (nitrogen) in their soils.
61. Each chapter has some multiple choice questions and a few other additional questions at its end. Give these a try. You might see them again!

Any of the above objectives could be turned into a short free response question.

I don't find any calculation type problems for this unit.

ESSAYS:

I have listed several essays that correspond to this unit because any one part of these essays would make a good and reasonable short free response questions. You will write one essay during the test. Parts of these essays would make good short free response questions. You will not know which essay before the test.

Likely Essays: 149 (sarcomere, neuron), 122, 89, 44, 164c (parts), 130, 114(b), 60, 158 (part), 146 (d,e), 59

Essays regarding behavior and plant response need to be identified.