**Intro to Neuroscience**

1. What are the two basic categories of cells that make up the nervous system?

**Neurons and glial cells**

1. What can these two categories be further subdivided into, based on characteristics of the CNS and the PNS? **CNS- upper motor neuron, PNS- “everything else,” lower motor neuron (includes spinal and peripheral nerves)**
2. What makes up the CNS and what type of cells would you find here?

**Brain and spinal cord, UMN**

1. What makes up the PNS and what type of cells would you find here? **Peripheral and spinal nerves, LMN**
2. What are the two ways of classifying neurons? **Shape and size, function**
3. Give three examples of neurons that are classified by their shape and size. Which is the most common? **Unipolar (dorsal root sensory fiber- one axon, one dendrite), Bipolar, Multipolar (most common)**
4. Give four examples of neurons that are classified by their function. **Motor, sensory, Interneuron, Projection**
5. What are Schwann cells? Give three functions of them. **Cells made up of lipids that surround the axon of the nerve cell and produce myelin. For electrical insulation and conduction, metabolic support (osmotic gradient pulls nutrients to end of axon)**
6. What are nodes of Ranvier? What do they do? **Spaces between myelin sheath, for saltatory conduction of impulses, impulses jump gaps**
7. Name the four different types of glial cells. **Oligodendrocytes- myelin sheath, astrocytes- structural support, microglial-NS Response to injury, epindymal- lines ventricles**
8. What are their functions?
9. Draw and label a nerve cell with these parts: dendrite, axon, cell body, synaptic ending
10. What is the function of the dendrite? **Receives and collects info from other neurons**
11. What is the function of the axon? **Convey electrical signals to other neurons**
12. What is the function of the cell body? **Synthesize macromolecules and integrate electrical signals**
13. What is the function of the synaptic ending? **Release neurotransmitters**
14. Are the cell bodies (soma) made of white matter or grey matter? **grey**
15. Are the axons made of white matter or grey matter? **axon**
16. What is the difference between white and grey matter? **Grey- site of information processing, white- connection between sites**
17. Separate the following terms according to their location (white or grey matter): peduncle, soma, axon, tract, funiculus, cortex, lemniscus, nuclei, fasciculus

**Grey- soma, nuclei, cortex;**

**White- funiculus, fasciculus, peduncle, lemnisculus, axon, tract**

1. What is the purpose of a neuron? **Cells specialized for rapid communication**
2. What is the resting surface membrane potential of a neuron? **-70mV**
3. What is this maintained by? **Na++/ K+ pump**
4. What is its purpose? **Pumps out Na++ and K+ ions in to maintain surface membrane potential. For electrical signaling.**
5. What is the path (from beginning to end) down which a chemical transmitter travels? **Released by axon terminal, diffuses through synaptic cleft, received by post-synaptic ending where chemical binds**
6. What is the purpose of chemical transmitters (two specific purposes)? **Stimulation or inhibition**
7. What is the relative Na++ and K+ concentration outside of the cell? **High Na++ and Low K+ extracellular (compared to intracellular)**
8. Explain the sodium pump and how the neuronal membrane reaches resting potential.

**Entry of Na and loss of K are opposed by the “sodium pump” 🡪 uses energy to move ions through a membrane against a concentration gradient**

1. What is resting potential (the definition, not the number)? **Resulting number after exchange of ions**
2. How do axons conduct signals away from the cell body? **Action potential**
3. What is the “fastest signal?” **impulses**
4. Where are impulses carried? **Surface membrane of axons**
5. For an action potential to occur, what must happen? **The threshold must be reached**
6. T or F: When an action potential occurs, it can send all of the signal or part of the signal depending its strength. **False, all or nothing.**
7. What follows the occurrence of an action potential? What happens during this time? **Refractory period, absolute-- Na++ flows in (next AP cannot reach threshold), and relative-- K+ flows out (can still have another AP if its stronger)**
8. Which axon would have faster conduction velocity: myelinated or non-myelinated? Why? **Myelinated because of salutatory conduction (fast velocity)**
9. T or F: The axon has a uniform diameter throughout its length. **True.**
10. T or F: The diameter of an axon is proportionate to its length. **True.**
11. T or F: The larger the diameter, the slower the conduction velocity. **False.**
12. T or F: The smaller the diameter, the faster the conduction velocity. **False.**
13. Put the peripheral nerves in order from largest to smallest, while labeling whether they are myelinated or unmyelinated: III fibers (A delta), A alpha fibers, Type IA fibers, A gamma fibers, Type IV or C fibers, Type IB fibers, B fibers, Type II fibers

**Type IA, Type IB, A Alpha, Type II-Beta, Gamma, Type III- Delta, B fibers, Type IV or C fibers**

**C fibers only unmyelinated because so short**

1. Electrical signaling can be disturbed by damage to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_. **Oligodendrocyte cell body, myelin sheath/ Schwann cell**
2. Two disorders affecting electrical signaling of which causes are unknown are: **Multiple Sclerosis, central pontine myelinolysis**
3. A disorder affecting electrical signaling of which the cause is genetic is: **leukodystrophies**
4. Three disorders affecting electrical signaling of which the cause is inflammatory are: **Guillan Barre (post-infectious), progressive multifocal leukoencephalopathy (viral), subacute sclerosing paraencephalitis (measles)**
5. The three parts of the synapse include the **pre-synaptic ending** where a chemical is released, the **synaptic cleft** where the chemical diffuses, and the **post-synaptic ending**, where the chemical binds.
6. Which neurotransmitter results in rapid, point to point transmission in the PNS? **Acetylcholine**
7. Which neurotransmitter results in rapid, point to point transmission in the CNS? **Amino acids (glutamate/ GABA)**
8. Which neurotransmitters result in slow, diffuse transmission? **Amines and neuropeptides**
9. Draw a spinal cord and label the following parts: dorsal sulcus, ventral sulcus, white matter, grey matter, central canal, dorsal root, ventral root, sensory cell bodies, motor cell bodies, motor fibers, sensory fibers, ganglion, interneuron, spinal nerve, receptor, effector
10. As far as connective tissue covering peripheral nerves, we have the **endonurium** which is wrapped in bundles by the **perinurium**, which is covered by the **epinurium**. Then the three layers of tissue surrounding the brain are the **pia mater**,which is covered by the **arachnoid**, which is covered by the most “durable” layer, the **dura mater**.
11. What is an involuntary and stereotypical response to a stimulus? **reflex**
12. Two examples of primitive reflexes that integrate as we grow are: **thumb sucking, Babinski**
13. MSR stands for **monosynaptic stretch reflex** which is also known as a DTR or a **deep tendon reflex**.
14. The simplest type of reflex is : (common and scientific name) **knee jerk reflex, patellar tendon reflex**
15. For a reflex to occur, first the **sensory** information is sent to the **CNS from the** **structures in the muscle spindle sends info to spinal cord**. This information then synapses with a **motor neuron**, which causes a motor response to sensory input.
16. What is a muscle spindle? **Made up of chain and bag, sensory endings, and LMN**
17. Where is a muscle spindle located? **Within the muscle**
18. How is a muscle spindle involved in a MSR? **Muscle spindle feels change in length and rate**
19. Two intrafusal parts to a muscle spindle are: **nuclear chain, nuclear bag**
20. T or F: A nuclear chain is sensitive to length changes. **True**
21. T or F: A nuclear bag is sensitive to rate of changes. **True**
22. Two sensory endings in a muscle spindle are: **Primary and secondary endings**
23. T or F: A primary ending has flower-spray endings. **False.**
24. T or F: A secondary ending has annulospiral endings. **False.**
25. The lower motor neuron \_\_\_\_\_\_\_\_motor information.
    1. **Receives**
    2. Sends
26. T or F: The alpha motor supply is intrafusal and is large. **False, extrafusal and large**
27. T or F: The gamma motor supply is extrafusal and is small. **False, intrafusal and small**
28. If we compare the surface of thebrain to mountains and valleys, the **gyrus** would be the mountains, and the **sulcus** would be the valleys.
29. The two parts of the diencephalon are: **Thalamus, hypothalamus, (epithalamus too)**
30. The lobe of the brain that controls our motor function is the **frontal lobe**.
31. The part of the brain that controls our executive decisions is the **prefrontal portion** which is in the **frontal** lobe.
32. What lobe of the brain controls our sensory function? **Parietal lobe**
33. What lobe of the brain controls our vision? **Occipital lobe**
34. What lobe of the brain controls our hearing? **Temporal lobe**
35. What lobe of the brain controls our emotions, memory, and drives? **Limbic lobe**
36. Be able to label lobes on a brain…
37. The **basal** ganglia controls movement and has related structures in the brainstem.
38. Two major components of the Limbic system are: **amygdala- emotions, hippocampus-memory**
39. Means “little brain.” **cerebullum**
40. What coordinates trunk movements? **vermis**
41. What coordinates limb movements? **hemispheres**
42. Which cranial nerves does the brainstem house? **III-XII**
43. What are the three divisions of the brainstem? **Midbrain, pons, medulla**
44. Which is continuous with the diencephalon? **Midbrain**
45. Which is connected to the cerebellum? **pons**
46. Which is continuous with the spinal cord? **medulla**
47. Primary afferent (**sensory**) pathways lead into the **CNS**. This includes the second order neuron which projects to the **thalamus**, and the third order neuron which projects from the **thalamus** to the **cerebral cortex**.
48. Primary efferent (**motor**) pathways come from the **CNS**.
49. The three destinations of afferent (**sensory**) inputs are: **local reflex pathways, cerebral cortex, cerebellum**
50. Sensory inputs sent to illicit conscious awareness or appropriate behavioral responses are directed to the **cerebral cortex**.
51. Sensory inputs sent to illicit coordination are directed to the **cerebellum**.
52. An upper motor neuron is a neuron whose axon starts at the **cerebral cortex** or **brainstem** and goes to the **spinal cord** or **Cranial nerve nuclei** to affect the activity of lower motor neurons.
53. Six tracts in which UMN involved: **corticospinal, corticobulbar (cranial nerve)… these are important, but there are more in notes**
54. Is a lower motor neuron small or large? **large**
55. Where are LMN’s found? **Spinal anterior horn and CN motor nuclei**
56. What do the axons of LMN’s innervate? **Extrafusal fibers of skeletal muscle**
57. What are two other names for LMN’s? **alpha motor neurons and anterior horn cells**
58. From what do LMN’s receive direct information? (three things) **cerebral cortex, brainstem, local reflexes**
59. From what do LMN’s receive indirect information? (two things) **cerebellum, basal ganglia**
60. So, we have UMN’s which are located in the **cerebral cortex and brainstem** with descending axons that terminate on the **LMN in anterior horn**, as opposed to the LMN’s which are located in the **anterior horn** and terminate on **skeletal muscle**.

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|  | 1. UMN | 1. LMN |
| 1. Strength | 1. **Decreased** | 1. **Decreased** |
| 1. Muscle Tone | 1. **Increased** 2. (**Spasticity**) | 1. **Decreased** 2. (**flaccidity**) |
| 1. MSR | 1. **Increased** 2. **(Hyperreflexia)** | 1. **Decreased** 2. **(Hyporeflexia)** |
| 1. Atrophy | 1. **Mild** | 1. **Severe** |
| 1. Other signs | 1. **Clonus** 2. **Abnormal Reflexes** 3. **(+ Babinski)** | 1. **Fasciculations** 2. **Fibrillations** |

1. A somatotopic representation of which areas of our brain control certain areas of our body is the **homonculus**.
2. What is a syndrome characterized initially by ipsilateral spinal shock below the level of the lesion? **Brown Sequard Syndrome**
3. T or F: Later in Brown Sequard syndrome, MSR is increased below the level of the lesion. **True**
4. T or F: Later in Brown Sequard syndrome, there is contralateral loss of all motor, proprioception, and discriminative touch. **False, ipsilateral**
5. T or F: Later in Brown Sequard syndrome, there is ipsilateral loss of pain and temperature below the level of the lesion. **False, contralateral**