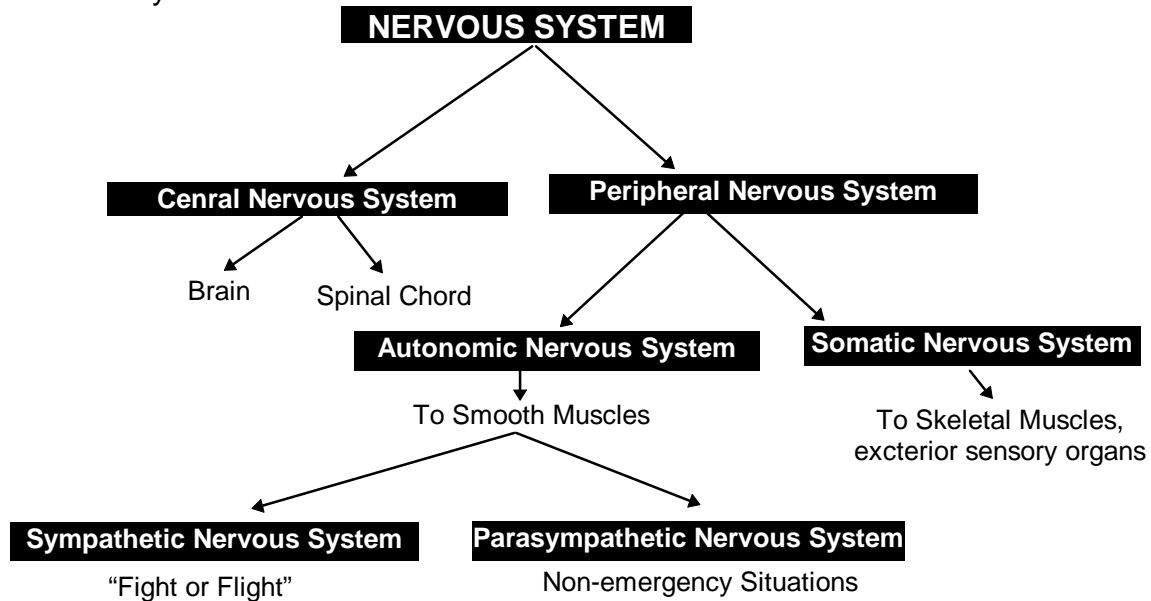


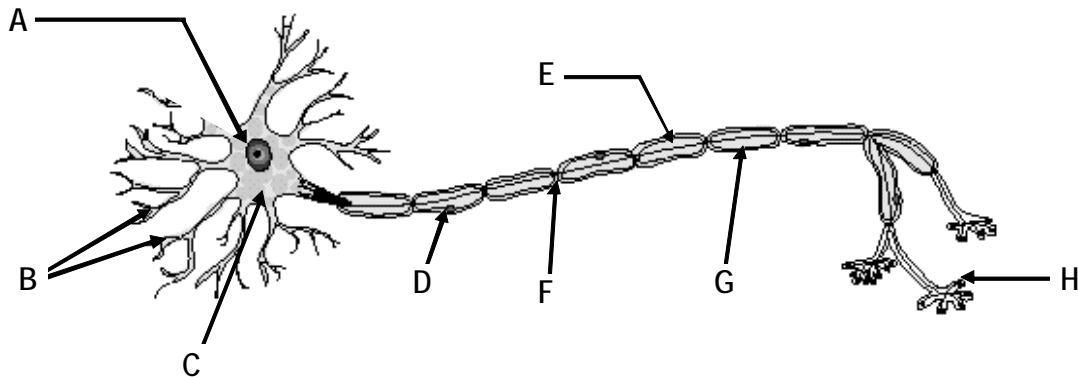
Biology 12 - The Nervous System Study Guide

1. Explain how the nervous system is divided into **sub-systems**. What is the **main function** of each sub-system?



2. Draw and label a simple **motor neuron** and state the **function** of each labelled part.

See Notes



3. What are the three types of **neurons**? Describe each and state their function(s).

- **SENSORY NEURON:** (*afferent* neuron) - takes a message from a sense organ to CNS. has long dendrite and short axon
- **MOTOR NEURON:** (*efferent* neuron) - takes message away from CNS to a muscle fiber or gland. Short dendrites, long axon.
- **INTERNEURON:** (*association* neuron or *connector* neuron): completely contained within CNS. Conveys messages between parts of the system. Dendrites, axons, may be long or short.

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4. What is an **action potential**? Describe the sequence of events in the transmission of a nerve impulse. Be sure to indicate the role of **Na⁺ and K⁺**.
 - See notes p. 2-3
 5. Why does nervous transmission occur in **one direction** only?
 - During the recovery phase (refractory period) sodium gates are unable to open therefore the impulse cannot go in the reverse reaction
 6. Describe the structure of **myelinated** nerve fiber and relate this to the efficiency of impulse conduction. How fast do nerve impulses travel?
 - **myelinated** nerve fibers contain an insulating sheath (lipids that cause the fiber to appear whiteish) formed by tightly packed spirals of the cell membrane of Schwann cells
 - an insulating sheath is interrupted by gaps called Nodes of Ranvier
 - Results in an increase in the speed of the impulse as the impulse jumps from node to node
 7. Draw a **synapse**, identify its major components, and explain how impulses travel across the synaptic cleft. **List the sequence of events in a transmission across a synapse.**
 - See notes p. 4
 8. Describe how **transmission of impulses** across synapses can be **controlled**.
 - Neurotransmitters are degraded by enzymes
 - Neurotransmitters are reabsorbed into the presynaptic cleft
 9. What is a **reflex arc**? Describe the sequence of events that would occur if you accidentally extended your arm into the path of a Bunsen burner flame.
 - automatic, involuntary responses to changes occurring inside or outside the body. Can involve the brain (e.g. blinking) or not involve brain (e.g. withdraw hand from hot stove).
 - The Reflex arc is the main functional unit of the nervous system. It allows us to react to internal and external stimuli.
 - Sensory neuron- receives information – high temperature
 - Interneuron – relays this information to the motor neuron
 - Motor neuron- takes this message to an effector. In this case the muscle of your arm.
 - Effector – arm muscle contracts and it is pulled away from the heat source
 10. What are **meninges**, and in what nervous system do you find them?
 - three protective membranes that protect the brain and spinal cord
 - found between the brain and the skull
 - found between the vertebrae and spinal cord
 11. Describe the composition, structure, and function of the **spinal cord**.
 - See notes p. 8-9

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12. How does the **somatic** nervous system differ from the **autonomic** nervous system?
- See notes p. 7-8
13. Describe the physiological events associated with the "**fight or flight**" response. Which system controls this response?
- See notes p. 8
14. Briefly describe the function of the following parts of the brain:
- See notes p. 9
 - medulla oblongata
 - thalamus
 - hypothalamus
 - cerebrum
 - cerebellum
 - corpus callosum
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15. Make a table that lists the four **lobes** of the cerebral cortex and give at least two **functions** of each. Make a **sketch** that shows the locations of these lobes on the brain.
- See notes p. 10-11
16. Compare and contrast the **Extrapyramidal** System and **Limbic** System with respect to structure and function.
- See notes p. 11
17. Compare and contrast **short-term memory** with **long-term memory**. **Where** are memories **stored** in the brain?
- See notes p. 10-11
18. What is an **EEG**, and what can it be used to do?
- See notes p. 11
19. What is **REM** sleep? What mental process does it coincide with? How often do periods of REM occur per night, on average?
- See notes p. 11
20. Explain the 5 ways that **drugs** act at **synapses**.
- See notes p. 12
21. Compare, contrast, and give specific examples of **inhibitory** and **excitatory** neurotransmitters.
- See notes p. 12
22. Describe the ways in which **stimulant** and **depressant** drugs can affect neurotransmitter action.
- See notes p. 12

23. What are **opioids**, and how do they work?

- Opioids (e.g. endorphins and enkephalins) are neurotransmitters that act as natural pain relievers
- When painful stimuli is felt other neurotransmitters are released from certain neurons in the spinal chord that create the sensation of pain
- Opioids prevent the release of the neurotransmitter that causes the sensation of pain

24. How do neuro-**poisons** such as **strychnine** and **nerve gas** work? What are the symptoms of exposure?

NOT TESTABLE

- Nerve gas blocks the action of acetylcholinesterase – the enzyme that breaks down acetylcholine
- Strychnine increases the reflex irritability of the spinal cord, which results in a loss of normal inhibition of the body's motor cells,
 - causes painful muscle contractions and convulsions, pulling the head back and arching the back; death usually results from respiratory muscle spasm
- Basically these poisons alter the normal functioning of the nervous system which is responsible for all of our bodies physiological functions

25. How do **narcotics** such as **heroin** and **morphine** work? **NOT TESTABLE**

- They mimic opioids
- See notes p. 12

26. Explain the biochemical events that occur when an impulse is transmitted through a reflex arc. Begin with the opening of the sodium gates in a sensory receptor.

- Stimulus (electric shock, pH change, mechanical stimulation...) that is sensed reaches a threshold and causes an action potential to occur
- Action potential through motor neuron (see notes p. 2-3)
- Transmission across synapse to interneuron (see notes p. 5-6)
- AP through interneuron → synapse
- AP through motor neuron → effector

27. It has been noted that after continuous stimulation for extended periods of time, it becomes difficult to conduct a nerve impulse along a fibre. Suggest **two** reasons for this.

- Same stimulation does not reach the threshold
- The reticular activating system (RAS) may filter out this information

28. Assume that the action of pain killers interferes with the normal transmission from one neuron to another. Suggest **two** different mechanisms that would result in the brain detecting **less pain**.

- See notes p. 12 (same reasoning as “Drug Action on Neurotransmitters”)

29. Explain the differences in structure and function between the left and right sides of the brain.

- See notes p. 10