

# NERVOUS SYSTEM

The nervous system coordinates body functions. Nerves are capable of sending signals to many different parts of the body, controlling the body's responses to changes in the environment. In Chapter 17: The Nervous System (pp. 317-341) we will learn about the main components of the nervous system and how it coordinates the body.

## Neurons

- The nervous system is composed of nerve cells called neurons. Read "Neuron-Structure" p. 318. Identify the following parts of a motor neuron from fig. 17.2 and describe these parts below:

Parts	Function
a. cell body	_____
b. dendrite	_____
c. axon	_____
d. node of Ranvier	_____
e. myelin sheath	_____
f. synaptic endings	_____

- There are three types of neurons found in the nervous system. It is important to understand their function, the location, and direction of impulse. Fill in the chart below. ( p. 318 )

Neuron type	Direction of Flow	Function
sensory neuron	_____	_____
interneuron	_____	_____
motor neuron	_____	_____

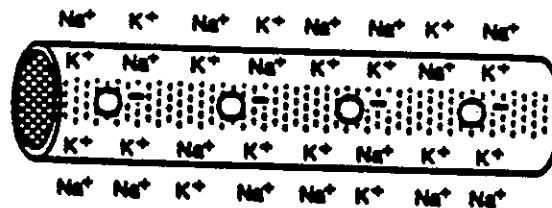
- Define the term *neuron*.

# Impulse Generation

(pp. 320-21)

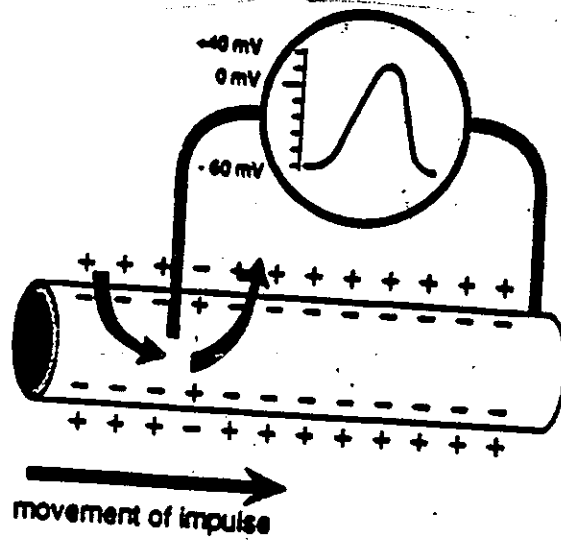
Neurons are capable of sending messages to other structures in the body. When a message is sent down a neuron we say that the neuron is conducting an impulse.

1. Define the following terms:
  - a. impulse
  - b. resting potential
  - c. action potential
  
2. What is meant when we say that a neuron has:
  - a. a resting potential
  - b. an action potential



Resting Potential

3. The neuron above has a resting potential. Referring to the distribution of ions, explain why the neuron is positive on the outside and negative on the inside.
  
4. What maintains the distribution of ions outside and inside the neuron?



**Action Potential**

5. The neuron in the above diagram is having an action potential. What events occur during the action potential?
6. Explain why the neuron becomes more positive on the inside during an action potential.
7. Explain what happens when a neuron is:
  - a. depolarized
  - b. polarized
8. Explain how a nerve impulse is transmitted along a neuron using the term *resting potential* and *action potential*.
9. Explain why neurons carry an impulse (action potential) in only one direction.
10. Explain why a myelinated neuron transmits impulses faster than a non-myelinated neuron. (p. 319)

## Synapse

(pp. 322-323)

1. Nerve impulses must travel from one neuron to the next neuron via a gap called a synapse. Using fig. 17.5, and the text on pages 323, state the function of the listed components of a synapse:

<i>Component of synapse</i>	<i>Function</i>
a. axon	_____
b. synaptic ending	_____
c. presynaptic membrane	_____
d. synaptic vesicles	_____
e. synaptic cleft	_____
f. neurotransmitter substances	_____
g. postsynaptic membrane	_____
h. dendrite	_____

2. Explain how a nerve impulse crosses a synapse. Use the following headings to list your main points. (pp. 322-3' fig. 17.5)
- pathway the impulse takes to get to the end of the neuron
  - events that occur when impulse reaches the synaptic ending
  - role of the calcium ions
  - neurotransmitters-their action and role
  - role of the cleft
  - excitation of postsynaptic membrane
  - short existence of neurotransmitters in the synapse
  - acetylcholine

## **Reflex Arc**

(pp. 335...)

- Describe the function of a reflex arc.
- Identify the labeled parts of a reflex arc on fig. 17.16 p. 335 and state the function of each.

<i>Part of reflex arc</i>	<i>Its role or function</i>
a. receptor	_____
b. sensory neuron	_____
c. interneuron	_____
d. motor neuron	_____
e. effector organ	_____

3. Trace the pathway through a reflex arc starting with the stimulation of a skin receptor and ending at the effector organ. List the events a, b, c, ... etc.

## Divisions of the Nervous System

(p. 324-334)

1. Explain the difference between the *central* and *peripheral* nervous systems using the following headings as your guide:

*Central nervous system:*

- a. location
- b. components
- c. role in the nervous system

*Peripheral nervous system:*

- a. location
- b. components
- c. role in the nervous system

2. Differentiate between the *somatic* and *autonomic* nervous systems using the following headings as your guidelines.

*Somatic nervous system:*

- a. location
- b. main function in the nervous system

*Autonomic nervous system:*

- a. location
- b. main function in the nervous system

3. Differentiate between the *parasympathetic* and *sympathetic* nervous systems using the following chart as your guideline: (pp. 337 & table 17.1 for summary)

Headings	Parasympathetic	Sympathetic
a. Behaviour it elicits	_____	_____
b. Neurotransmitter substance released on stimulation.	_____	_____
c. Length of pre- and post ganglionic fibers.	_____	_____
d. Where the preganglionic fibers exit from the nerve cord.	_____	_____

4. Explain how the *sympathetic* and *parasympathetic* nervous system affect the following: (pp. 336-3)

	<i>Parasympathetic effect</i>	<i>Sympathetic effect</i>
a. digestion	_____	_____
b. breathing rate	_____	_____
c. heart rate	_____	_____
d. pupil size (of eyes)	_____	_____
e. artery diameter (dilation/contraction)	_____	_____

5. Imagine you have received a severe fright. List all the body changes you associate with fright and suggest their survival advantages. You can consider other mammals besides man.

## The Brain

(pp. 326-7)

### Functions

1. Describe the function of the following parts of the brain:

<i>Part of the brain</i>	<i>Function</i>
a. medulla oblongata	_____
b. cerebrum	_____
c. thalamus	_____
d. cerebellum	_____
e. hypothalamus	_____
f. corpus callosum	_____

### Cerebrum

1. Locate the following areas of the brain and list the activities that go on in the following areas of the cerebral cortex (p.327, fig. 17.10)

<i>Part of Cerebral Cortex</i>	<i>Activity</i>
a. frontal lobes	_____
b. parietal lobes	_____

c. temporal lobes

\_\_\_\_\_

d. occipital lobes

\_\_\_\_\_

## Memory

1. Differentiate between *short term* and *long term* memory. (p. )

## Electrical waves and sleep

1. Identify the stages of sleep from the EEG.
2. What happens during REM sleep?

## Drug Effects

(pp. 338)

1. What is the nature and action of analgesics such as: (*Reference: Merck Manual*)

Drug	Nature and Action
Aspirin	_____
Endorphines	_____

2. Indicate whether the following drugs inhibit, modify, or enhance the release of hormones in the brain: (*pp. Merck Manual*)

Drug	Inhibit/Modify/Enhance		
amphetamines	<input type="checkbox"/> Inhibit	<input type="checkbox"/> Modify	<input type="checkbox"/> Enhance
tranquilizers	<input type="checkbox"/> Inhibit	<input type="checkbox"/> Modify	<input type="checkbox"/> Enhance
LSD	<input type="checkbox"/> Inhibit	<input type="checkbox"/> Modify	<input type="checkbox"/> Enhance
caffeine	<input type="checkbox"/> Inhibit	<input type="checkbox"/> Modify	<input type="checkbox"/> Enhance
nicotine	<input type="checkbox"/> Inhibit	<input type="checkbox"/> Modify	<input type="checkbox"/> Enhance
alcohol	<input type="checkbox"/> Inhibit	<input type="checkbox"/> Modify	<input type="checkbox"/> Enhance

# Disorders of the Nervous System

1. State the *characteristics, causes, and suggested corrective measures* that can be taken against the following:

poliomyelitis  
multiple sclerosis  
Parkinson's disease

epilepsy  
cerebral palsy  
dyslexia

## Sample Exam Questions

1. Describe the events that occur during a *synapse transmission*.
2. Name the main components of a *reflex arc* and describe the passage of an impulse through this arc.
3. Explain how an impulse passes along a motor neuron.
4. Compare and contrast an *action potential* with a *resting potential*.

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