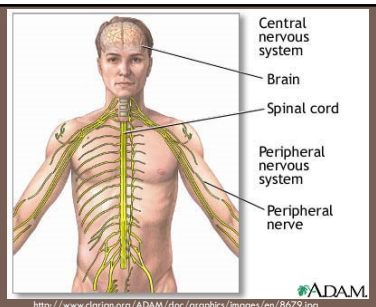

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NERVOUS SYSTEM
CHAPTER 9A

Mrs. Michaelsen Chetek High School

9.1 Introduction

B. Nerves:

C. Neuroglial cells:

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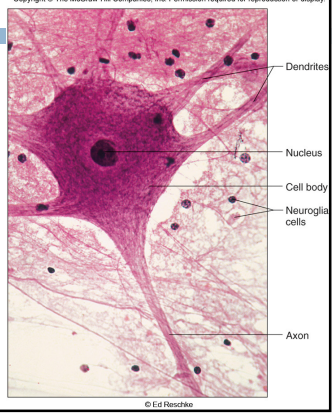

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9.1 Introduction

A. Neuron: Nerve cells that make up
   1. Transmit information as electrochemical changes called
   2. Consist of:
      a. Cell body
      b. Dendrite:
      c. Axons:

9.1 Introduction

D. Divisions:
   1. Central Nervous System (CNS):
   2. Peripheral Nervous System (PNS):
      a. Somatic Nervous System:
      b. Autonomic Nervous System: Controls involuntary effectors such as the

9.2 Functions of the Nervous System

A. Sensory (afferent) function:
   1. Impulses coming into
   2. Derives from
   3. Monitor external factors such as

9.2 Functions of the Nervous System

C. Motor function:
   1. Uses peripheral neurons to send impulses from the
      a. Effectors are
   2. These motor effectors are controlled by the

9.2 Functions of the Nervous System

B. Integrative function
   1. Performed
   2. Involves gathering sensory signals to create sensations, add to memory, help produce thoughts, and turn sensation into perception.

9.3 Neuroglial Cells

A. Neurons cannot exist without
B. Fill in
C. They are more numerous than neurons in the

9.3 Neuroglial Cells

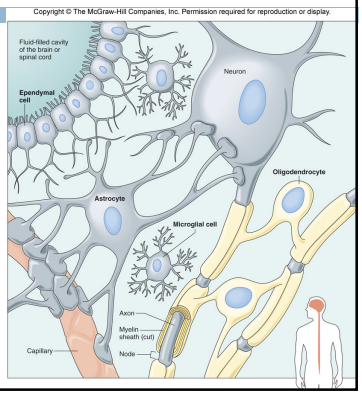
D. Types:
   1. Microglial cells: scattered throughout
      Support neurons and
   2. Oligodendrocytes: Provide insulating myelin around
   3. Astrocytes: Common between
      Support, join parts with cellular processes,
   4. Ependymal cells: Form epithelia-like membrane that covers

9.4 Neurons

A. Neurons vary in size in shape. All share three features:
   1.
B. Cell body:
   1. Consists of granule cytoplasm, cell membrane, mitochondria and other organelles, and
   2. Chromatophilic substance (Nissel bodies): Membranous sacs found in the

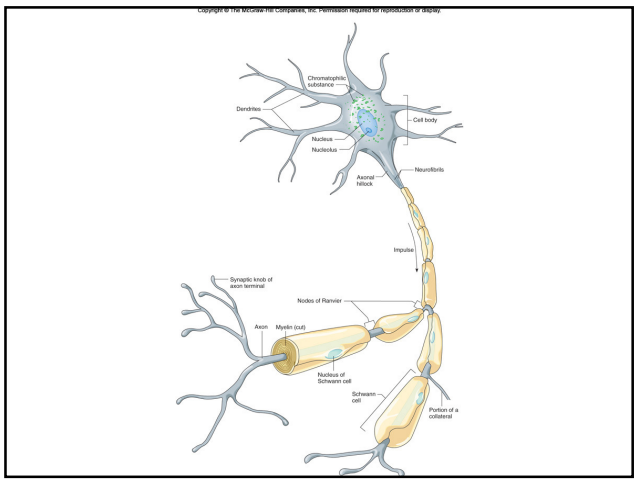
9.3 Neuroglial Cells

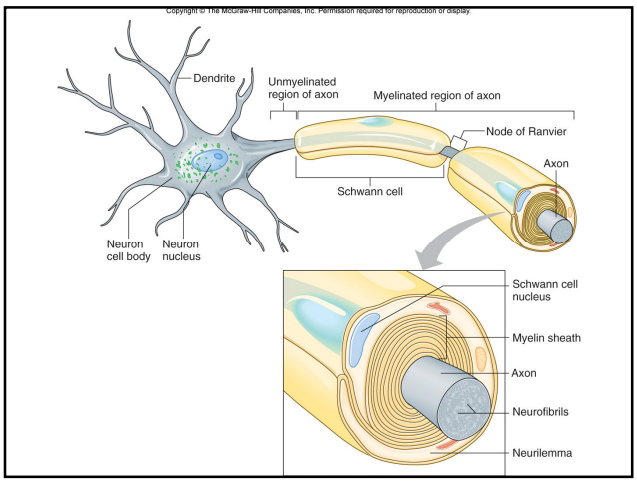
E. Schwann cells are the.



9.4 Neurons

C. Dendrites
   1. Bring impulses into the cell body
   2. Usually
   3. Highly
   4. Have
   5. Communicate with the





9.4 Neurons

D. Axons
   1. Conducts nerve impulses
   2. Begins as a single fiber, but
   3.
   4. Large axons in
      a. Myelin wrapped tightly in many layers
      b. Outside of
      c. Gaps between

9.4 Neurons

4. Axons with myelin are
   a. Called
   b. Myelin can speed up impulses up to
5. Axons without myelin are
   a. Called
6. Peripheral nerve damage of axons can regenerate
7. CNS axon damage cannot be repaired because

9.4 Neurons

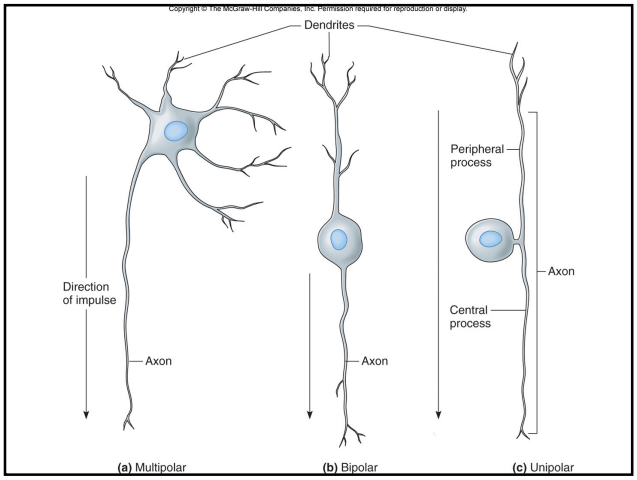
E. For a reference, if a cells body was the size of a tennis ball, the axon would be a mile long and half an inch thick and the dendrites would fill a large bedroom.

9.4 Neurons

3. Unipolar neurons:
   a. Have a single nerve fiber that branches
   b. One is
   c. Cells bodies can group together and form

9.4 Neurons

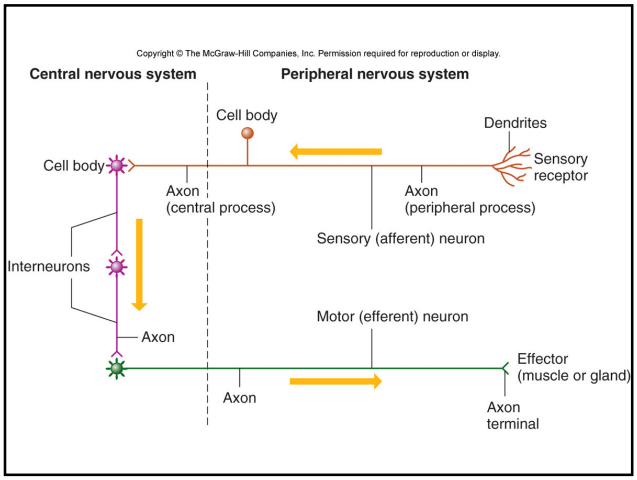
F. Structural Classification (3 major groups)
   1. Multipolar neurons:
      a. Most
      b. Have many processes arising from
   2. Bipolar neurons:
      a. Found in parts of
      b.



9.4 Neurons

G. Functional Classification

1. Sensory neurons (afferent):
   a. Carry impulses from
   b. Either have
   c. Most are



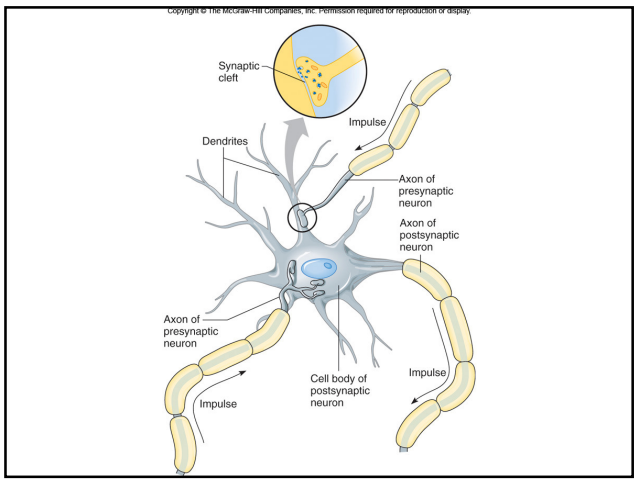
9.4 Neurons

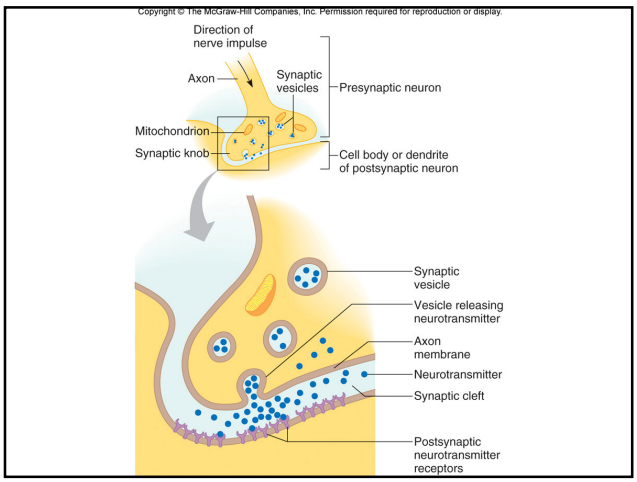
2. Interneurons (association or internuncial neurons):
   a. Lie entirely in
   b. Multipolar and
   c. Direct incoming sensory impulses to the appropriate part of the
   d. Cells bodies can group together in specialized masses called
3. Motor neurons (efferent):
   a.
   b. Carry impulses from
      i.

9.5 The Synapse

A. Nerve impulses travel along complex

1. Synapse:
2. Neurons separated by gap called
3. Neuron carrying impulse (axon) – called
4. Neuron receiving impulse (cell body or dendrite) – \





9.5 The Synapse

5. The process of the nerve impulse crossing the
6. This is a one-way process carried out by
   a. Distal ends of axons have
   b. There are approximately 50 known

9.5 The Synapse

7. Neurotransmitters can either be
8. Neurotransmitters must either be removed or broken down in order to
9. Each postsynaptic neuron can have hundreds or even a thousand
10. Once a neurotransmitter has reacted with the postsynaptic neuron,

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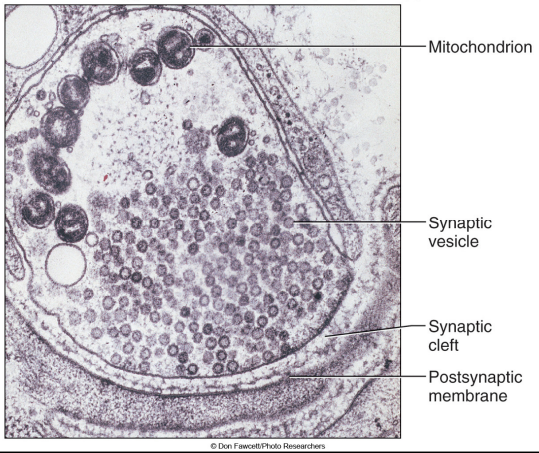

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9.6 Cell Membrane Potential

A. The surface of a neuron membrane is usually

B. Due to unequal distribution of

C. <u>Action potential</u>: Forms a nerve impulse that is propogated along an axon due

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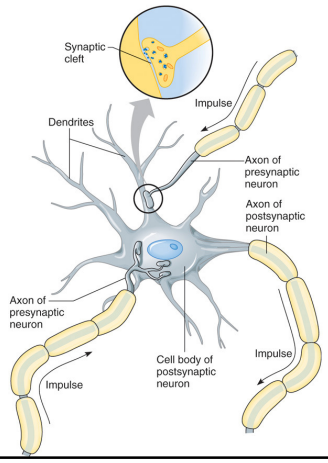


9.6 Cell Membrane Potential

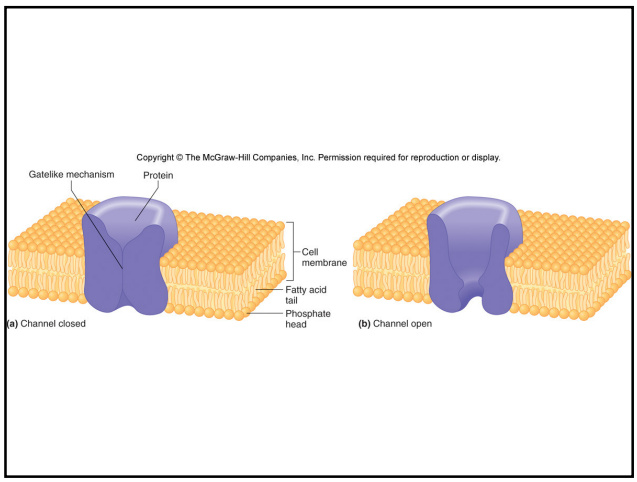
D. Distribution of Ions
   1. Cells have a greater concentration of ____ outside the cell and _____ inside the cell due to active transport. _____is also found in the cell.
   2. The cytoplasm also contains negatively charged particles:

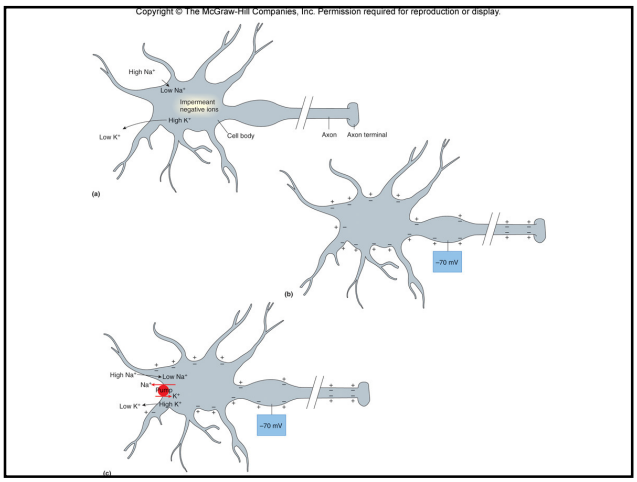
9.6 Cell Membrane Potential

E. Ion distribution is determined in part by channels and pores in the membrane.
   1. Some are always
   2. Most are opened only
   3. Many are

9.6 Cell Membrane Potential

F. Ions will move through a membrane (as permeability or selective channels permit) following the
   1. Move according to a concentration gradient





9.6 Cell Membrane Potential

G. Resting potential
   1. Cell membranes are more permeable
   2. More _____ leave than enter based solely on diffusion.
   3. This creates a slight _____charge outside and a slight _____charge inside.
   4. Active transport (requiring energy) runs "sodium/potassium pumps" that go against the concentration gradient and maintain the optimal concentrations inside and outside the cell.

9.6 Cell Membrane Potential

5. The difference in electrical charge is called the
6. The potential difference between the
7. As long as the nerve cell membrane remains undisturbed,

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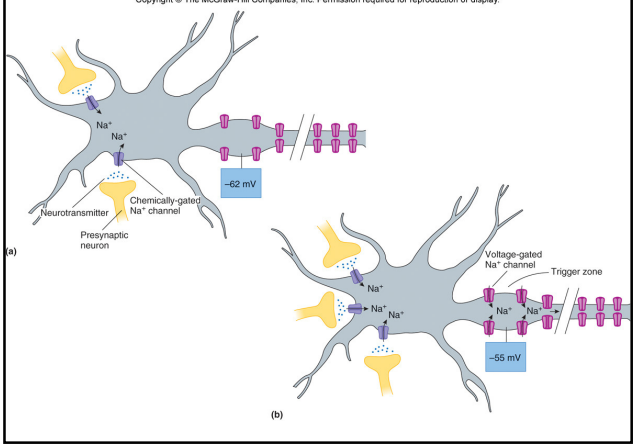


9.6 Cell Membrane Potential

F. Potential Changes
   1. Nerve cells are excitable –
   2. Local potentials are graded.
      a. This means the change in potential is proportional to
      b. Increased or additional stimuli lead to
         i. Summation is when stimuli are added
      c. Eventually nerve cells reach the threshold potential which triggers an action potential.

9.6 Cell Membrane Potential

G. Action potential
   1. An action potential is the rapid sequence of
      a. This takes about
   2. An action potential triggers a change in permeability that allows _____ to diffuse inward through selective channels.
      a. Positive ions going in

9.6 Cell Membrane Potential

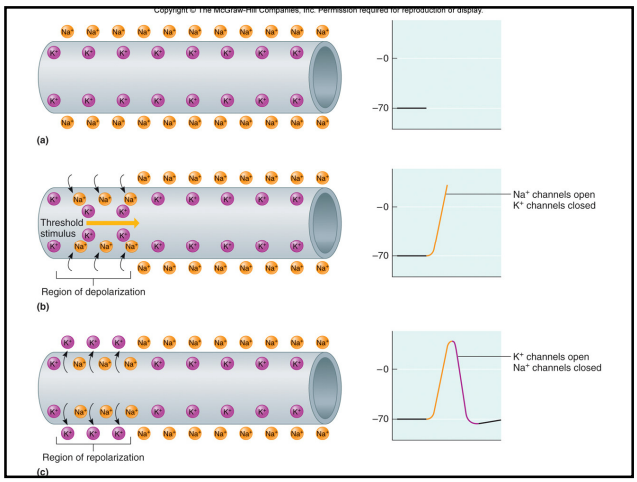
4. The active transport mechanism called the sodium/potassium pump returns the
   a. Only a small fraction of the _____ move during an action potential so many action potentials can be occurring in a rapid succession.

9.6 Cell Membrane Potential

3. As the inside of the membrane becomes positive, _____ channels are opened that allows _____ ions to diffuse out of the cell.
   a. Positive ions going out increases the potential difference which causes
   b. Often, the repolarization goes beyond the resting potential which is called

9.7 Nerve Impulses

A. The action potential stimulates adjacent membranes to threshold levels and
   1. This creates a wave of



9.7 Nerve Impulses

B. Impulse conduction

1. Unmyelinated axons conduct impulses over their

2. Myelinated areas do not allow ions to move across a membrane.
   a. The only place action potentials can occur is at the Nodes of Ranvier, and

3. Nerve impulses follow the _____ conduct an impulse or they don't.