**Chapter 11 and 12 Review**

1. **Central Nervous System** – includes the **\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_**
2. **Motor (efferent) division** – consists of motor neurons that carry out the motor functions of the nervous system. Motor output traveling from the brain and spinal cord via cranial and spinal nerves of the PNS may be used to control the contraction of muscle or secretion from a gland.

Organs that carry out the effects are called **\_\_\_\_\_\_\_\_\_\_\_\_.**

* + - * **\_\_\_\_\_\_\_\_\_\_\_\_\_ motor** **division** (aka **voluntary motor division**)**-** consists of neurons that transmit signals to *skeletal muscles*; skeletal muscle tissue is under conscious control
      * **\_\_\_\_\_\_\_\_\_\_\_ Motor Division, better known as Autonomic nervous system** (**ANS**)

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_** –short, branched processes; *receive input* from other neurons, which they transmit to toward cell body in form of electrical impulses, may have multiple
2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ neurons** – carry information toward CNS; receive information from sensory receptor and transmit info to their cell body in PNS then down their axon to the brain or spinal cord.
3. **CNS**:

**\_\_\_\_\_\_\_\_** – clusters of neuron cell bodies

**\_\_\_\_\_\_\_\_** – bundles of axons

**PNS**:

**\_\_\_\_\_\_\_ –** clusters of neuron cell bodies

**\_\_\_\_\_\_\_ –** bundles of axons

1. **\_\_\_\_\_\_\_\_\_\_** – large *star-shaped* cells whose many processes terminate in structures called **end-feet**; function to:
   * + *Anchor* neurons and blood vessels in place
     + May facilitate *transport* of nutrients and gases from blood vessels to neurons
     + Regulate *extracellular environment* of brain
     + Assist in formation of **blood-brain barrier**; protective structure, by ensheathing capillaries and inducing their cells to form tight junctions, makes them virtually *impenetrable* to most polar compounds and proteins
2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – also found in CNS; have radiating processes with *flattened ends* that wrap around axons of nearby neurons to form **myelin**
3. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ –** *ciliated,* line fluid-filled cavities within brain and spinal cord function to *circulate* **cerebrospinal fluid,** certain cells also play a role in formation of CSF.
4. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** –encircle axons found in PNS to provide them with **myelination**
5. **Graphically depict an action potential. Describe each step.**
6. **Explain what goes on at a neuronal synapse**.
7. What neurotransmitter is used at the neuromuscular junction, is largely *excitatory* but it does exhibit some inhibitory effects in some PNS synapses, and it is quickly *degraded* by **acetylcholinesterase** (**AChE**) an enzyme in synaptic cleft?
8. As a person emerges from stage IV sleep he/she enters \_\_\_\_\_\_\_\_\_\_sleep, named for the rapid back–and-forth eye movements that occur during this stage, this is when the majority of dreams occur, brain waves resemble beta waves of an awake adult.
9. What are the 4 divisions of the brain?
10. What part of the brain is heavily involved in *planning* and *coordination* *of* *movement*, especially complex activities such as playing a sport or an instrument?
11. **\_\_\_\_\_\_\_\_\_\_\_\_** **fibers** – connect right and left hemispheres; includes **corpus** **callosum**.
12. **\_\_\_\_\_\_\_\_\_\_\_\_ system**- Involved in *memory*, *learning*, *emotion*, and *behavior*
13. Nearly all information destined for the cerebral cortex must first pass through the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
14. What are the 3 subdivisions of the brainstem?
15. Describe the blood-brain barrier.
16. List the 3 cranial meninges from superficial to deep.

**ANSWERS**

**1.Central Nervous System** – includes **brain** and **spinal** **cord**

**2. Motor (efferent) division** – consists of motor neurons that carry out the motor functions of the nervous system. Motor output traveling from the brain and spinal cord via cranial and spinal nerves of the PNS may be used to control the contraction of muscle or secretion from a gland.

Organs that carry out the effects are called **effectors**

* + - * **Somatic** **Motor** **division** (aka **voluntary motor division**)**-** consists of neurons that transmit signals to *skeletal muscles*; skeletal muscle tissue is under conscious control
      * **Visceral Motor Division, better known as Autonomic nervous system** (**ANS**)
        + Consists of neurons that carry signals primarily to *thoracic* and *abdominal viscera*; critical for maintaining homeostasis of body’s internal environment
        + Regulates secretion from certain *glands*, contraction of *smooth muscle*, and contraction of *cardiac muscle* in heart; *sometimes called the* **involuntary motor division**

1. **Dendrites** –short, branched processes; *receive input* from other neurons, which they transmit to toward cell body in form of electrical impulses, may have multiple
2. **Sensory** or **afferent neurons** – carry information toward CNS; receive information from sensory receptor and transmit info to their cell body in PNS then down their axon to the brain or spinal cord, generally *pseudounipolar* or *bipolar*
3. **CNS**:

**Nuclei** – clusters of neuron cell bodies

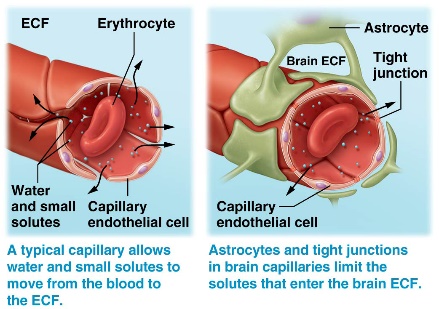
**Tracts** – bundles of axons

**PNS**:

**Ganglia –** clusters of neuron cell bodies

**Nerves –** bundles of axons

1. **Astrocytes** – large *star-shaped* cells whose many processes terminate in structures called **end-feet**; function to:
   * + *Anchor* neurons and blood vessels in place
     + May facilitate *transport* of nutrients and gases from blood vessels to neurons
     + Regulate *extracellular environment* of brain
     + Assist in formation of **blood-brain barrier**; protective structure, by ensheathing capillaries and inducing their cells to form tight junctions, makes them virtually *impenetrable* to most polar compounds and proteins
2. **Oligodendrocytes** – also found in CNS; have radiating processes with *flattened ends* that wrap around axons of nearby neurons to form **myelin**
3. **Ependymal** **cells –** *ciliated,* line fluid-filled cavities within brain and spinal cord function to *circulate* **cerebrospinal fluid,** certain cells also play a role in formation of CSF.
4. **Schwann** **cells** –encircle axons found in PNS to provide them with **myelination**
5. **Graphically depict an action potential. Describe each step. A local potential depolarizes the axolemma of the trigger zone to threshold.** *The local potential* must be strong enough to *depolarize axon* to a level called **threshold** (**usually −55 mV**)
   1. Once threshold reached, voltage-gated sodium ion channels *activate* and sodium ions flow into axon causing **depolarization**
   2. As the membrane potential becomes more positive, more voltage-gated sodium ion channels are activated. This influx of positive charges causes **rapid depolarization to about +30.**
   3. Sodium ion channels *inactivate* and voltage-gated potassium ion channels *activate*: sodium ions stop entering and potassium ions exit axon **- *repolarization***
   4. Axolemma may ***hyperpolarize*** before potassium ion channels return to resting state; then axolemma returns to **resting membrane potential**
6. **Explain what goes on at a neuronal synapse**.
   1. An action potential in presynaptic neuron triggers **voltage-gated calcium ion channels** in axon terminal to open
   2. *Influx of calcium ions* causes synaptic vesicles to ***release neurotransmitter*** into synaptic cleft
   3. **Neurotransmitters *bind to receptors* on postsynaptic neuron**
   4. **Ion channels open**, leading to a *local potential* and possibly an *action potential* if threshold is reached
7. **Acetylcholine** (**ACh**) – What neurotransmitter is used at the neuromuscular junction, is largely *excitatory* but it does exhibit some inhibitory effects in some PNS synapses, it is quickly *degraded* by **acetylcholinesterase** (**AChE**) an enzyme in synaptic cleft.
8. **REM** **sleep** (**rapid** **eye** **movement**)- As a person emerges from stage IV sleep he/she enters REM sleep, named for the rapid back–and-forth eye movements that occur during this stage, REM sleep is when majority of dreams occur, brain waves resemble beta waves of an awake adult
9. Cerebrum, Diencephalon, Cerebellum, Brainstem
10. What part of the brain is heavily involved in *planning* and *coordination* *of* *movement*, especially complex activities such as playing a sport or an instrument? **Cerebellum**
11. **Commissural** **fibers** – connect right and left hemispheres includes **corpus** **callosum**.
12. **Limbic System**- Involved in *memory*, *learning*, *emotion*, and *behavior*
13. Nearly all information destined for the cerebral cortex must first pass through the **thalamus.**
14. Midbrain, pons, and medulla oblongata



1. List the 3 cranial meninges from superficial to deep.

**Dura mater, arachnoid mater, and pia mater.**