Neuro review

Lab and lecture review

- 1/ Which of the following statements is TRUE?
- a) Peripheral nerve is similar to smooth muscle in terms of the connective tissue investment
- b) Most nerves contain afferent and efferent fibers and thus carry both motor and sensory signals
- c) Nodes of Ranvier are most easily seen in cross-section of peripheral nerve
- d) None of the above
- 2/ Which of the following cells is reponsible for myelin formation in the peripheral nervous system?
- a) Astrocyte
- b) Oligodendrocyte
- c) Schwann cell
- d) Microglial cell
- e) Satellite cell

- 3/ The perineurium is the connective tissue layer:
- a) Surrounding an entire nerve
- b) Surrounding individual axons in the CNS
- c) Surrounding individual axons in the PNS
- d) Surrounding fascicles of axons in the CNS
- e) Surrounding fascicles of axons in the PNS

4/The peripheral nervous system includes the:

- a) Somatic nervous system
- b) Brain
- c) Spinal cord
- d) Nuclei
- 5/The system that controls smooth muscle, cardiac muscle, and gland activity is the:
- a) Somatic nervous system
- b) Autonomic nervous system
- c) Skeletal division
- d) Sensory nervous system

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- 6/A neuron with many short dendrites and a single long axon is a:
- a) Multipolar neuron
- b) Bipolar neuron
- c) Unipolar neuron
- d) None of the above
- 7/ Most sensory neurons are

neurons.

- a) Unipolar
- b) Bipolar
- c) Multipolar
- d) Efferent
- e) A and b
- f) A and c
- g) B and c

8/Cells found in the choroid plexus that secrete cerebrospinal fluid are:

- a) Astrocytes
- b) Microglia
- c) Ependymal cells
- d) Oligodendrocytes
- e) Schwann cells
 - 9/The most likely type of fiber that would carry the impulse for a withdrawal reflex would be a(n):
 - a) A fiber because they carry the strongest action potentials
 - b) A fiber because they carry APs the fastest
 - c) B fiber because they carry APs the fastest
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Neuronal Structure





Neuronal Structure





Specialized to receive & integrate stimuli



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Single process

Specialized to conduct impulses to other cells. Speed of impulse conduction is related to axon diameter

May receive excitatory or inhibitory stimuli from other neurons



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Spinal Cord H&E

grey matter

neurones

neuropil

NissI bodies

white matter





A - axon, AH - axon hillock, D - dendrite, NB - Nissl bodies, NU - nucleolus



Neurons in CNS

polygonal with many cell processes

Neurons in PNS

round, usually with single process



Dorsal Root Ganglion H&E

satellite cell nuclei

Dorsal Root Ganglion H&E

satellite cell nuclei



Motoneuron

glial cell nucleus

blood vessel

Motoneuon

blood vessel



protoplasmic astrocytes



dendritic spines

dendrite of neuron

astrocyte-



Cuboidal - low columnar epithelium

lines ventricles & central canal of spinal cord

ciliated - CSF



EPENDYMA Cuboidal - Iow



columnar epithelium

lines ventricles & central canal of spinal cord

ciliated - CSF

Forebrain, Cortex Giemsa

CEREBRAL CORTEX



CEREBRAL CORTEX



•10/Axons within nerves may have which of the following associated with them?
a.Schwann cells
b.Nodes of Ranvier
c.Oligodendrocytes
d.A and b
e.All of the above

•11/Action potentials are conducted more rapidly in:
a.Small diameter axons than large diameter
axons
b.Large diameter axons than small diameter
axons
c.Unmyelinated axons than myelinated axons
d.Axons that lack a wrapping of Schwann
cells

•12/Clusters of nerve cell bodies within the PNS are called ______.

•13/Gray matter contains primarily: a.Myelinated fibers b.Neuron cell bodies c.Schwann cells d.All of the above •10/Axons within nerves may have which of the following associated with them? a.Schwann cells b.Nodes of Ranvier c.Oligodendrocytes d.A and b e.All of the above

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•12/Clusters of nerve cell bodies within the PNS are called ganglia______.

•13/Gray matter contains primarily: a.Myelinated fibers b.Neuron cell bodies c.Schwann cells d.All of the above •Arrange the following connective tissue structures from the outermost to the innermost.

1.Endoneurium

2.Epineurium

3.Perineurium

•Neurotransmitters are stored in vesicles that are located primarily in specialized portions of the: a.Soma b.Axon c.Dendrite

d.Perikaryon

•An inhibitory neuron could affect the neuron with which it synapses by: a.Producing an IPSP within the neuron b.Hyperpolarizing the neuron c.Increasing K+ efflux from the neuron d.Increasing Cl- influx into the neuron e.All of the above f.2 of the above

•Summation:

a.Is caused by a combining of several local potentials b.Can occur when 2 action potentials arrive simultaneously at 2 different presynaptic terminals c.Can occur when 2 action potentials arrive in very close succession at a single presynaptic terminals d.All of the above

•Which of the following organelles is responsible for the appearance of Nissl bodies in the cell bodies of motor neurons?
a.Smooth endoplasmic reticulum
b.Rough endoplasmic reticulum
c.Golgi apparatus
d.Mitochondria
e.Basal bodies

•Which of the following structures is a component of a reflex arc? a.Afferent neuron b.Efferent neuron c.Sensory receptor d.Effector organ

e.All of the above

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231

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•A convergent circuit: a.Is a positive feedback system that produces many action potentials b.Is a negative feedback system that produces IPSPs c.Occurs when multiple neurons synapse onto few neurons d.Cannot be affected by a sodium channel blocker e.All of the above

•The output of a convergent circuit could be: a.An IPSP b.An EPSP c.An action potential d.All of the above

•Which of the following is TRUE of the perineurium?
a.It's a fascia surrounding many bundles of nerve fibers
b.It's a layer of connective tissue surrounding a singl bundle (fascicle) of nerve fibers
c.It's a thin layer of reticular fibers covering individual nerve fibers
d.It's an artery-rich fascia covering the external coat of nerves

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The somatic nervous system is part of the:

- 1. Sympathetic nervous system
- 2. Parasympathetic nervous system
- 3. Autonomic nervous system
- 4. 2 of the above
- 5. None of the above
- Effector organs of the ANS include all of the following EXCEPT:
- 1. Medulla oblongata
- 2. Arteriolar smooth muscle
- 3. Heart
- 4. Visceral smooth muscle
- 5. Glands

Some of the nerves that innervate lymph nodes have been discovered to be adrenergic (i.e., they release norepinephrine). This suggests that the:

- 1. Parasympathetic nervous system may influence lymph node activity
- 2. Parasympathetic nervous system does NOT influence lymph node activity
- 3. Sympathetic nervous system must exert the only nervous control of lymph nodes
- 4. Sympathetic nervous system may influence lymph node activity
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- All preganglionic autonomic neurons secrete:
- 1. Epinephrine
- 2. Acetylcholine
- 3. Nicotine
- 4. Dopamine
- All postganglionic neurons bear these receptors.
- 1. Alpha adrenergic
- 2. Beta adrenergic
- 3. Nicotinic
- 4. Muscarinic
- The parasympathetic nervous system affects all of these organs EXCEPT:
- 1. Heart
- 2. Pupillary smooth muscles
- 3. Salivary glands
- 4. Adrenal glands

- Sympathetic stimulation of the iris causes:
- 1. Astigmatism
- 2. Pupillary constriction
- 3. Pupillary dilation
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Posterior view of brainstem



Posterior view of brainstem

Cerebral peduncle Superior cerebellar peduncle

Middle cerebella<u>r</u> peduncle

Inferior cerebellarpeduncle



Brainstem: 3 major divisions



Brainstem: 3 major divisions



MidbrainPonsMedulla











| 1 | |
|------|--|
| П | |
| 111 | |
| IV | |
| V | |
| VI | |
| VII | |
| VIII | |
| IX | |
| Х | |
| XI | |
| XII | |

| Ι | Olfactory | S |
|------|----------------------------|---|
| 11 | Optic | S |
| 111 | Occulomotor | Μ |
| IV | Trochlear | Μ |
| V | Trigeminal | В |
| VI | Abducens | Μ |
| VII | Facial | В |
| VIII | Auditory/Vestibulocochlear | S |
| IX | Glossopharyngeal | В |
| Х | Vagus | В |
| XI | Spinal/Accessory | Μ |
| XII | Hypoglossal | Μ |





- A sagittal fissure
- **B** central sulcus
 - C frontal lobe
- **D** parietal lobe
- **E** occipital lobe
- F temporal lobe
 - G cerebellum
 - H vermis
 - I medulla





- A medulla
- B cerebellum
- **C** occipital lobe
- **D** temporal lobe
- **E** parietal lobe
- F frontal lobe
- G olfactory bulb & tract
 - H optic nerve
 - I optic chiasma
 - J optic tract

The folds on the surface of the cerebellum are called:

- A) gyri
 - **B)** fissures
 - C) vermis
 - D) nodes
 - E) folia

The cerebellum mainly functions to:

A) initiate most involuntary muscle activity

- **B)** initiate most voluntary muscle activity
- **<u>C</u>**) coordinate complex skeletal muscle actions
- **D)** integrate emotional states in memory formation
- **E)** relay spinal sensory inputs to the thalamus

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Name the structure where is the arrow

Name the Specific Sulci/Fissures:



Name the Specific Sulci/Fissures: a. b. c. d.





Corpus Callosum









Name the various structure?



<u>Cerebellum</u>,


























- The central nervous system consists of the brain and spinal cord. T F
- 2. The telencephalon and diencephalon are the two main divisions of the forebrain. T F
- The three main divisions of the hindbrain are the cerebellum, basal ganglia, and hypothalamus.
 T F
- During embryogenesis, the notochord induces the formation of the neuroectoderm in the overlying ectoderm.
 T F
- 5. The peripheral nervous system develops from the cells of the neural tube. T F
- 6. At the equilibrium potential for a permeant ion, the flux of the ion down its concentration gradient is equal to the flux of the ion down the electrical gradient across the membrane.
 - ΤF
- If pNa were greater than pK, the resting membrane potential of a cell would closer to the sodium equilibrium potential than to the potassium equilibrium potential. T F

1. T 2. T 3. F 4. T 5. F 6. T 7. T

Suppose that in a neuron, the sodium equilibrium potential is +58 mV, the potassium equilibrium potential is -80 mV, and the resting membrane potential of the neuron is -70 mV.

- a) In this neuron, the potassium permeability of the membrane is less than the sodium permeability.
- b) If the sodium permeability and the potassium permeability were both doubled, the resting membrane potential of the neuron would remain at -70 mV.
- c) In this neuron, the internal potassium concentration is less than the external potassium concentration.
- d) In this neuron, both sodium and potassium are at equilibrium at the resting membrane potential of the cell.
- e) In this neuron, the membrane is permeable to potassium but not to sodium.

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In the somatosensory system, which of the following statements is not correct: all the axons of primary sensory receptor cells terminate locally in the spinal cord and do not send branches into the brain.

- a) the primary somatosensory cortex is located in the postcentral gyrus of the cerebral cortex.
- b) the ascending axons of neurons that carry information about touch, pressure, vibration, and proprioception to the brain are found mostly in the dorsal columns of the spinal cord.
- c) the ascending sensory axons of the dorsal columns leave the spinal cord and terminate in the dorsal column nuclei of the medulla, the gracile nucleus and the cuneate nucleus.
- d) the three major spinal pathways for ascending sensory information are the dorsal columns, the lateral sensory tract, and the spinocerebellar tract.

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Acetylcholine is the neurotransmitter used by somatic motor neurons

- a) parasympathetic motor neurons
- b) parasympathetic preganglionic neurons
- c) sympathetic preganglionic neurons
- d) all of the above

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The nervous system has three overlapping functions. Which of the following represents a logical sequence of these three functions?

- a. sensory input, motor output, integration
- b. motor output, integration, sensory input
- c. sensory input, integration, motor output
- d. integration, sensory input, motor output

While studying for an exam, you reach for a beverage. To extend your arm, your _____ nervous system is activated.

- a. afferent
- b. autonomic
- c. sympathetic
- d. somatic

The door slams shut loudly and you flinch. After a few seconds, you realize that your heart is beating very rapidly and forcefully. This response is the result of your _____ nervous system.

- a. afferent
- b. sympathetic
- c. central
- d. somatic

Complete the following analogy: electrical wire is to electrical tape as peripheral neurons are to_____.

- a. Schwann cells
- b. oligodendrocytes
- c. astrocytes
- d. ependymal cells

Each neuron in our bodies has an estimated lifespan of

- a. 12<u>0 days</u>
- b. 10 years
- c. 10 months
- d. an average human lifespan

Nerves" are found in the ______ while "tracts" are found in the

- a. PNS... CNS
- b. CNS... PNS
- c. brain... legs and arms
- d. spinal cord... brain

You are a scientist that is studying secretory products of snail neurons. To culture these neurons in a laboratory and purify the secretory products of these neurons, which neuron component is critical to production of its secretory products?

- a. the axon terminals
- b. the cell body
- c. the axon
- d. the dendrites

The portion of an axon that contacts its target is the

- a. dendrite
- •b. axon
- c. axon terminal
- d. cell body

The basis for differentiation between gray matter and white matter in the CNS is the presence of _____ in white matter.

- a. unmyelinated fibers
- b. myelinated fibers
- c. Schwann cells
- d. oligodendrocytes



The <u>neurons</u> comprise the most common structural type of neuron in humans.

- a. pseudounipolar
- b. unipolar
- c. bipolar
- d. multipolar



When considering the relationship between structural classifications and functional classifications of neurons, it can be said that

- a. all multipolar neurons are interneurons.
- b. all motor neurons are multipolar neurons.
- c. essentially all bipolar neurons are sensory neurons.
- d. unipolar neurons ONLY function as motor neurons.

As a general rule of thumb, the greater the potential difference in charge between two points, the the voltage.

- a. higher
- b. lower
- c. less difference in
- d. more even

In a living neuron, which component provides resistance to current flow?

- a. the membrane
- b. the axon
- c. the cytoplasm
- d. the ions

Sodium ion concentration in the cytoplasm of a neuron ______ when its voltage-gated potassium channels open.

- a. increases
- b. decreases
- c. remains unchanged
- d. increases 10x

Sodium ion concentration in the cytoplasm of a neuron ______ when its voltage-gated sodium channels open.

- a. increases
- b. decreases
- c. remains unchanged
- d. decreases 10x

The chief contributor to the negative charge of a resting neuron's intracellular fluid is

- a. a high extracellular concentration of sodium ions.
- b. a high intracellular concentration of anionic proteins
- c. a high intracellular concentration of potassium ions.
- d. a high extracellular concentration of chloride ions.

The voltage displayed across a resting neuron membrane is termed the _____.

- a. action potential
- b. excitatory potential
- c. resting membrane potential
- d. depolarized potential

Maintenance of the resting membrane potential is possible due to

- a. ATP expenditure of the neuron.
- b. the actions of the sodium-potassium pump.
- c. potassium ions spontaneously crossing to the interior of the neuron.
- d. both a and b

Depolarization of the neuron refers to

- a. a reduction in membrane potential.
- b. an increase in membrane potential.
- c. an increased negativity of the neuron interior.
- d. both b and c.

Neurons generally repolarize once membrane potential reaches approximately +30 mV because

- a. voltage-gated sodium channel gates close.
- b. voltage-gated potassium channel gates open.
- c. chemically-gated sodium channels open.
- d. voltage-gated potassium channel activation gates open.
In a laboratory setting, stimulating an axon in the middle will cause the neuron to

- a. be unresponsive to any stimulation.
- b. initiate and propagate an action potential toward the cell body.
- c. hyperpolarize.
- d. send a nerve impulse in either direction away from the point of stimulus.



In an organism, action potentials are propagated unidirectionally toward the axon ending because

- a. membranes become non-responsive due to inactive sodium channels after action potential generation.
- b. action potentials are always propagated in an anterograde fashion regardless of conditions.
- c. the axon hillock sets direction of action potential propagation.
- d. both a and b

You would expect a neuron that depolarizes to -75 mV would

- a. return to resting membrane potential without generating an action potential.
- b. fire a much more intense action potential with a peak of +100 mV.
- c. fire a much less intense action potential with a peak of +15 mV.
- d. hyperpolarize.

The point at which the all-ornone principle of action potential generation is reached is termed the _____.

- a. peak
- b. depolarization point
- c. threshold
- d. point of no return

Stronger stimuli are interpreted when the CNS receives action potentials.

- a. higher magnitude
- b. more frequent
- c. lower magnitude
- d. infrequent

During the relative refractory period

- a. no action potentials can be generated.
- b. the threshold is substantially elevated.
- c. exceptionally strong stimuli could trigger action potentials.
- d. both b and c

The location at which a neuron interacts with its target (either another neuron or a muscle, etc.) is called the _____.

- a. synapse
- b. junction
- c. connection
- d. axoaxonal target

Which of the following synapse types is the most rapid?

- a. chemical synapse
- b. electrical synapse
- c. presynaptic synapse
- d. None of these is more rapid than the others.

During the events involved in information transfer across a chemical synapse, which of the following steps would be interrupted by exposing neurons to calcium channel blockers?

- a. neurotransmitter exocytosis from the presynaptic neuron
- b. depolarization of the presynaptic neuron
- c. binding of neurotransmitters to the postsynaptic membrane
- d. depolarization of the postsynaptic membrane

Dertain psychosomatic drugs exert their effects by keeping the concentration of neurotransmitters elevated within the synapse. These drugs could exert their effects by

- a. inhibiting enzymes associated with the postsynaptic membrane that degrade the neurotransmitter.
- b. inhibiting reuptake of the neurotransmitter by astrocytes or the presynaptic terminal.
- c. both a and b
- d. neither a nor b

Generally speaking, opening chloride channels in the postsynaptic membrane will result in a _____.

- a. excitatory postsynaptic potential
- b. excitatory presynaptic potential
- c. inhibitory postsynaptic potential
- d. inhibitory presynaptic potential

f a neuron were inactivated after being treated with a drug that inhibits adenylate cyclase, what could be said about the nature of the interaction between the neuron and its neurotransmitter?

- a. the neuron's neurotransmitter directly promotes rapid changes in its membrane potential
- b. the neuron's membrane contains receptors that will activate a G protein-linked cascade when bound to the neurotransmitter
- c. the neuron's membrane contains receptors that are channel-linked
- d. both a and c are correct

Neurotransmitters are important for functioning of _____ synapses.

- a. chemical
- b. electrical
- c. gap junction
- d. converging