

review: CNS

1. what are the 3 primary brain vesicles
prosencephalon, mesencephalon, rhombencephalon
2. what are the secondary brain vesicles
prosencephalon - telencephalon, diencephalon
mesencephalon - stays mesencephalon
rhombencephalon - metencephalon, myelencephalon
3. explain the ventricles of the brain
lateral ventricle - in the telencephalon
3rd ventricle - in the diencephalon
4th ventricle - in front of the cerebellum
4. what are the significance of gyri and sulci? name them and what lobes they separate
gyri - elevated ridges
sulci (furrows) - shallow grooves
longitudinal fissure - medial - splits hemispheres
transverse cerebra fissure - separates hemispheres from cerebellum
central sulcus - splits frontal lobe and parietal lobe
precentral gyrus - anterior to central sulcus
postcentral gyrus - posterior to central sulcus
5. what are the functional areas of the cerebral cortex?
frontal lobe, parietal lobe, temporal lobe, occipital lobe, and insula.
6. explain the following
 - a. primary motor cortex - found in the precentral gyrus of the frontal lobe. handles the primary/primitive motor actions for the brain.
 - b. premotor cortex - found anterior to the precentral gyrus, handles more complex motions and instructs the primary motor cortex what the brain wants to accomplish.
 - c. Broca's Area - a motor speech area of the brain in the frontal lobe. damage here can cause Broca's Aphasia, where the subject is unable to speak or write intelligibly, but understands what is being said.
 - d. primary somatosensory area
 - e. somatosensory association cortex
 - f. visual areas - found in the occipital lobe and stretching underneath into the insula
 - g. auditory areas - found in the temporal lobes, handle processing of auditory stimuli
 - h. prefrontal cortex
7. where are the language areas, and what are they called?
Broca's Area in the Frontal Lobe, Wernicke's Area in the Parietal and Occipital Lobe
8. explain the lateralization of cortical function
while the brain is roughly symmetric, the two halves do not share the same tasks exactly. some tasks are found to be handled more on one side than another. an example is the language processing being handled more likely on the left side than the right.
9. explain the functions of the following
 - a. diencephalon - the middle part of the brain, made of the thalamus, hypothalamus, and epithalamus
 - b. thalamus - the major relay station for sensory input in the brain. the triage nurse that decides where to send what inputs
 - c. hypothalamus - the major connection for the brain to the endocrine system. it sits upon the pituitary gland, the master gland of the endocrine system.
 - d. epithalamus - the posterior part of the diencephalon. it connects the brain with the pineal gland, providing regulatory control over sleep/wake cycle, and other circadian timers
 - e. brain stem - the lower part of the brain, made of midbrain, pons, medulla oblongata
 - f. midbrain - the top of the brain stem
 - g. pons - "bridge" - the middle part of the brain stem
 - h. medulla oblongata - the lowest part of the brain stem. it controls respiratory and cardiovascular control. site of the decussation of pyramids
 - i. cerebellum - the little brain - provides processing for motor activity that requires exact timing between repeated/trained

sequence of actions

- j. meninges - the protective layers surrounding the brain and spinal cord
- k. dura mater - the tough superficial meninx that protects the brain and spinal cord.
- l. pia mater - the deepest meninx that surrounds the the brain and spinal cord like tight cellophane.
- m. arachnoid mater - the intermediate meninx that supplies nutrients to the brain
- n. cerebrospinal fluid - the nutrient rich fluid that surrounds the brain, floating it and supporting it from its own weight.
- o. choroid plexus - capillaries of the arachnoid mater bend down into ventricles and provide blood plasma and other nutrients to the CSF in the subarachnoid space.
- p. blood brain barrier -
 - 1) endothelium of capillary wall
 - 2) thick basal lamina surrounding ext. face of each capillary
 - 3) bulbous feet of astrocytes clinging to the capillaries

10. explain the following

- a. strokes - when oxygen is cut off, brain tissue dies (infarcts). that triggers them to dump glutamine in large quantities which is an excitotoxin for the neighboring cells. they take in the glutamate and lots of Ca into their mitochondria. the mitochondria makes supraoxygen, a toxin and initiates apoptosis directly and makes proteins that initial apoptosis.
- b. Alzheimer's Disease - progressively degenerative leading to dementia. brain fills w/ senile plaques of beta-amyloid peptide - punching holes in neuron's membrane. protein tau which should bind microtubules into tracts binds w/ each other disrupting transport in cells causing death
- c. Parkinson's Disease - degeneration of dopamine releasing neurons of substantia nigra. tremors. L-dopa can replace dopamine temporarily.
- d. Huntington's Disease - mutant huntington protein accumulates in brain cells. wild floppy movements called "chorea" leads to death
- e. Epidural Space - fatty substance/space above the dura mater in the vertebral column.
- f. Cauda equina - once the spinal cord ends around T12-L1, the lower spinal nerves that innervate the lower body travel down the vertebral column together. this formation looks like the tail of a horse.
- g. flaccid paralysis - complete muscle paralysis caused by severing/damaging the lower motor neuron that innervates that muscle.
- h. spastic paralysis - paralysis of muscle caused by severing/damaging the upper neuron. this allows signals from the spinal cord to still reach the muscle providing occasional signals to contract.
- i. paraplegia - damage to the spinal cord that results in impairment to the lower two limbs.
- j. quadriplegia - damage to the spinal cord that results in impairment to all four limbs.
- k. poliomyelitis - destruction of ventral horn motor neurons by polio virus. paralyzing. can be fatal

11. explain the limbic system

parts of rhinencephalon (cingulate gyrus, parahippocampal gyrus, dentate gyrus, hippocampus), amygdala, hypothalamus, fornix.
collection of structures in the brain that coordinate emotional response to stimulus.

12. explain the different stages of sleep

NREM -

- stage 1: alpha waves, relaxed
- stage 2: sleep spindles with alpha waves, arousal difficult;
- stage 3: theta and delta waves, deepens, slowing down, vitals decline
- stage 4: relaxed muscles, delta waves

REM - O₂ use in REM greater than awakened state. limbs limp during REM

13. explain the stages of memory

short term memory - STM - working memory, capacity of 7-8 chunks of information
long term memory (LTM) limitless capacity. either from STM or procedural/skilled input

14. explain the difference between gray and white matter in the spinal cord, and the significance of each

gray matter is unmyelinated interneurons. white matter is myelinated nerve fibers. these nerves carry signals over longer distances.