Brain, Nerves and ANS

Brain: has 6 main parts:
Fore-Brain
1. Cerebrum
2. Diencephalon
3. Mid-Brain
Hind Brain
4. Pons
5. Medulla
6. Cerebellum

Brain: has 6 main parts:
Fore-Brain
1. Cerebrum: cerebral hemispheres, 4 lobes, lateral ventricles, cerebral cortex with Primary motor cortex, primary sensory cortex, and primary visual cortex.
2. Diencephalon: 3rd ventricle, Thalamus, hypothalamus, epithalamus - pineal gland
3. Mid-Brain
   Peduncles
   Aqueduct links 3rd and 4th ventricles
   Corpora Quadrigemina (superior and inferior colliculi)
Hind Brain
4. Pons
5. Cerebellum: vermis, cerebellar hemispheres, arbor vitae
6. Medulla oblongata: 4th ventricle,

Primary Areas:
1. Primary Motor Cortex lies in frontal lobe in front of central sulcus and control voluntary movements of skeletal muscles.
2. Primary Sensory Cortex lies in parietal lobe just behind central sulcus. It receives all sensory input.
3. Primary visual cortex lies in occipital lobe.

Cerebral Lateralization: Left cerebral hemisphere controls muscle activity of right side. Right cerebral hemisphere controls the activity of muscles on left side.
Left cerebral hemisphere usually controls speech making and general interpretations.
Right hemisphere deals with spatial relationships and logical analysis

Main cavities of brain
Lateral Ventricles are present in cerebral hemispheres
3rd ventricle is present in Diencephalon
4th ventricle is present in Medulla
Mid-Brain does not have a ventricle but a narrow duct Cerebral Aqueduct that joins 3rd and 4th ventricles

Blood-Brain Barrier
Blood-Brain-Barrier is formed of capillary cells with tight junctions and other features and does not allow all things in blood to enter brain.
Choroid plexus is a network of fine capillaries present in the roof of all 4 ventricles and secrete Cerebrospinal fluid = CSF. CSF supports brain, provides nourishment and protection. CSF moves freely in ventricles and central canal of spinal nerve cord.
Arachnoid villi return CSF into superior sagittal sinus by penetrating the inner layer of dura mater.
EEG Waves and Sleep
Electroencephalogram = EEG records electrical activity of brain. There are 4 kinds of waves.
Alpha: Awake and relaxed
Beta: Attentive or thinking consciously
Theta: seen in children or frustrated adults
Delta: fully asleep or in some diseases
Sleep Apnea is temporarily stopping of stimulation of breathing muscles

Gray M – White M – basal nuclei

Each Cerebral Hemisphere: has
1. Cerebral Cortex – formed of gray matter = cell bodies,
2. Cerebral white – formed of myelinated nerve fibers lies below gray matter and
3. Basal nuclei – lie deeper, have cell bodies and control rhythmic movements like walking.

Functions of the Cerebrum
Conscious thought
Intellectual activity
Memory
Origin of complex patterns of movement

Limbic system
Limbic system is a functional division of brain and has parts of fore brain and hind brain. It is associated with learning, and emotional behavior.

The Diencephalon
The diencephalon is 2nd part of forebrain. It has
Epithalamus – roof of diencephalon and has
Choroid plexus – secretes CSF
Pineal gland – is an endocrine gland
Thalamus – Very thick lateral walls of diencephalon and functions:
Relay switch
Integrates motor and sensory pathways
Hypothalamus is floor of diencephalon
It maintains temperature and concentration of body fluids by homeostasis
Has hunger and thirst centers
Regulates anterior pituitary and other endocrine glands

Spinal Nerves
Each spinal nerve arises from dorsal and ventral roots. Dorsal root has dorsal root ganglion.
There are 31 pairs of spinal nerves.

8 Cervical
12 Thoracic
5 Lumbar
5 Sacral
1 Coccygeal

All spinal nerves branch and join to form network = plexus except T₁ – T₁₂
Cranial Nerves
Cranial nerves arise from brain and pass through foramen of cranium.
There are 12 pairs. Eric Wise has a nice mnemonic to remember cranial nerves:
Old Oliver Ogg, Traveled To Africa, For Very Good, Vacation And Holidays.

<table>
<thead>
<tr>
<th>Cranial Nerves – 12 pairs</th>
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<tbody>
<tr>
<td><strong>1. Olfactory</strong></td>
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<td><strong>2. Optic</strong></td>
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<tr>
<td><strong>3. Oculomotor</strong></td>
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<td><strong>4. Trochlear</strong></td>
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<tr>
<td><strong>5. Trigeminal</strong></td>
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<tr>
<td><strong>6. Abducens</strong></td>
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<tr>
<td><strong>7. Facial</strong></td>
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<tr>
<td><strong>8. Vestibulocochlear</strong></td>
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<td><strong>9. Glossopharyngeal</strong></td>
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<td><strong>10. Vagus</strong></td>
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<td><strong>11. Accessory Spinal</strong></td>
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<td><strong>12. Hypoglossal</strong></td>
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Autonomic Nervous System is visceral motor in action. It has 2 antagonistic divisions sympathetic and parasympathetic.

<table>
<thead>
<tr>
<th>Sympathetic division</th>
<th>Parasympathetic division</th>
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<tbody>
<tr>
<td>1. It consists of sympathetic trunks and isolated ganglia</td>
<td>1. It has only isolated ganglia.</td>
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<td>2. Communicates with CNS through Thoraco-lumbar spinal nerves.</td>
<td>2. Communicates with CNS through Cranial and sacral nerves.</td>
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<td>3. Pre ganglionic fibers (before synapse) are much longer than postganglionic fibers</td>
<td>3. Pre ganglionic fibers are shorter than postganglionic fibers</td>
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<td>4. Fight or flight – response, increases heart and breathing rate</td>
<td>4. Rest and Digest response. Decreases heart and breathing rate but promotes digestion.</td>
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