Brain & Spinal Column

Cerebrum –
Diencephalon-
Brainstem –
- **Mid-brain** –
- **Pons** –
- **Cerebellum** –
- **Medulla Oblongata** –

Brain –
Spinal Cord –
- **Cervical/Thoracic/lumbar/sacral/coccygeal regions –**
- **Cervical curve** –
- **Thoracic Curve** –
- **Lumbar Curve** –
- **Sacral Curve** –

Brain & Spinal Column

Cerebrum – largest single component of the human brain. Probably where we think. Larger in mammals than in non-animals (mostly)
Diencephalon- translated as the "In between brain". Located deep inside the cerebrum. In all other creatures, its prominent, in humans and other advanced mammals it's "hidden" by the cerebrum.
Brainstem – where the brain starts to narrow down as it leaves the skull. In many organisms, that's all there is.
- **Mid-brain** most cranial part of the brainstem.
- **Pons** – the middle part of the brain stem. In front of the cerebellum
- **Cerebellum** – middle part of the brain stem behind the pons – Means small cerebrum.
- **Medulla Oblongata** – the most inferior part of the brainstem. The most caudal.

Brain – everything enclosed within the skull. This includes the brainstem.
Spinal Cord – everything enclosed within the bony spine.
- **Cervical/Thoracic/lumbar/sacral/coccygeal regions –** The nerves coming off the bony spine take the name of the part of the spine from where they exit.
- **Cervical curve** – C1-C7 – lordotic curve. Gives off spinal nerves C1 through C8.
- **Thoracic Curve** – kyphotic curve – Runs from T1 to T12. Involved with the thoracic nerves T1 through T12.
- **Lumbar Curve** – l1 through l5 vertebrae gives off spinal nerves L1 through L5. It is a lordotic curve.
- **Sacral Curve** – Kyphotic. Sacral segments S1 through S5, and the coccyx, it's the nerves, S1-S5 and Cox 1.

Central Nervous System

CNS –
PNS –
Cranial nerves –
Spinal Nerves –
- **8 cervical** –
- **12 thoracic –**
- **5 Lumbar –**
- **5 sacral –**
- **1 coccygeal -**

Cranial/Caudal –

Central Nervous System

CNS – enclosed within the skull and bony spine.
PNS – all the nerves coming off of the CNS that leave the skull or bony spine.
Cranial nerves – 12 pairs of nerves that come off of the brain
Spinal Nerves – 31 pairs of nerves that come off of the spinal cord.

- **8 cervical** – The cervical nerves (c1-c7) exit above the corresponding bone. C8 exists below C7. It's the only one that's different. After this, the nerve all exist below their named vertebrae.
- **12 thoracic –** Exit below the thoracic vertebrae, T1 – T12.
- **5 Lumbar –** They exit below their named lumbar vertebrae.
- **5 sacral –** They exit below the corresponding sacral levels through both an anterior and posterior foramen. The 5th nerve comes out at the sacral hiatus. These split inside the spine unlike the other nerves that split outside the bony spine.
- **1 coccygeal -** also exits at the sacral hiatus.

Cranial/Caudal – toward the “top” or toward the “bottom”.

Initial Development

Initial development

Neural Tube –

Further Development –

Forebrain vesicle / prosencephalon –

Midbrain vesicle / mesencephalon –

Hindbrain vesicle / rhombencephalon -

Initial Development

Initial development

Neural Tube – one of the earliest structures in the nervous system development. It develops from ectoderm.

Further Development – the tube expands into three "balloons"

Forebrain vesicle / prosencephalon – the most superior vesicle that expands out of the neural tube.

Midbrain vesicle / mesencephalon – the middle vesicle. It does the least changing

Hindbrain vesicle / rhombencephalon - The most "distal" expansion.

Later Development

Later Stage Development

- **Telencephalon** –
  - **Cerebral hemispheres** –
- **Diencephalon** –
  - **Things with the name "thalmus"** –
- **Mesencephalon** –
- **Metencephalon** –
  - **pons** –
  - **cerebellum** –
- **Myelencephalon** –

Later Development

Later Stage Development

- **Telencephalon** – The most cranial part. Going to turn into the cerebrum. Comes from the prosencephalon.
  - **Cerebral hemispheres** – paired lateral regions of the cerebrum. Our brain tends to be paired. It is a "paired" organ. Sometimes it's obvious, and sometimes it's not.
- **Diencephalon** – Comes from the prosencephalon. It's the "higher" brain in many lower organisms.
  - **Things with the name "thalmus"** – are found in the diencephalon.
- **Mesencephalon** – this does the least changing of any of the three vesicles. This turns into the mid-brain.
- **Metencephalon** – The upper portion of the rhombencephalon. Gives rise to the
  - **pons** – which lies in front
  - **cerebellum** – which lies behind.
- **Myelencephalon** – The lower portion of the rhombencephalon. This will turn into the medulla. The remainder turns into the spinal cord.

Neuron Physiology

Cations -
Anaions -
Plasma membrane charge -
Sodium – Potassium Pump –
Polarization –
Resting membrane potential -
Depolarization -
Action Potential –
Nerve Impulse –

Neuron Physiology

Plasma membranes are positive on the outside and negative on the inside.
Cations - Positive – lost electrons. -
Anions - Negative – gained electrons
Sodium – Potassium Pump – refers to a physiological process in which every cell actively keeps the outer surface of the membrane is kept positive relative to the inner cell membrane. It requires energy.
Polarization – the term used to describe this positive/negative relationship. It's the state that cells are normally found in.
Resting membrane potential - -80 mV toward the inside. (With a distrubing amount of variation seen in different texts). You have potential energy.
Depolarization - When you have done something to the cell membrane to let the charges switch. It's the opposite of polarization. (It's not really an all-or-nothing thing, but close enough.) (You interrupt the sodium-potassium pump.)
Action Potential – refers to the specific spot where you have messed up the sodium-potassium pump. Where the cell has been depolarized. Where the negative and positive has actually switched. Only one "spot" at a time actually switches in the cell membrane. One action potential will disrupt the next sodium-potassium pump, turning it off. It then repolarizes. It will "travel" down the length of the cell membrane. Action potentials will travel in both directions.
Nerve Impulse – The sum total of action potentials from beginning to end.

Nerve Impulse

Repolarization –
Refractory Period –
    Absolute refractory period –
    Relative refractory period –
Summation –
Domino analogy -
Speed of Nerve impulse –

Nerve Impulse

Repolarization – refers to the fact that as soon as the membrane becomes depolarized, it becomes polarized again. It goes back to normal.
Refractory Period – The period between impulses when the nerve cannot be stimulated. Measure in milliseconds.
    Absolute refractory period - you can do anything you want and it won't repolarize.
    Relative refractory period – a short period of time where you can get some stimulation, but not a complete charge/or complete nerve impulse.
Summation – you have to reach some degree of disruption before you can make the nerve depolarize. It generally takes multiple stimulations.
Domino analogy - one domino falls and then the next, except that here the dominos stand back up again.
Speed of Nerve impulse – it depends on the thickness of the axon. It's on average of 1m per second.

Myelin

Nodes of Ranvier –
Salutory conduction –
Mylenated nerve impulses travel
White matter –
Gray matter –

Myelin

Nodes of Ranvier – These are areas in the myelin sheath where the insulation is missing.
Salutory conduction – The action potentials are jumping from node to node down the axon.
Mylenated nerve impulses travel a factor of 100 times faster.
White matter – axons with a myelin covering. (axons)
Gray matter – any nerve tissue that doesn't have a myelin sheath. (cell bodies and dendrites) where nerve touches nerve.

Axon/Dendrite Interaction

Axonodendritic –
Axosomatic –
Axoaxonic –
Synapse –
Synaptic Cleft –
Neurotransmitter –
Presynaptic membrane –
Presynaptic vesicle –
Postsynaptic membrane –
Neuromodulator –

Axon/Dendrite Interaction

Axonodendritic – an axon is stimulating a dendrite.
Axosomatic – an axon is directly touching the cell body.
Axoaxonic – one axon is in contact with another axon.
Synapse – Where a nerve stimulates something.
Synaptic Cleft – The space within the synapse.
Neurotransmitter – The chemical one nerve releases to stimulate another nerve or organ.
Presynaptic membrane – The plasma membrane of the first neuron.
Presynaptic vesicle – little globules containing neurotransmitters. In the presynaptic nerve.
Postsynaptic membrane – the membrane that is going to receive the neurotransmitter.
Neuromodulator – These try to keep the nerve impulse from firing all the time.