



Embryology: Development of CNS

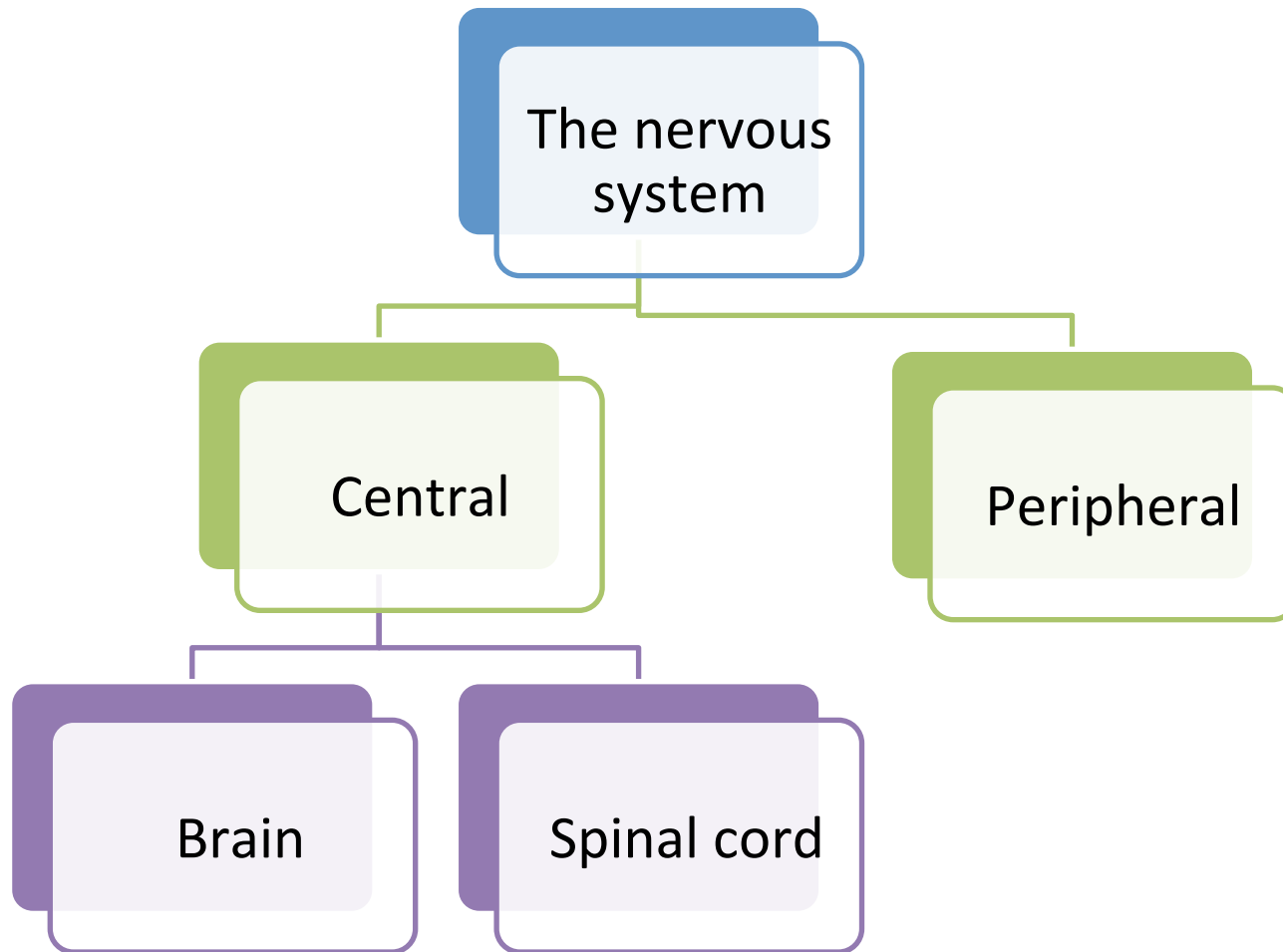
Presented by: Ala'a Alsayed
King Saud Bin Abdulaziz University
for Health Sciences

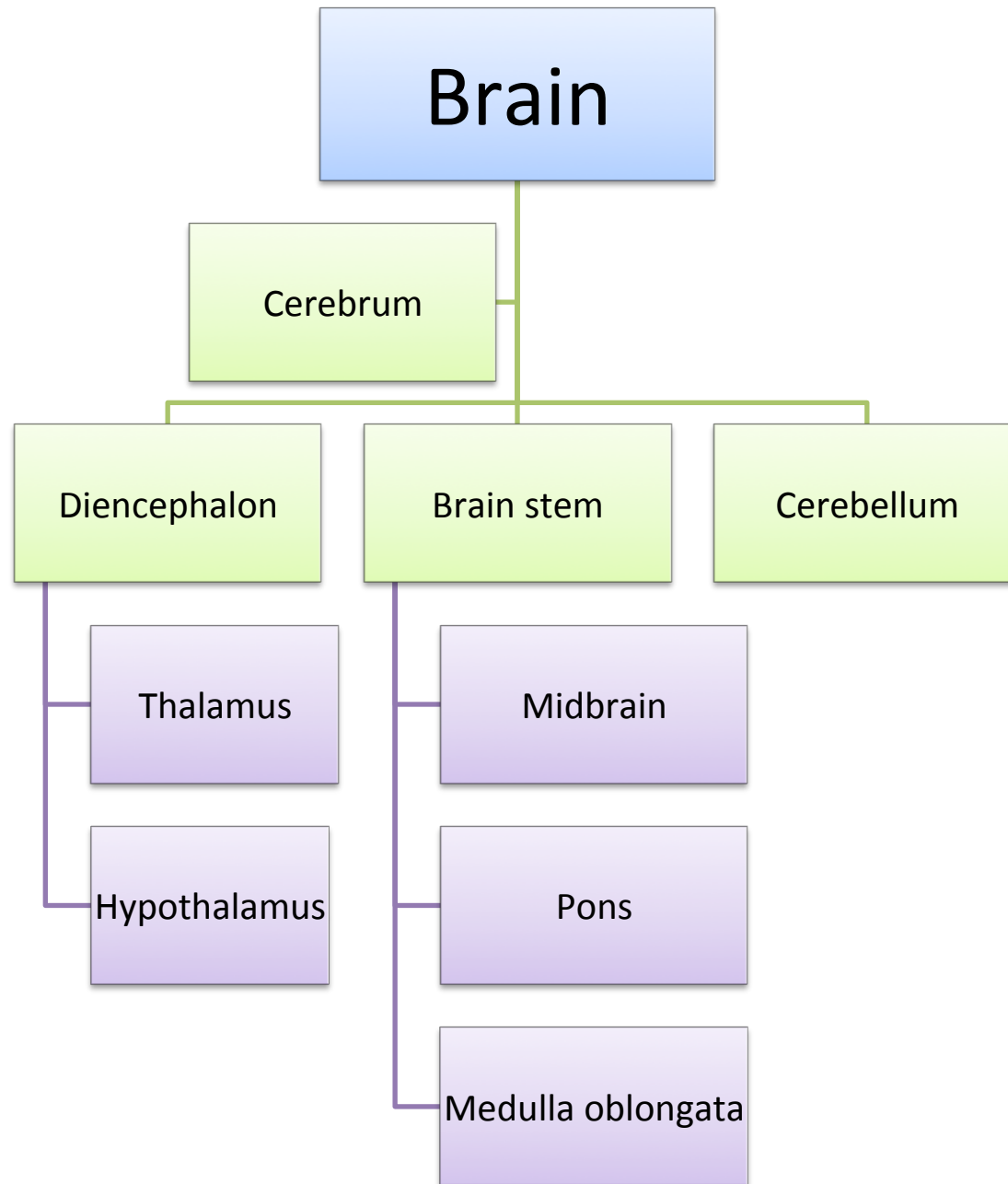


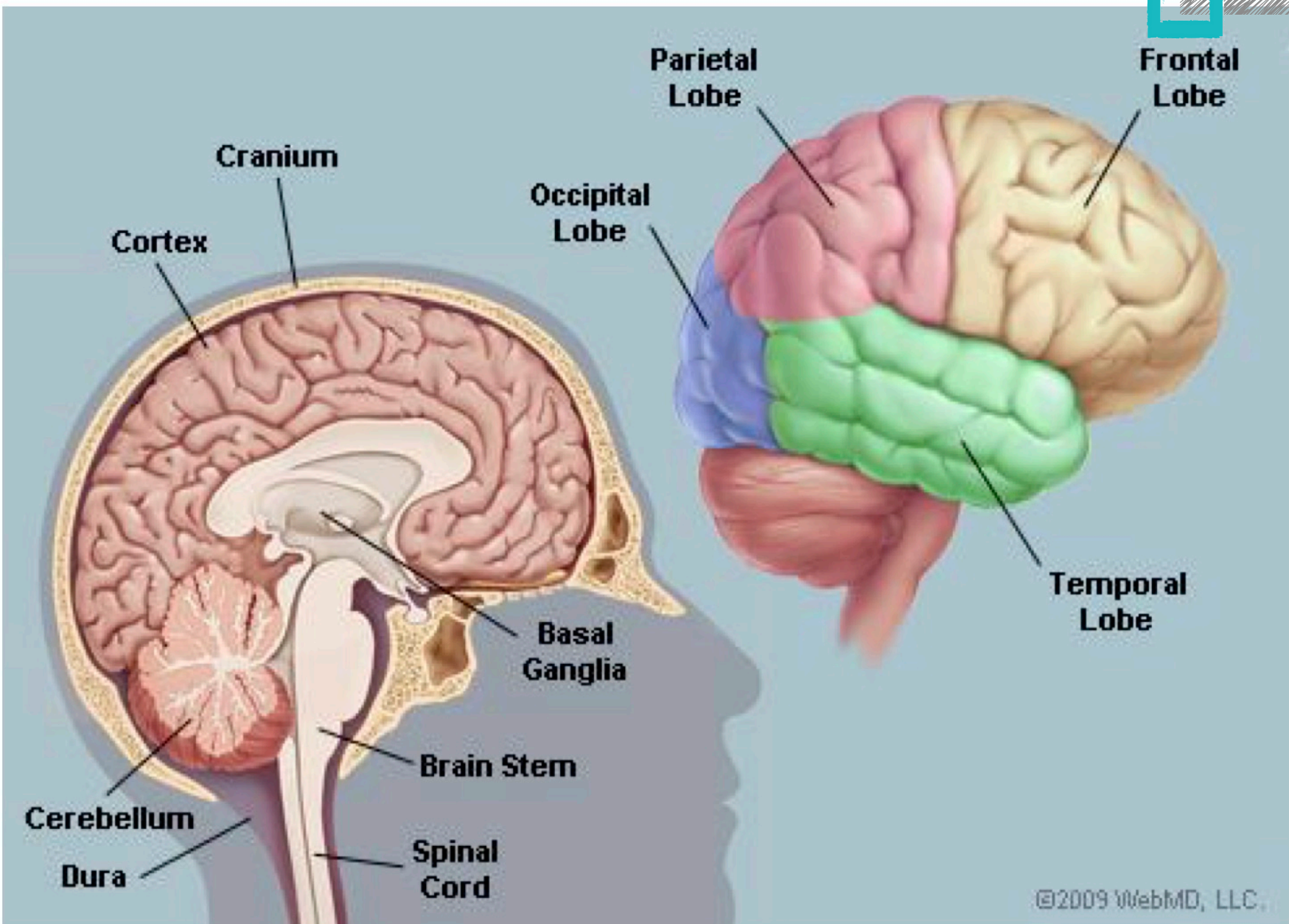
Outline

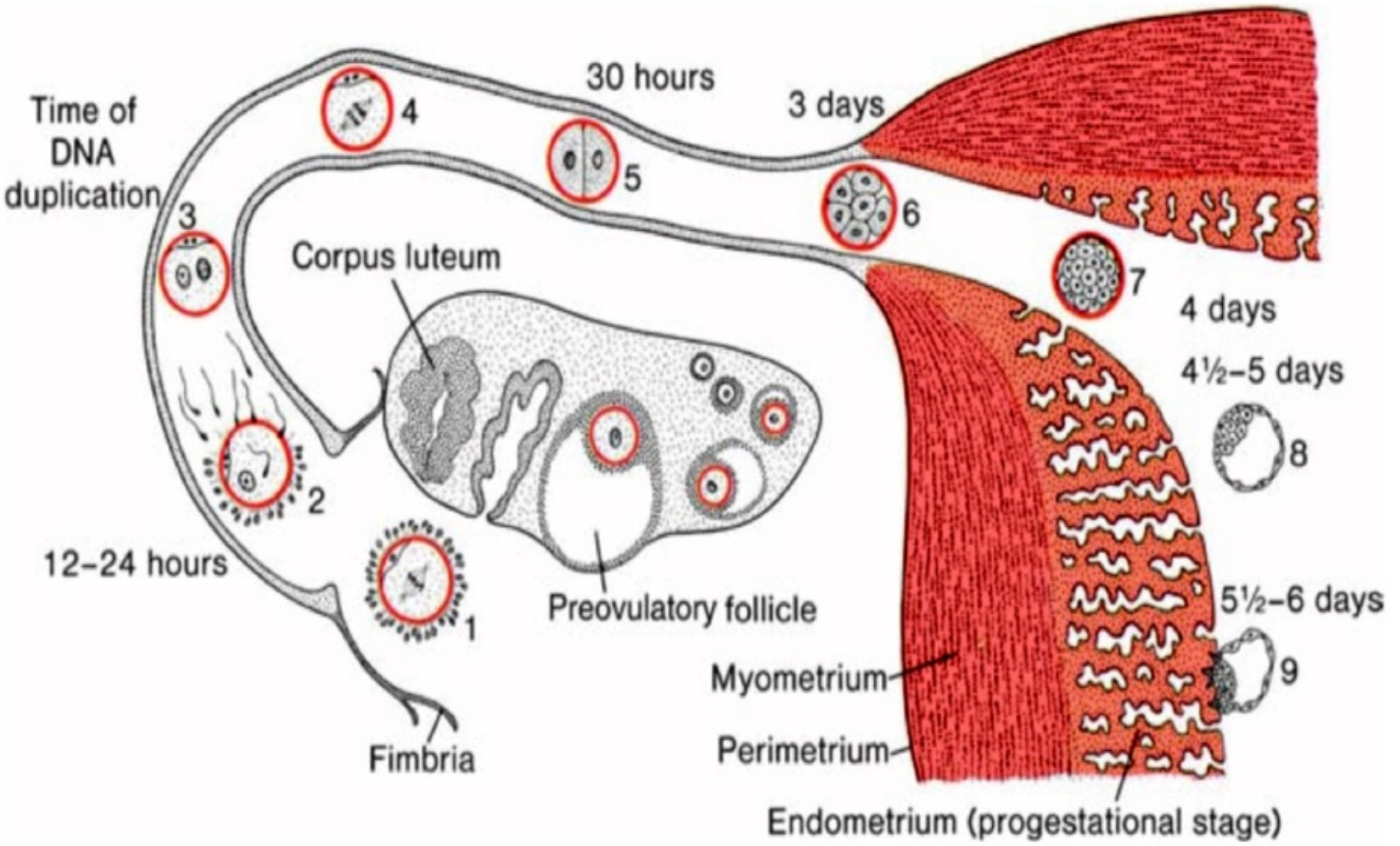
- Basics (a brief introduction to the organization of the nervous system).
- The stages in embryology from the formation of the zygote , the bilaminar disc and the trilaminar disc.
- The stages of development of the brain.
- The stages of development of the spinal cord.
- Derivatives of the neural crest cells.
- Development of the ventricles.
- Development of the cranial nerves.
- Summary.

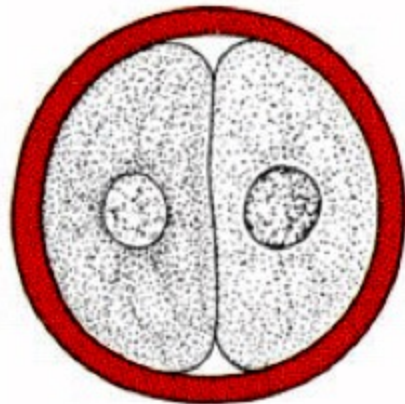
Basics



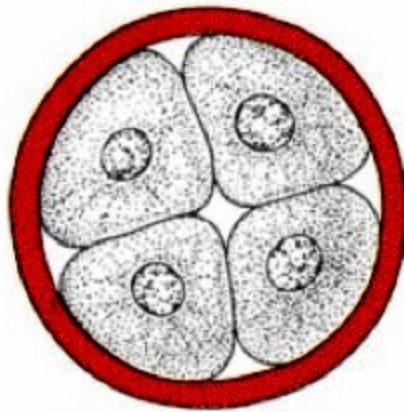




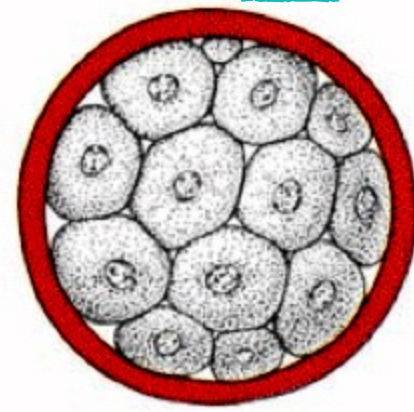




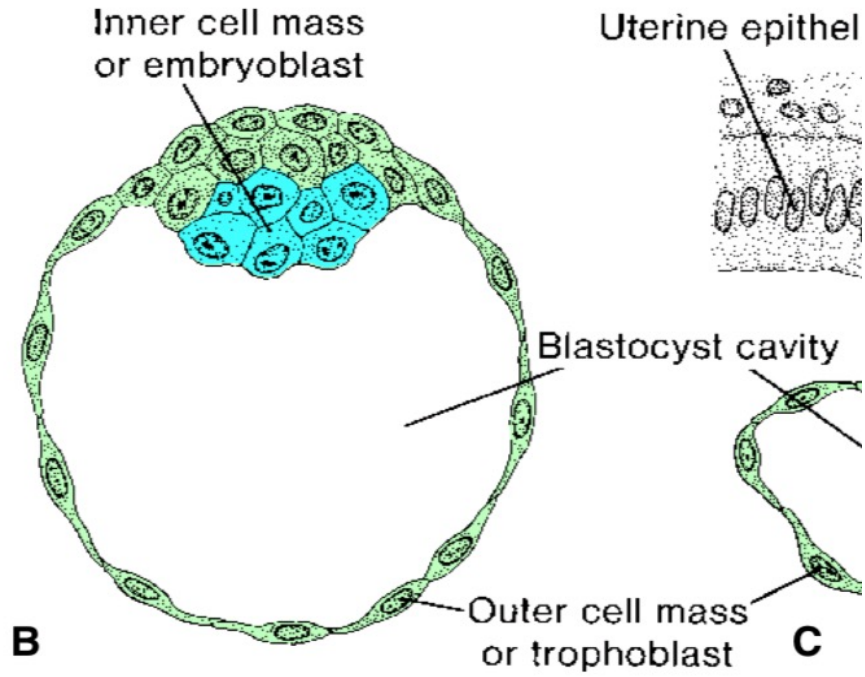
Two-cell stage



Four-cell stage



Morula



Inner cell mass
or embryoblast

Uterine epithel

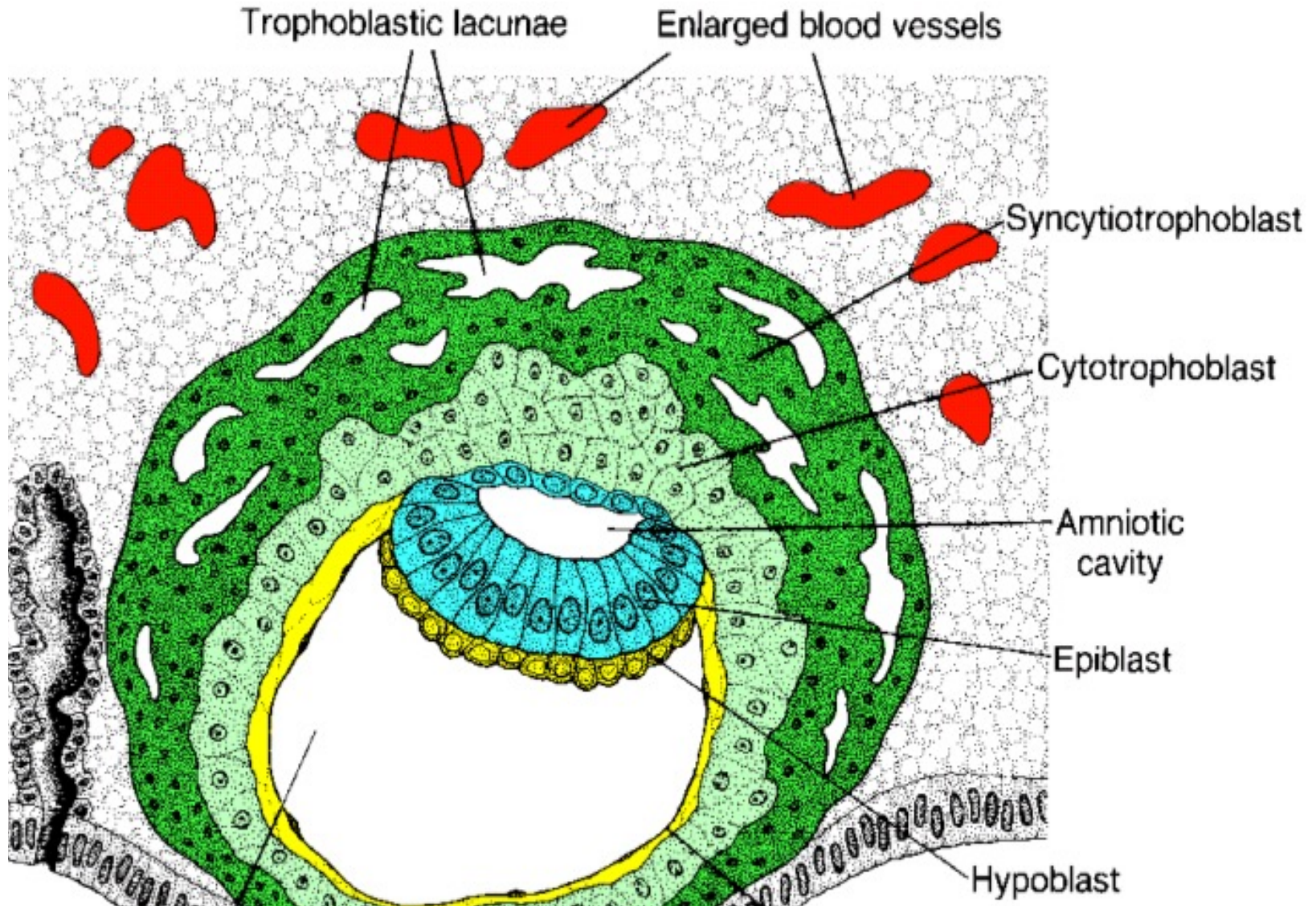
Blastocyst cavity

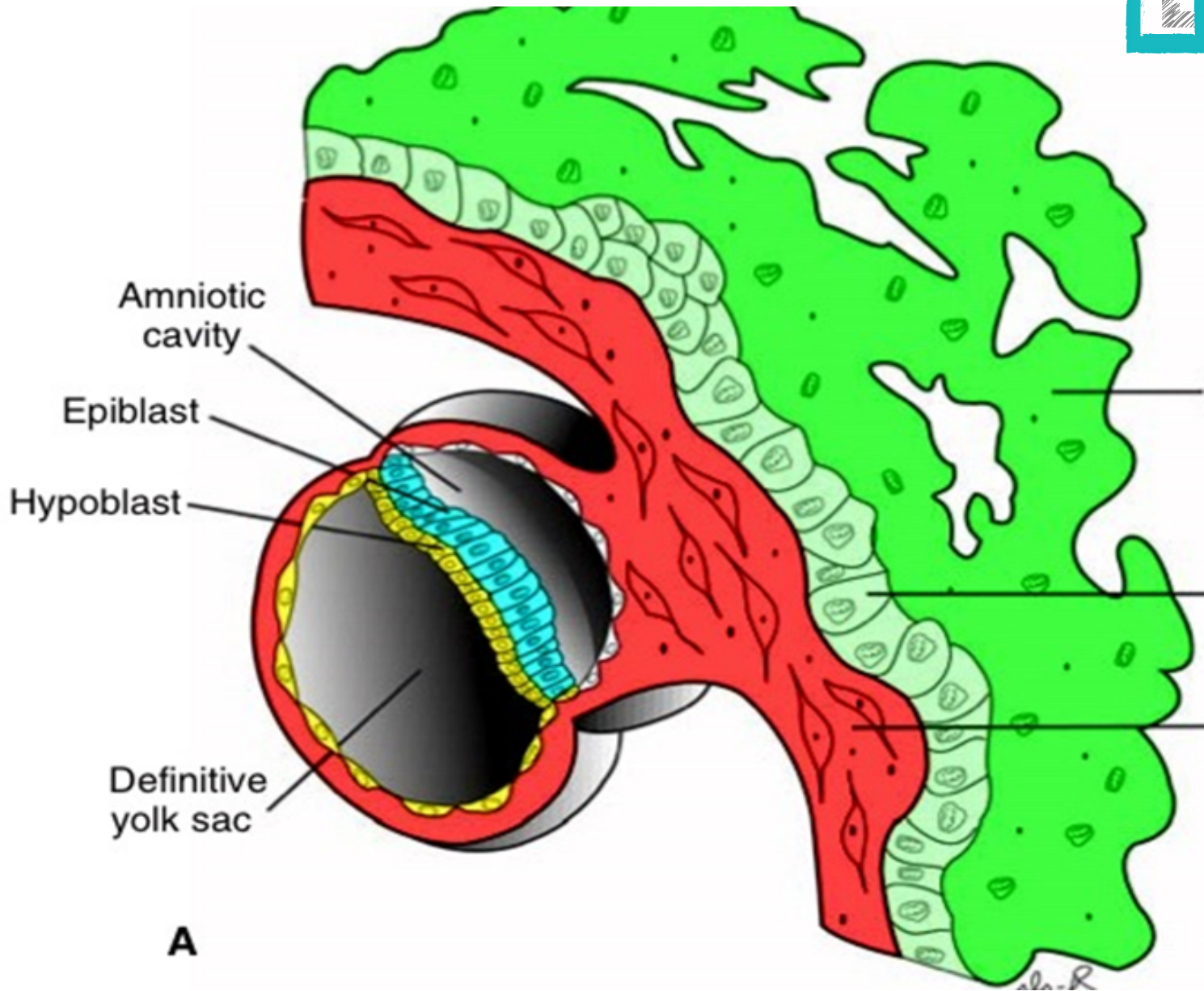
Outer cell mass
or trophoblast

B

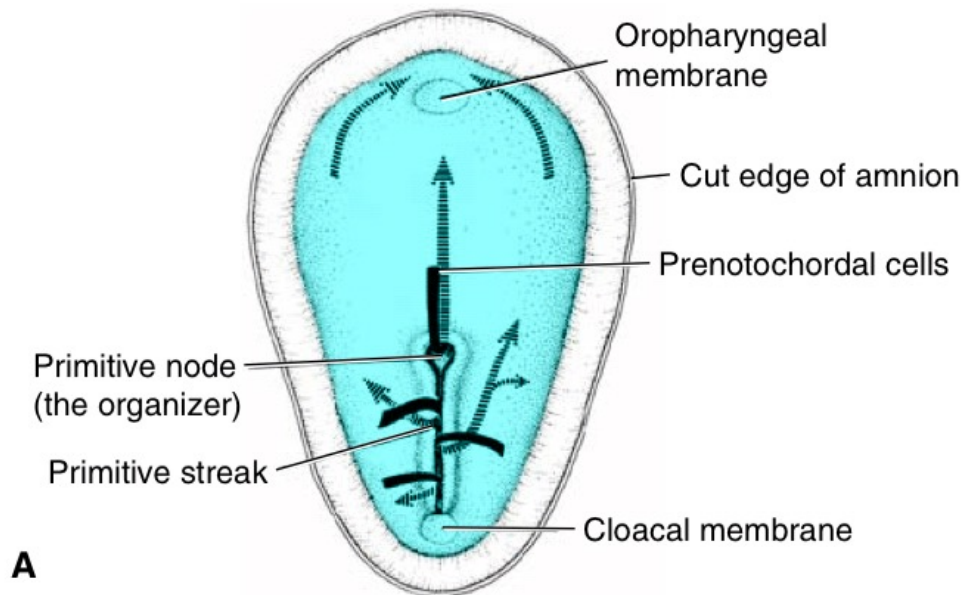
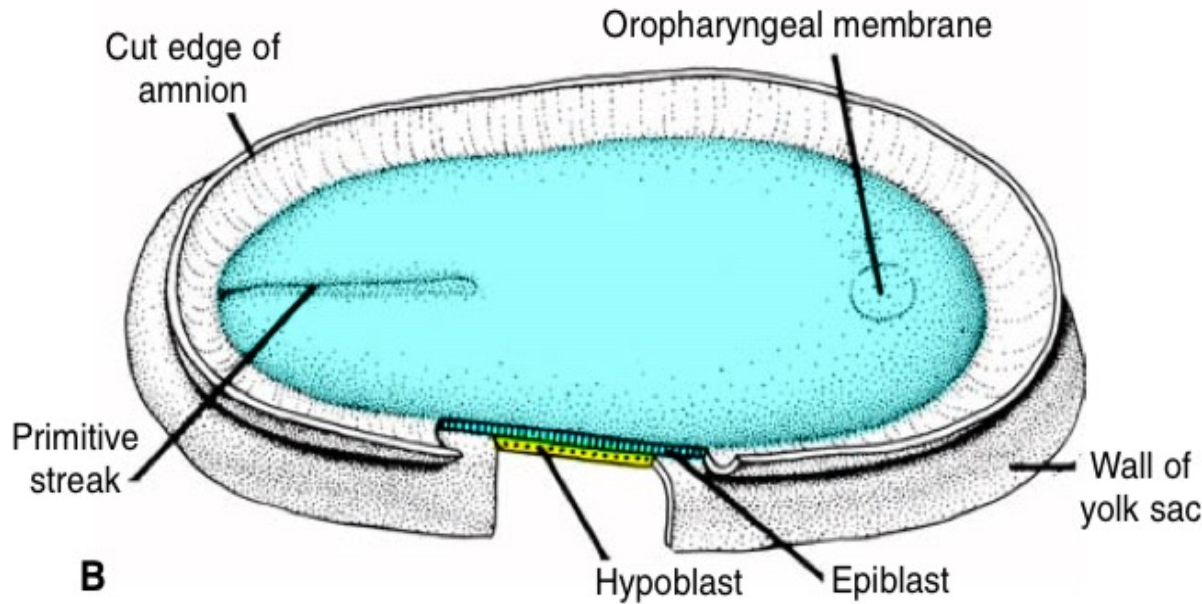
C

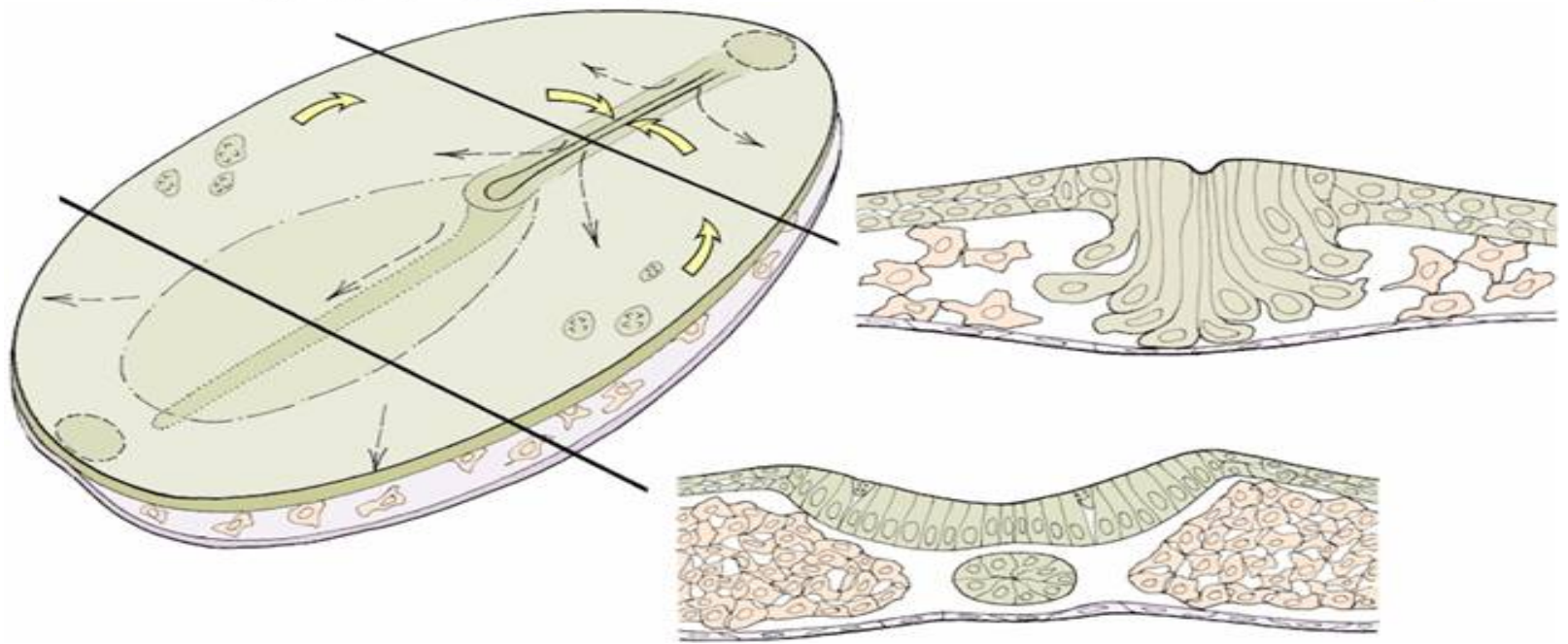
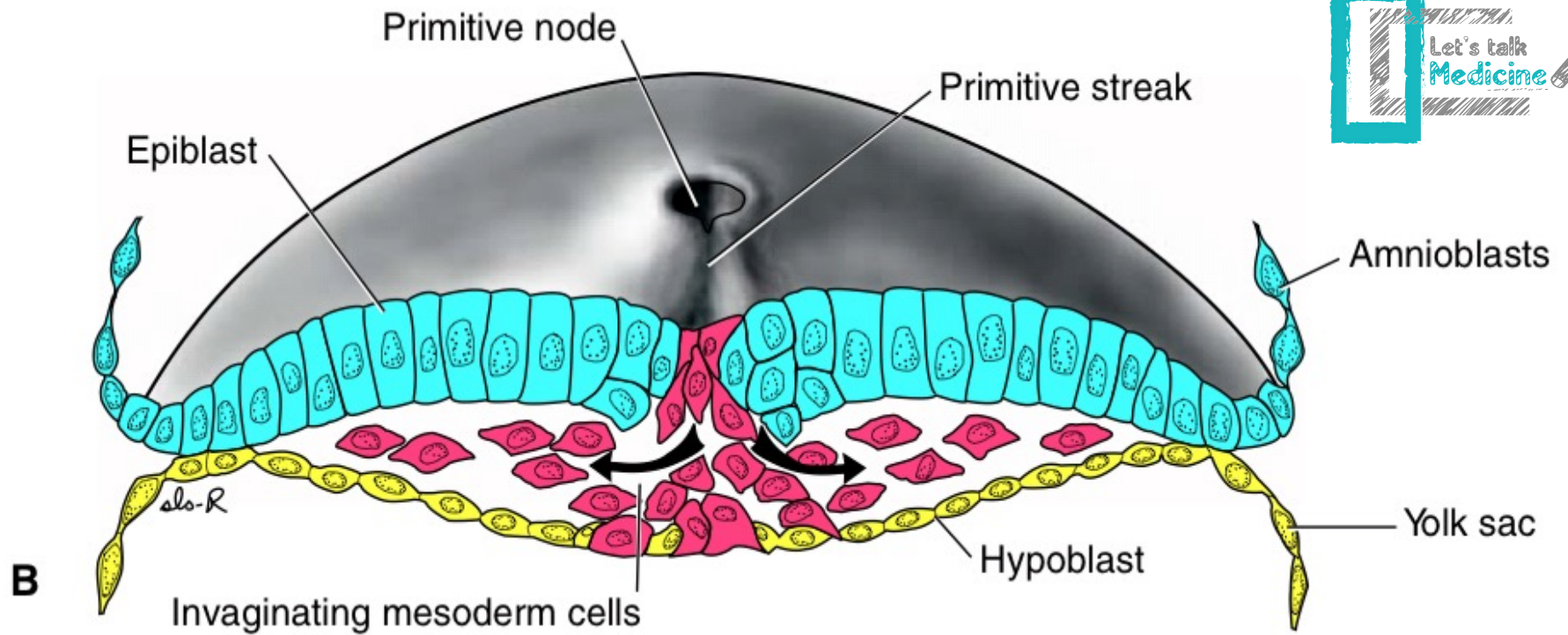
The bilaminar disc

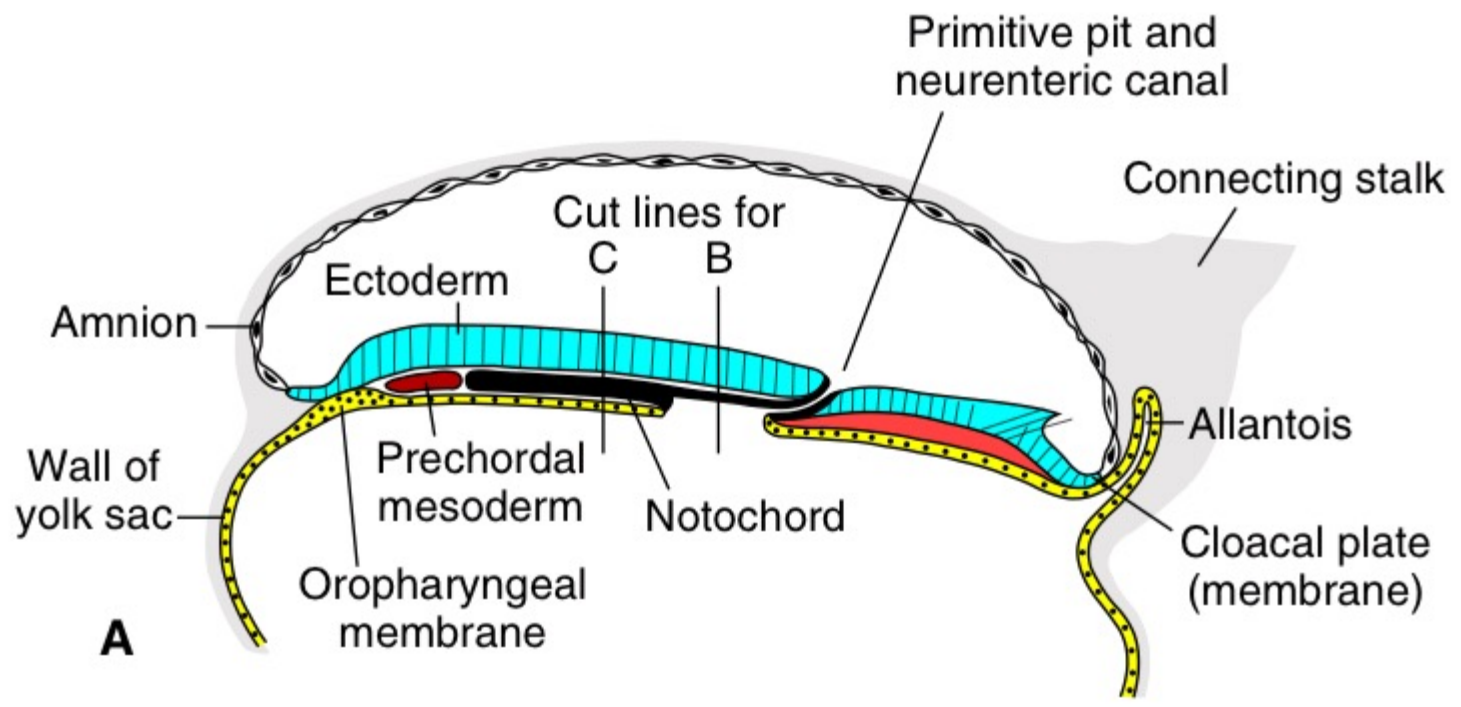




The primitive streak and node

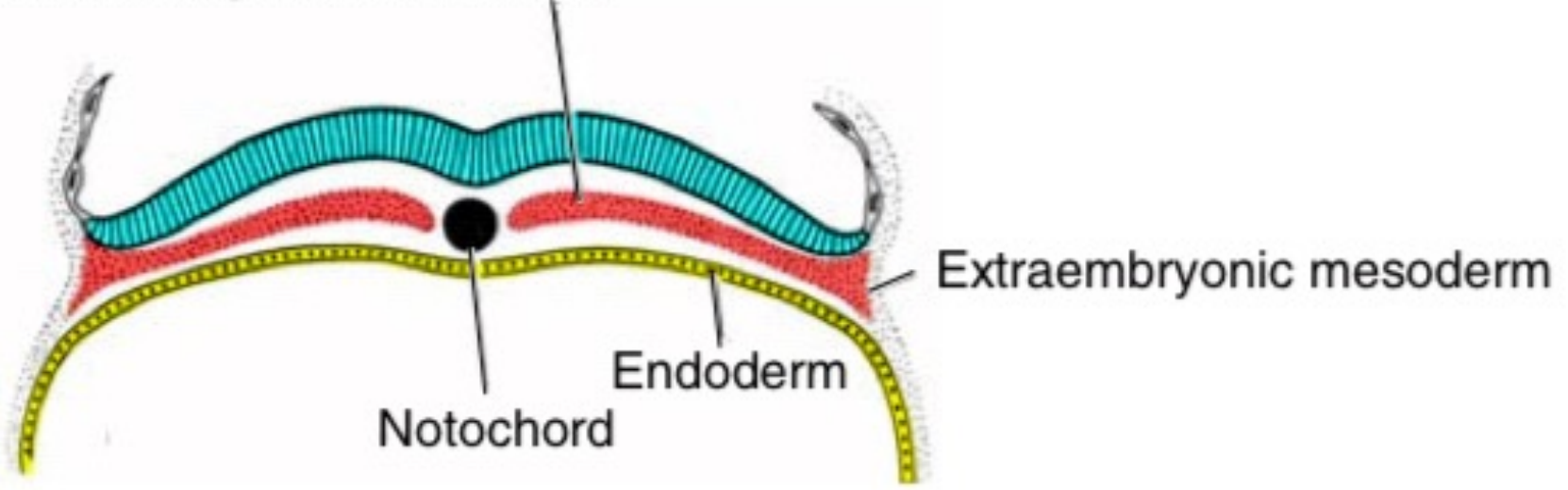




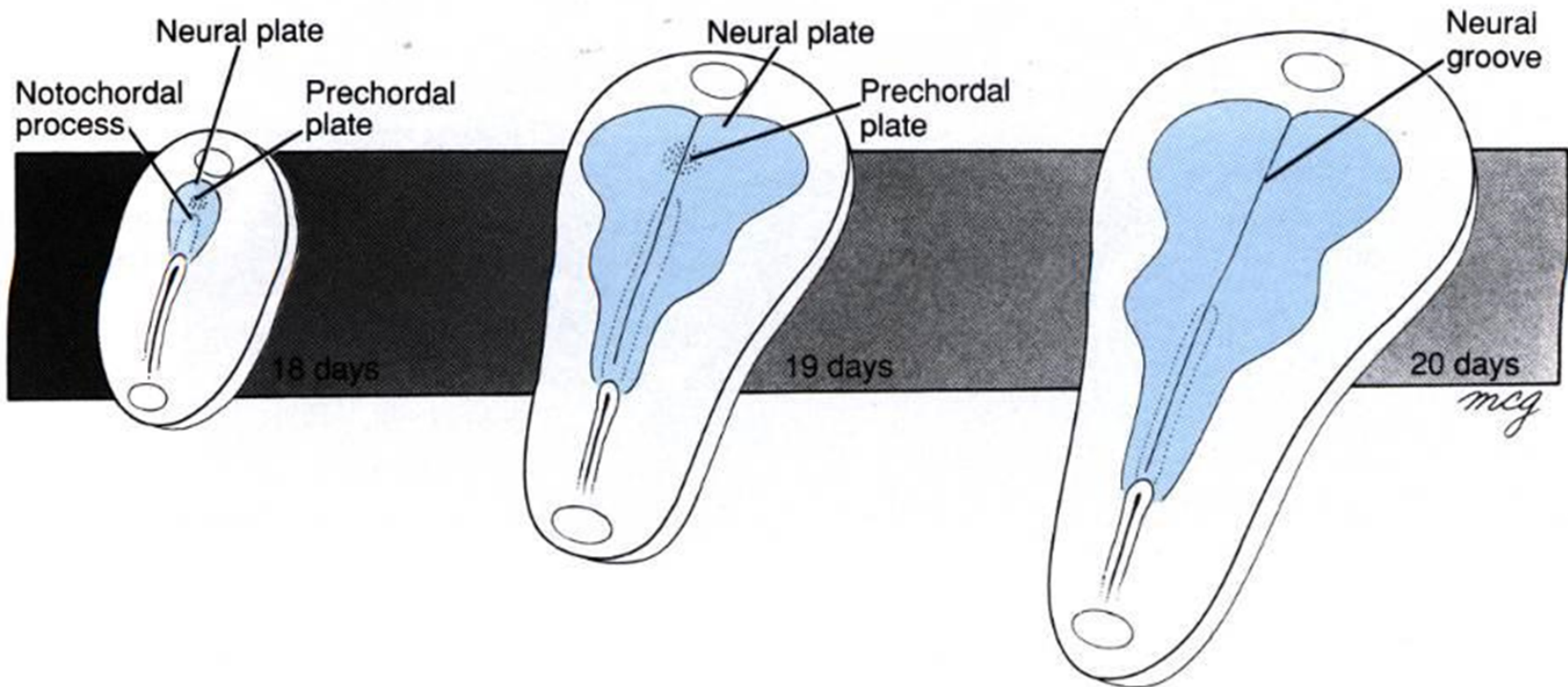


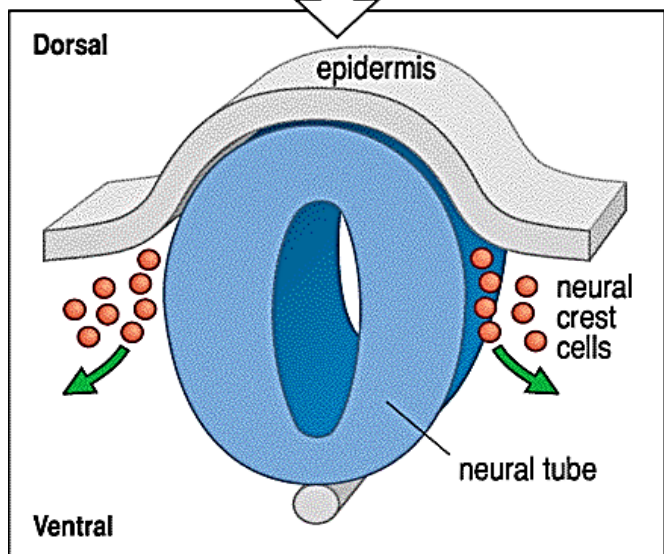
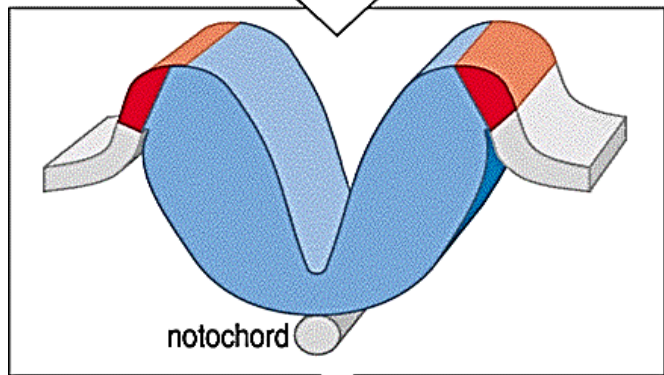
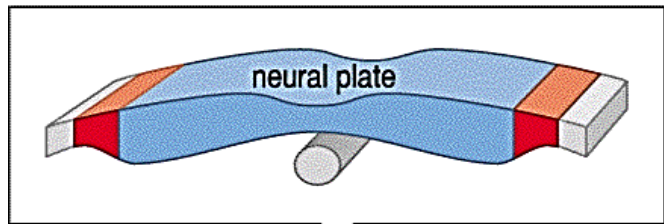
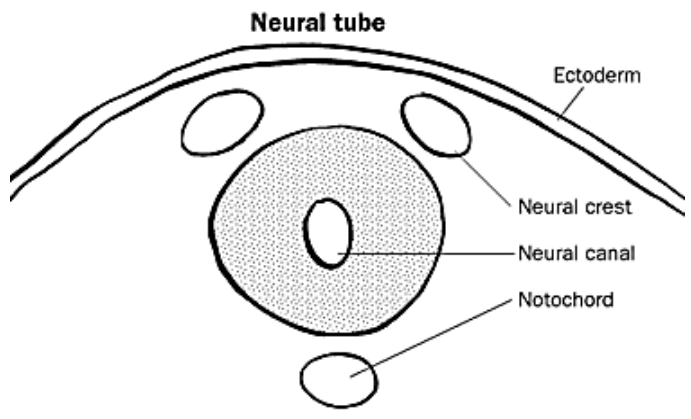
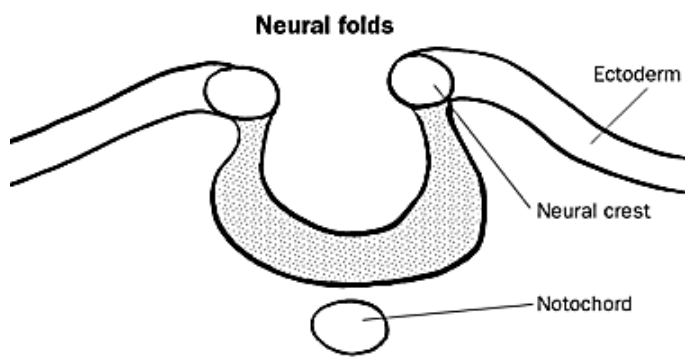
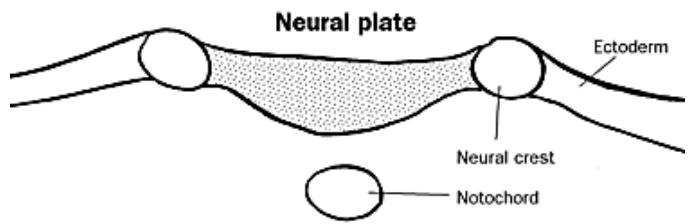
A

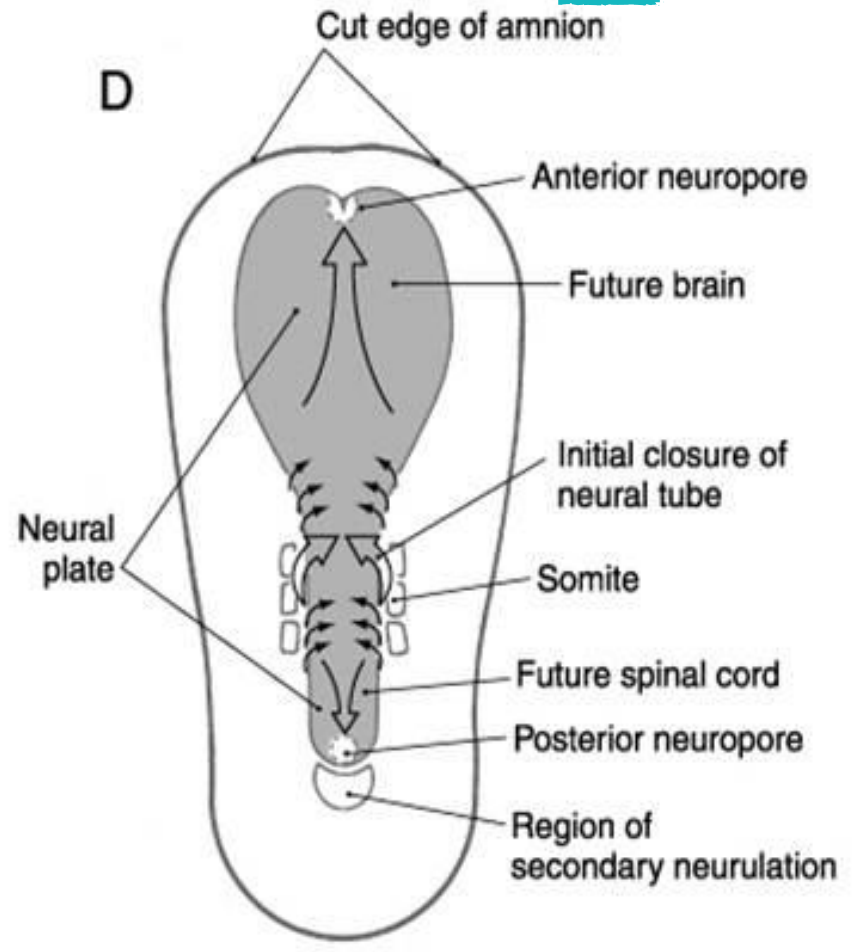
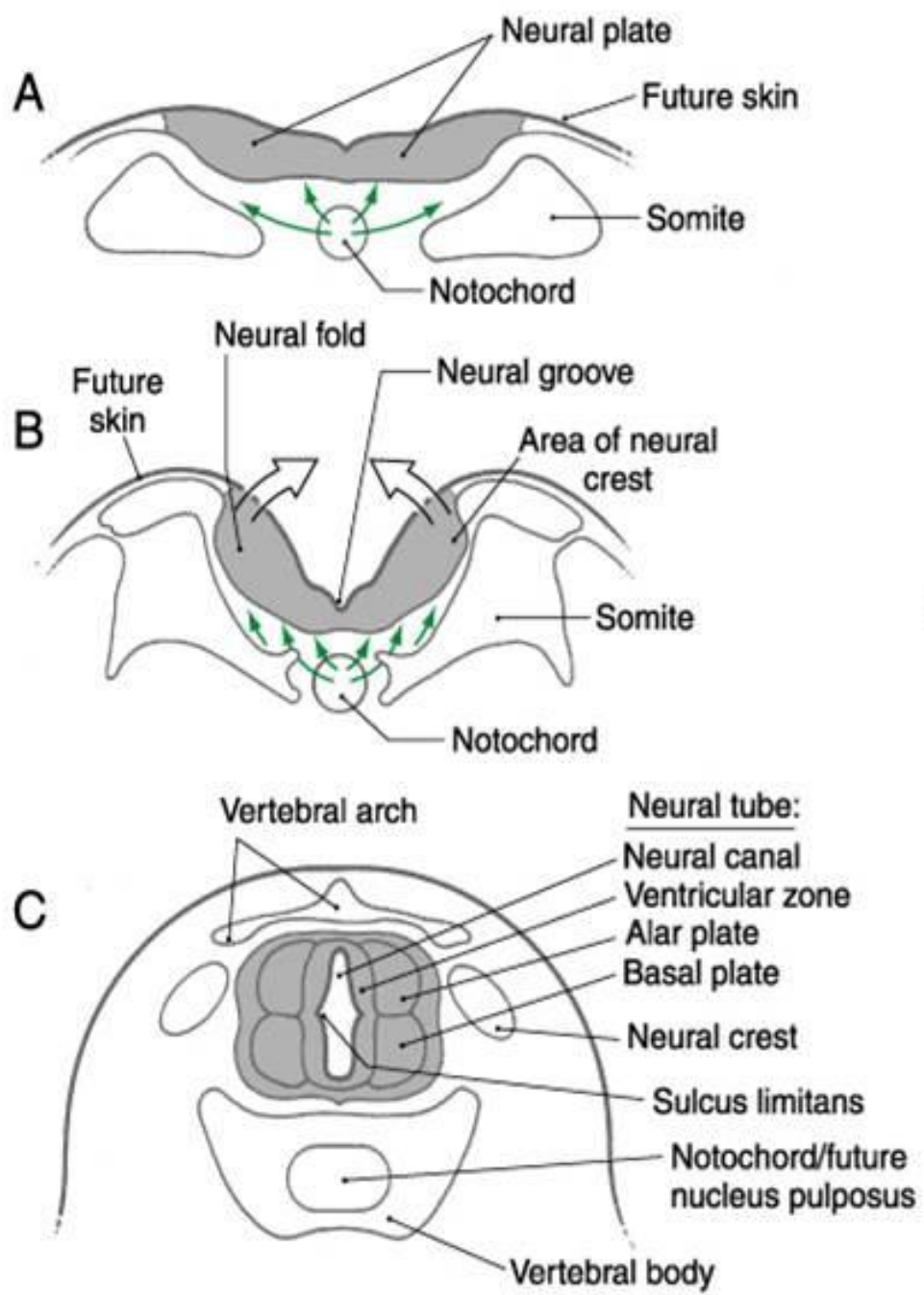
Intraembryonic mesoderm

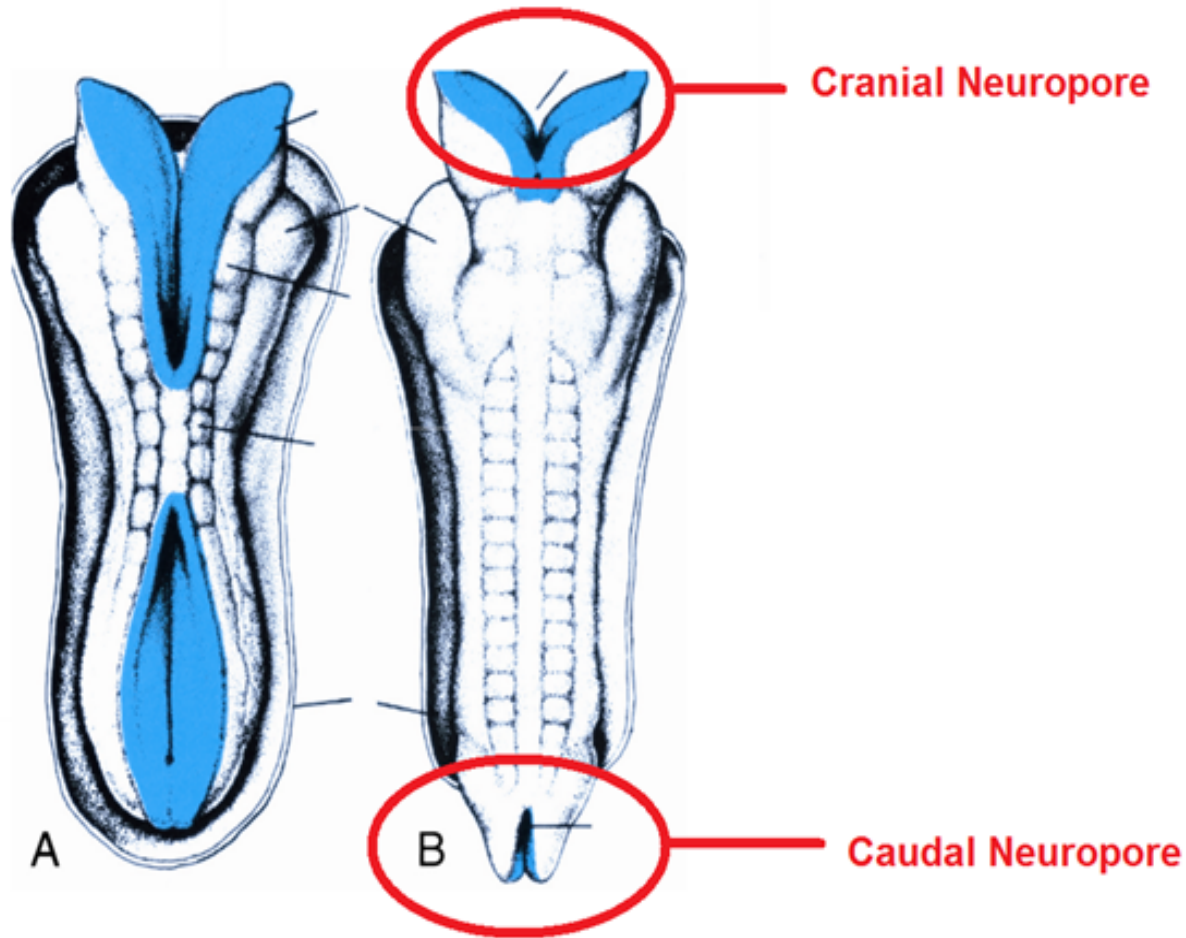


Neural plate





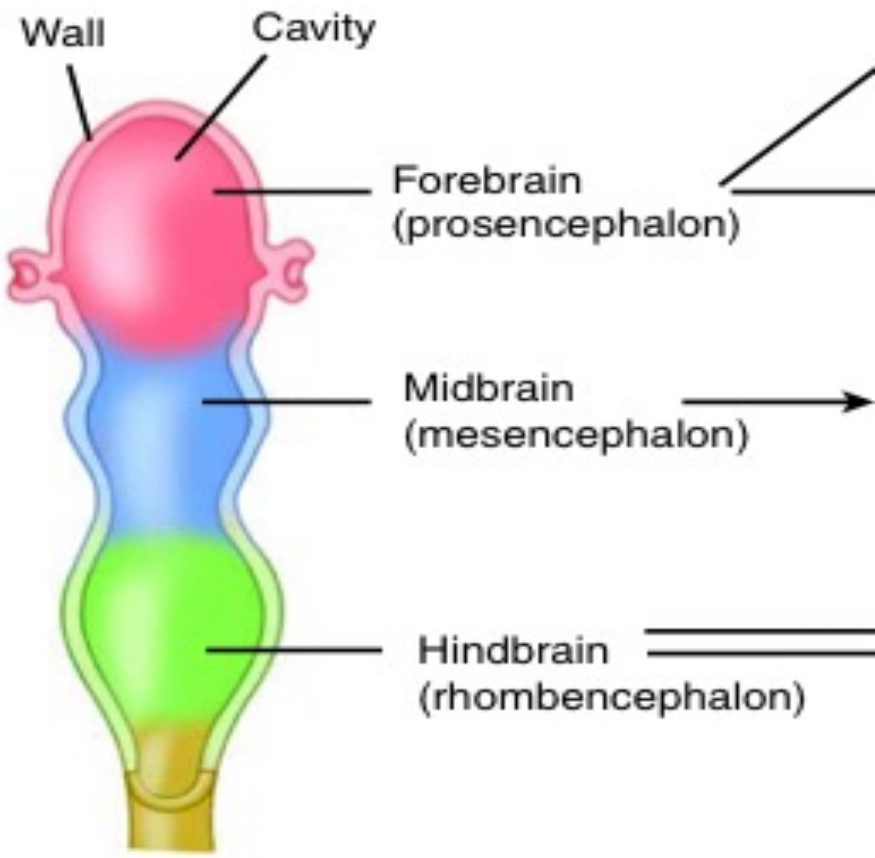




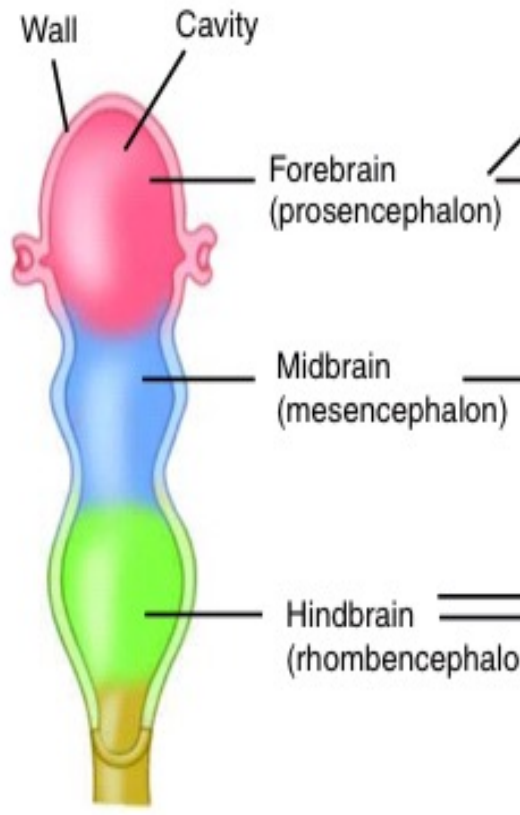
The cranial neuropore closes first at day 25 and the caudal neuropore closes at day 27.

Development of the brain

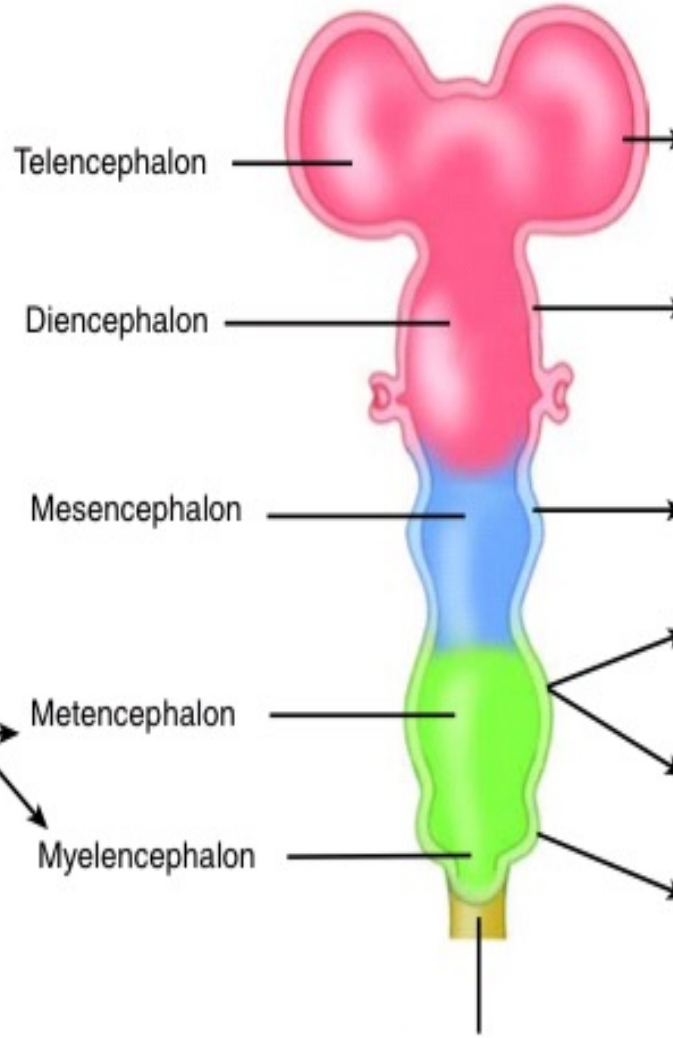
Three primary vesicles



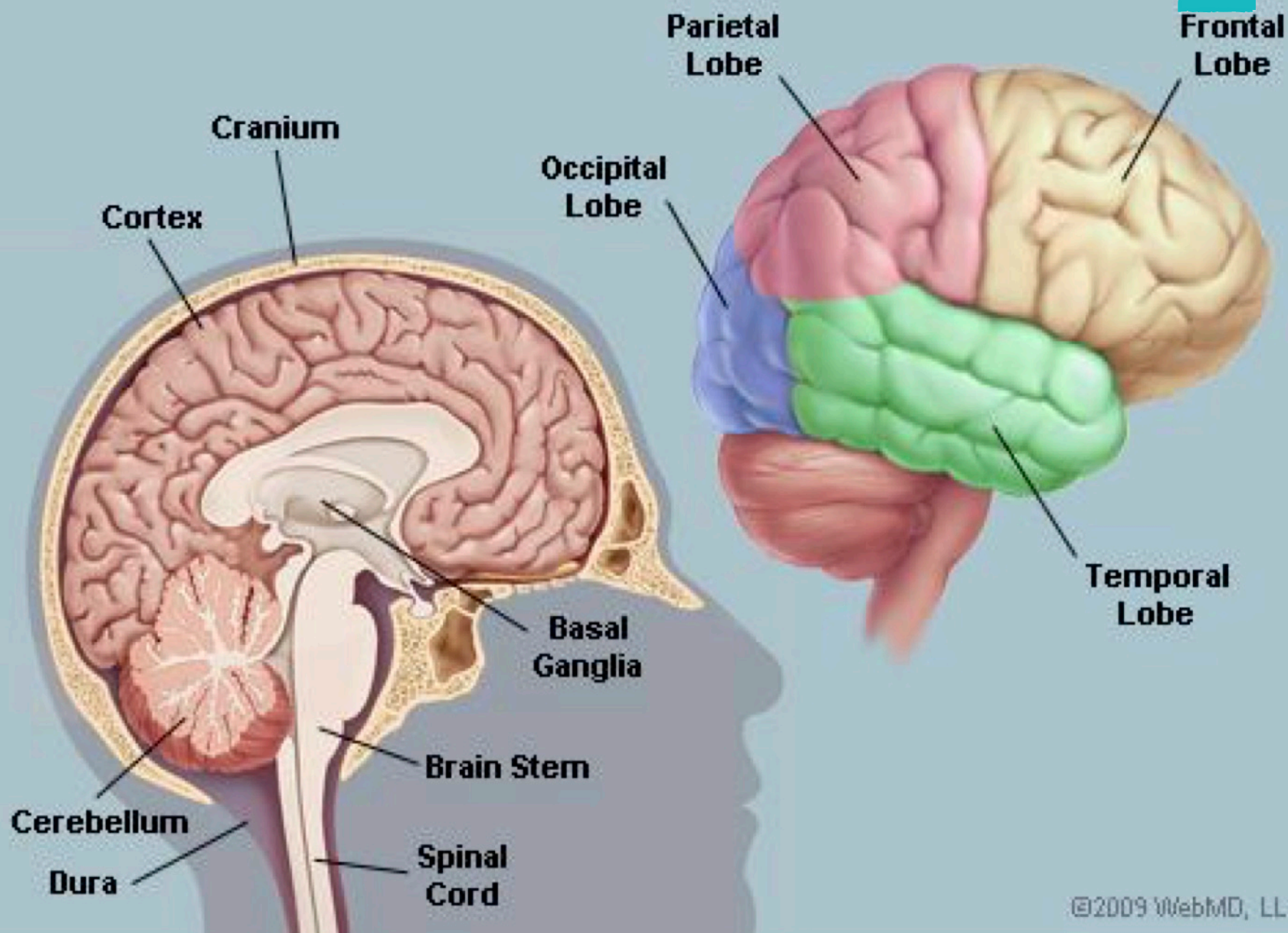
Three primary vesicles



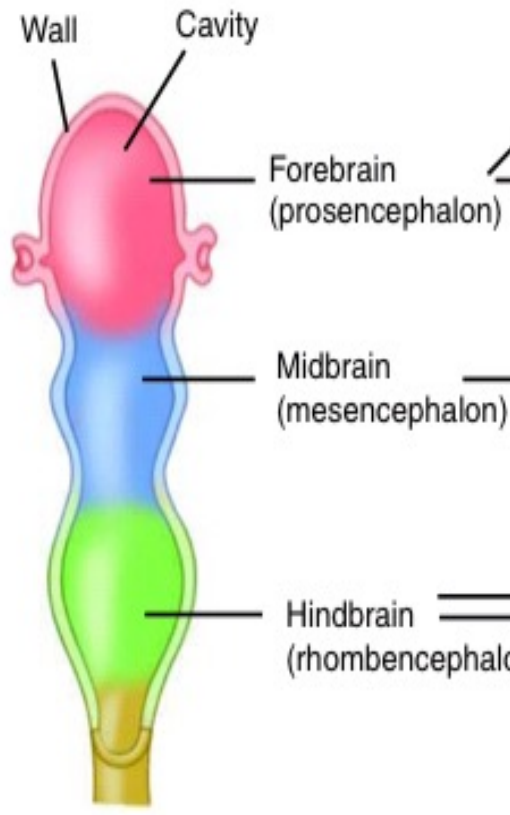
Five secondary vesicles



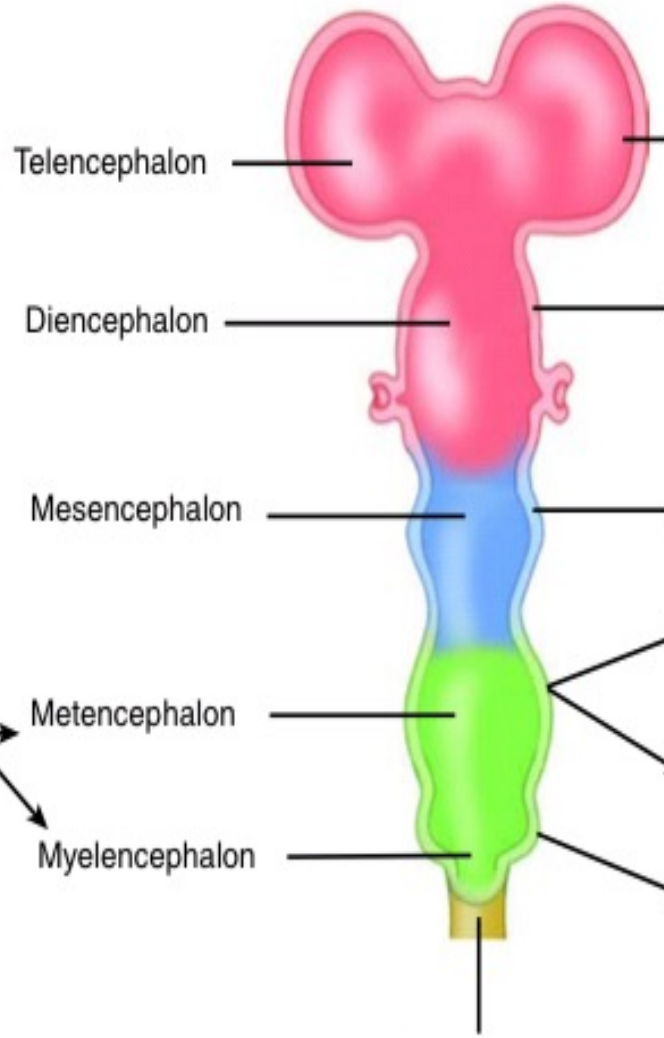
Adult derivatives of:	
Walls	Cavities
Cerebral hemispheres	Lateral ventricles
Thalamus	Third ventricle
Midbrain	Aqueduct
Pons	Upper part of fourth ventricle
Cerebellum	
Medulla	Lower part of fourth ventricle



Three primary vesicles



Five secondary vesicles



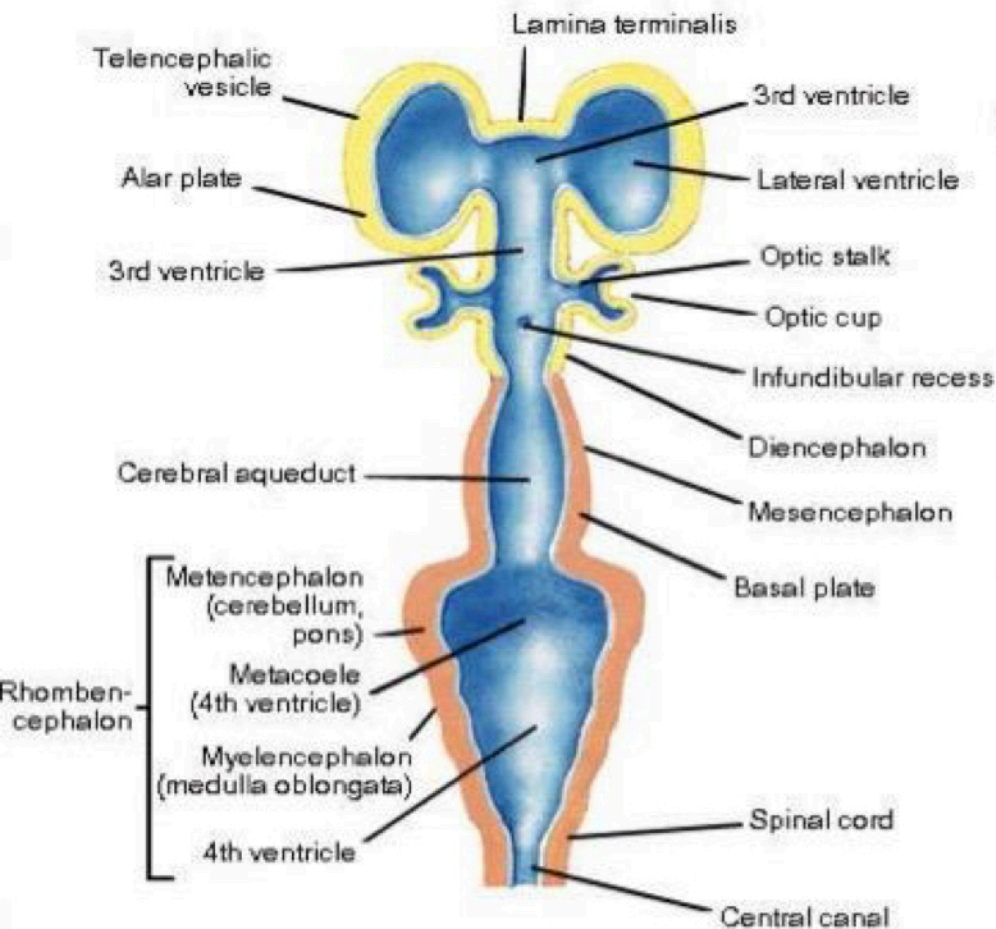
Adult derivatives of:	
Walls	Cavities
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Pons	Upper part of fourth ventricle
Cerebellum	
Medulla	Lower part of fourth ventricle

Spinal cord

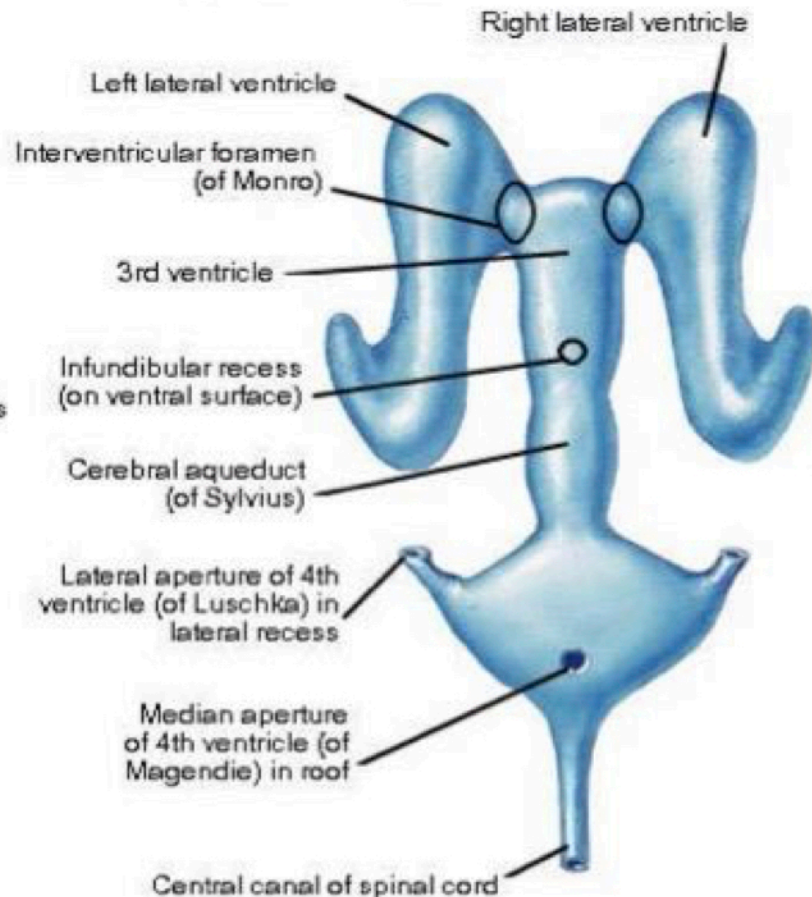
Development of the Ventricles



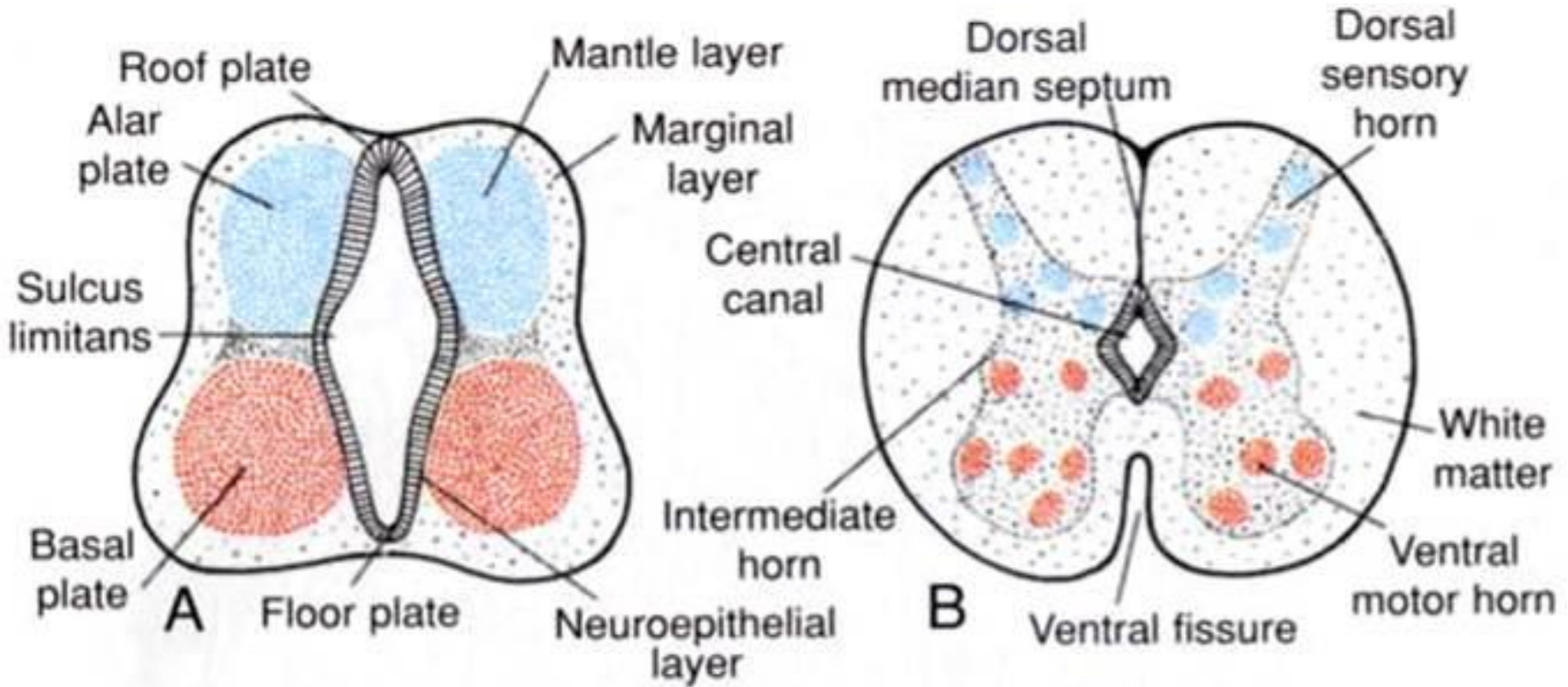
Frontal section (ventral to sulcus limitans) at 36 days



Ependymal lining of cavities of brain at 3 months



Development of the spinal cord

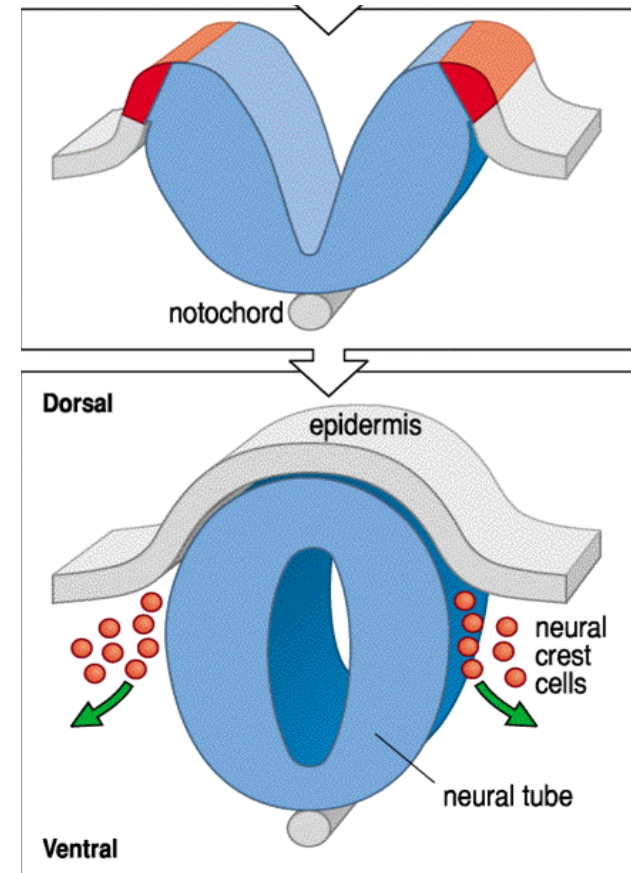


- Mantle layer = gray matter
- Marginal layer = white matter
- Alar = sensory
- Basal = motor

Derivatives of the neural crest cells



- These neural crest cells are **ectodermal**.
- They migrate laterally and give rise to:
 1. Sensory ganglia (dorsal root ganglia) of the spinal nerves, (Pseudounipolar cells)
 2. Sympathetic neuroblasts,
 3. Schwann cells,
 4. Pigment cells,
 5. Odontoblasts,
 6. Meninges, and
 7. Mesenchyme of the pharyngeal arches.



Forebrain	Telencephalon	Cerebral hemispheres (neocortex) Olfactory cortex (paleocortex) Hippocampus (archicortex) Basal ganglia/corpus striatum Lateral and 3rd ventricles	Nerves: Olfactory (I)
	Diencephalon	Optic cup/nerves Thalamus Hypothalamus Mammillary bodies Part of 3rd ventricle	Optic (II)
Midbrain	Mesencephalon	Tectum (superior, inferior colliculi) Cerebral aqueduct Red nucleus Substantia nigra Crus cerebelli	Oculomotor (III) Trochlear (IV)
Hindbrain	Metencephalon	Pons Cerebellum	Trigeminal (V) Abducens (VI) Facial (VII) Acoustic (VIII) Glossopharyngeal (IX) Vagus (X) Hypoglossal (XI)
	Myelencephalon	Medulla oblongata	



References:

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For any questions or comments
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