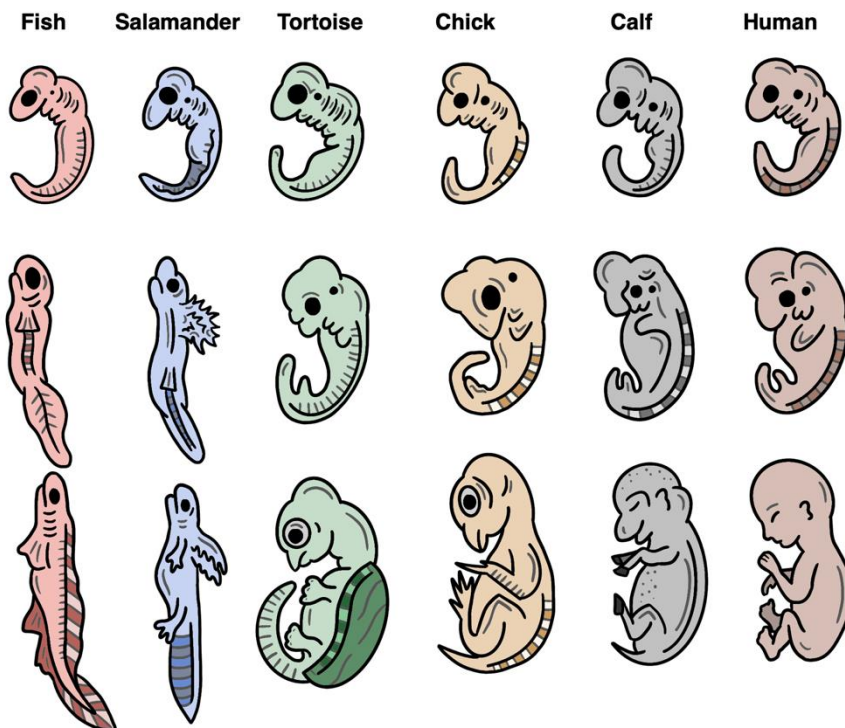


CONCEPT: ANIMALS

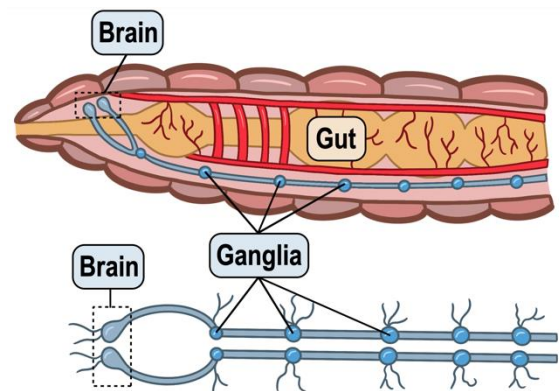
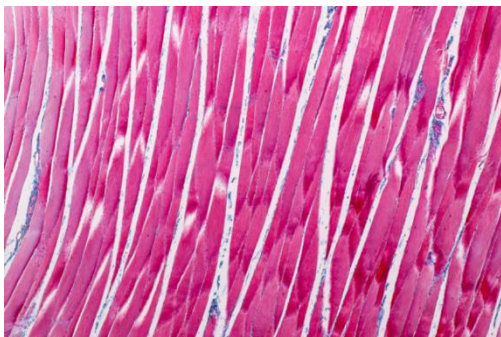
- Animals are multicellular, heterotrophic eukaryotes that feed by ingesting their food
 - Most animals are diploid, and produce gametes produced directly by meiosis
 - Animals lack cell walls, and instead use an extracellular matrix for support
 - All animals are motile, meaning they exhibit active movement at some point in their life
 - Most animals reproduce sexually, although some reproduce asexually
 - Animals undergo embryonic development, as a zygote undergoes cleavage
 - Viviparous – embryo nourished inside parent, give birth to live offspring
 - Oviparous – parent lays egg, embryo is nourished by yolk in egg
 - Ovoviviparous – eggs remain inside parent until ready to hatch, embryo is nourished by yolk
 - Homeobox genes are common to almost all animals and control the development of the body

EXAMPLE:



- **Tissues** – organized groups of similar cells that act as a functional unit
- **Nervous system** – coordinates actions and transmits signals around the body of animals (except sponges)

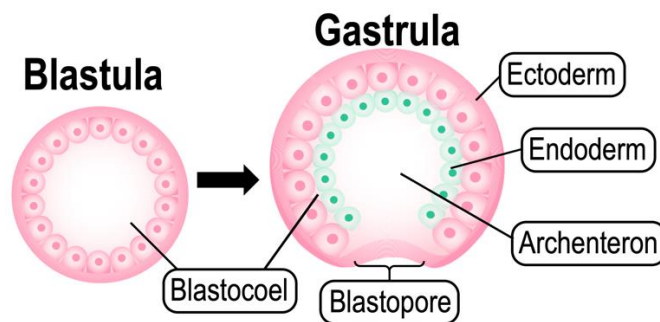
EXAMPLE:



CONCEPT: ANIMALS

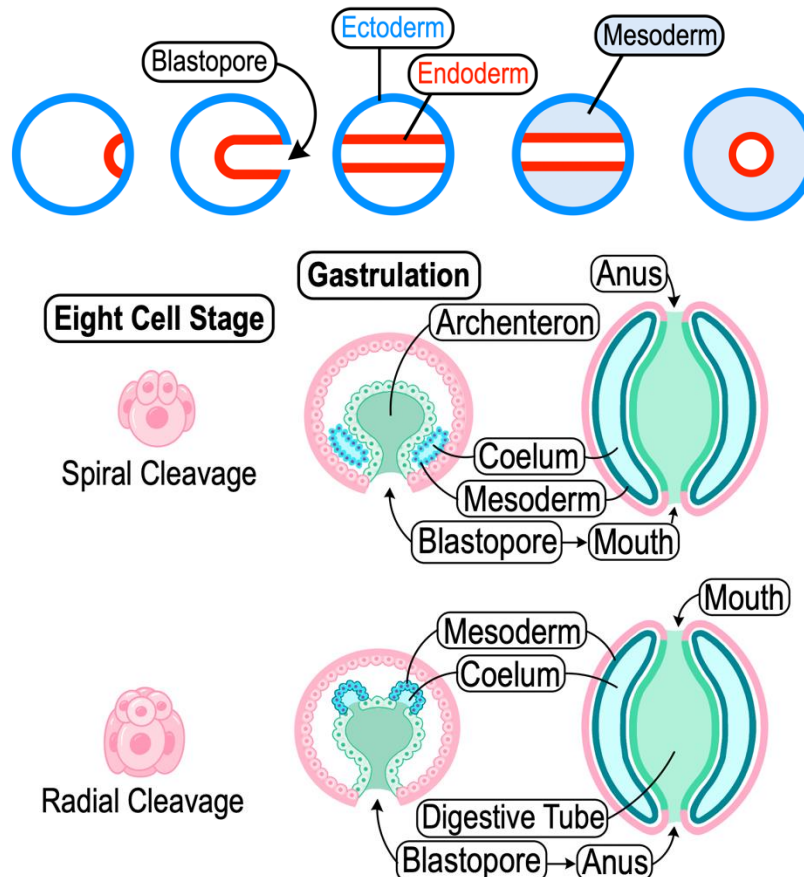
- **Cleavage** – rapid mitotic cell divisions in the zygote
 - **Blastula** – hollow ball of cells (mammalian blastula is called blastocyst)
- **Gastrulation** – formation of the three germ layers, forming a gastrula
 - Gastrulation defines the body axes, blastopore becomes mouth or anus
 - **Blastopore** – the opening that forms to the digestive tube (**archenteron**)
 - **Ectoderm** – cells that remain outside and form nerves, adrenal medulla, skin, brain, eyes, and inner ear
 - **Mesoderm** – internal cells that give rise to organs, adrenal cortex, blood, bone, gonads, and the soft tissues
 - **Endoderm** – innermost cells that form the epithelial linings of the digestive tract, liver, pancreas, and lungs

EXAMPLE:



- **Protostomes** – blastopore develops into mouth, and mesoderm hollows out to form coelom
- **Deuterostomes** – blastopore develops into anus, and mesoderm pinches off pockets from archenteron that form coelom

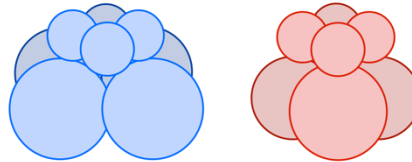
EXAMPLE:



CONCEPT: ANIMALS

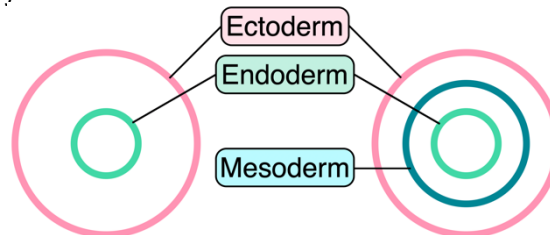
- Most protostomes show spiral and determinate cleavage, most deuterostomes show radial and indeterminate cleavage
 - **Spiral cleavage** – plane of cell division is diagonal to the vertical axis of the embryo
 - **Radial cleavage** – plane of cell division is parallel or perpendicular to the vertical axis of the embryo
 - **Indeterminate cleavage** – the cells that arise are able to develop into a whole organism
 - **Determinate cleavage** – the cells that arise are committed to differentiation

EXAMPLE:



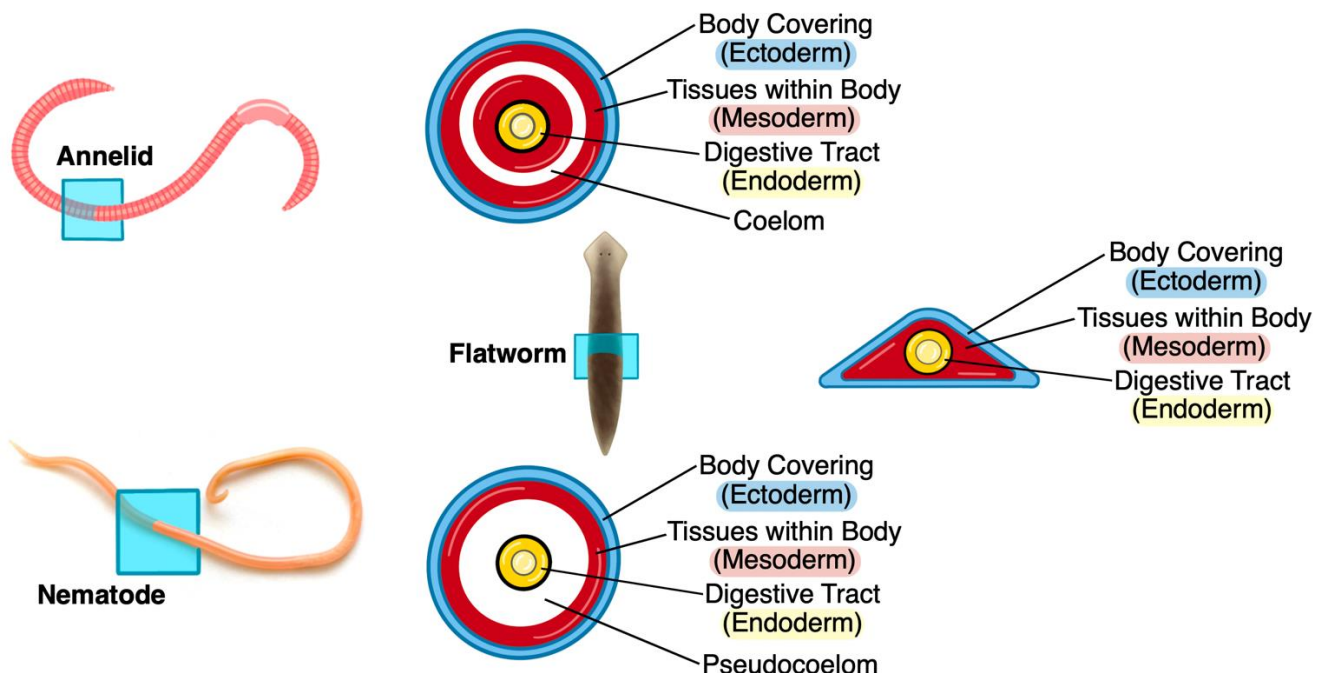
- **Diploblast** – two primary germ layers of the blastula, ectoderm and endoderm
- **Triploblast** – three primary germ layers of the blastula

EXAMPLE:



- **Coelom** – body cavity inside and animal that surrounds the digestive tract, and is derived from the mesoderm
- **Pseudocoelom** – body cavity that surround the digestive tract, and is derived from the mesoderm and endoderm
 - **Coelomates** – triploblasts that have a true coelom
 - **Pseudocoelomates** – triploblasts that have a pseudocoelom
 - **Acoelomates** – triploblasts that lack a coelom

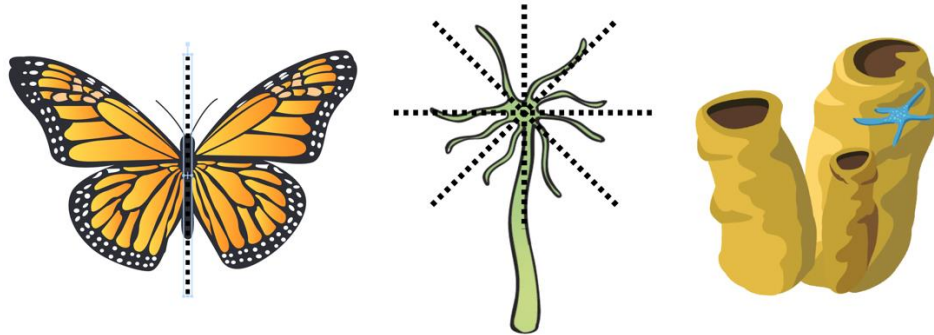
EXAMPLE:



CONCEPT: ANIMALS

- **Radial symmetry** – arrangement of body parts around a one main axis
- **Bilateral symmetry** – organism body plan is divided into two roughly equal halves
 - **Bilaterians** – animals that show bilateral symmetry

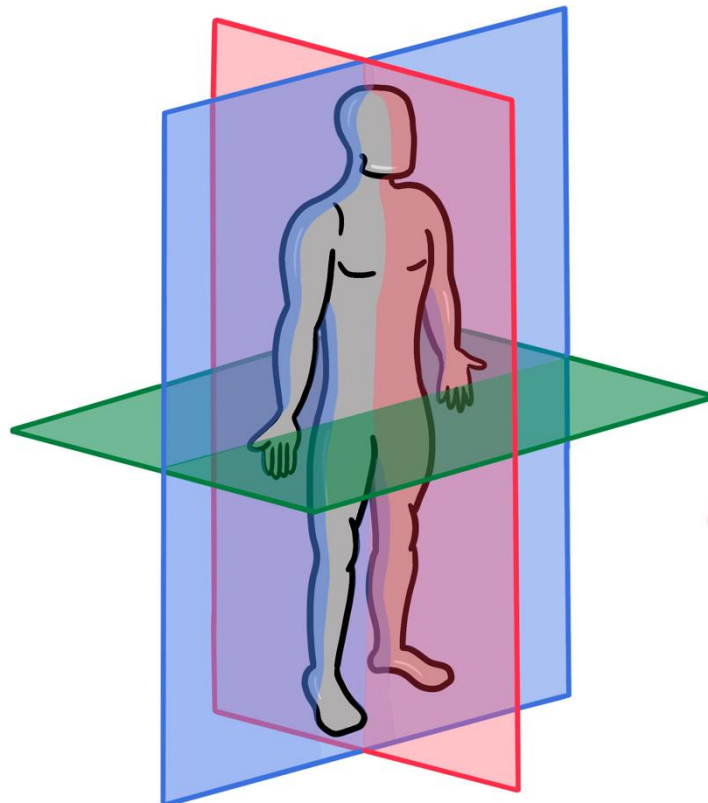
EXAMPLE:



● **Body axes:**

- **Anterior** – toward the head
- **Posterior** – toward the tail
- **Dorsal** – toward the back
- **Ventral** – toward the belly

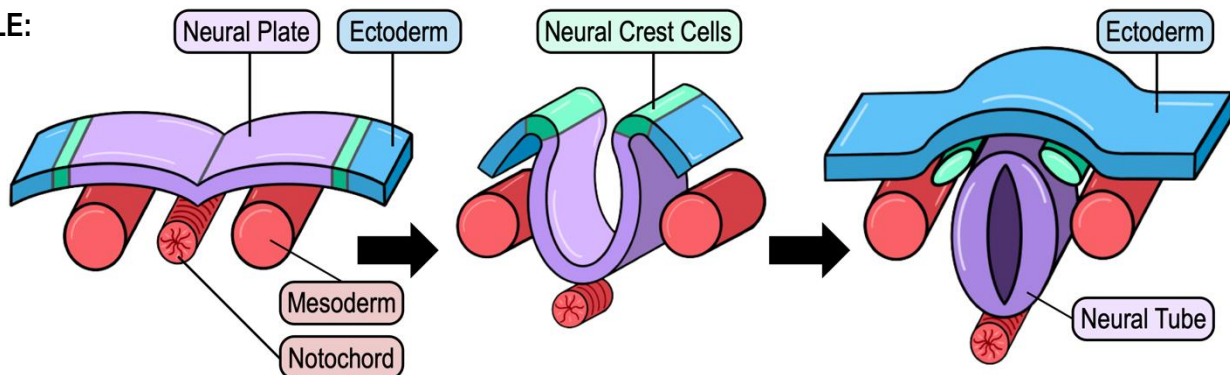
EXAMPLE:



CONCEPT: ANIMALS

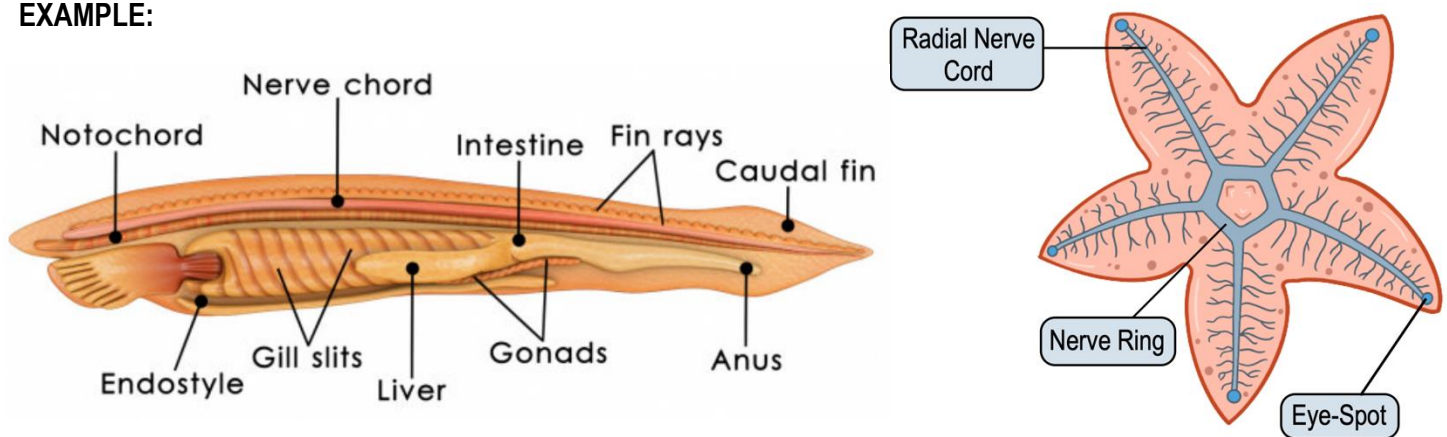
- **Neurulation** – formation of nervous tissue from primary germ layers
 - **Notochord** – primitive backbone formed in chordates during development
 - In some animals this develops into the vertebrae of the spine
 - In some animals it is a transient structure during development
 - **Neural tube** – hollow structure that the brain and spinal chord derive from
 - Neural tube swells in multiple places, forming the embryonic brain

EXAMPLE:



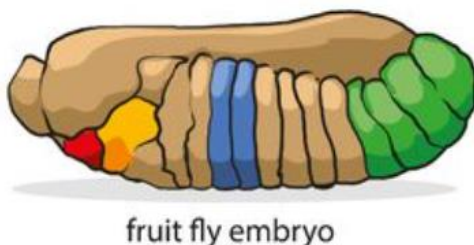
- **Cephalization** – evolutionary trend in which nervous tissue becomes concentrated toward anterior end of an organism
- **Brain** – mass of neurons in the head that integrates and processes sensory information
- **Central nervous system** – neurons are clustered into one or more large tracts that project through the body
- **Nerve net** – diffuse arrangement of nerve cells found in radially symmetric animals

EXAMPLE:



- **Segmentation** – the presence of repeated body structures
- **Vertebrates** – have a vertebral column developed from the notochord, most are deuterostomes
- **Invertebrates** – lack vertebral column developed from the notochord, still have segmented bodies, most are protostomes

EXAMPLE:



fruit fly embryo



FRUIT FLY