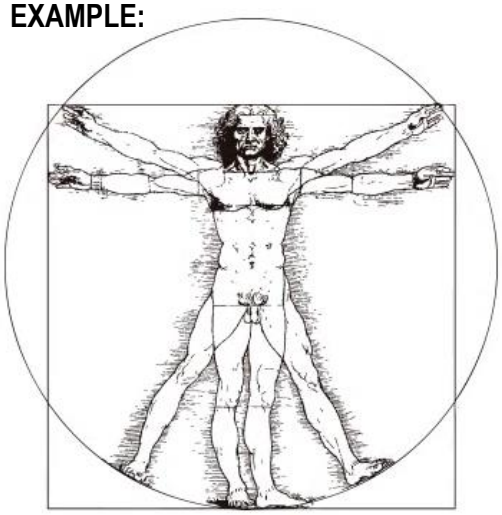
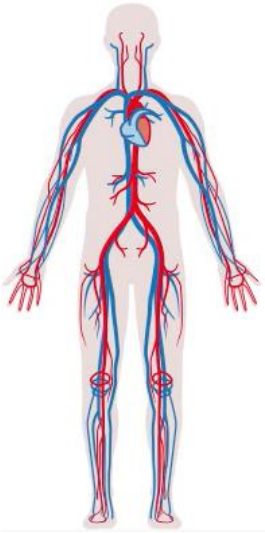
CONCEPT: ANIMAL PHYSIOLOGY

- ***Anatomy*** – study of organisms' physical structures
- ***Physiology*** – study of the functions of organisms' structures
- ***Adaptations*** – heritable traits that improve the chances of an organisms surviving and reproducing in an environment
- ***Acclimatization*** – short-term ability to adapt to changes in the environment

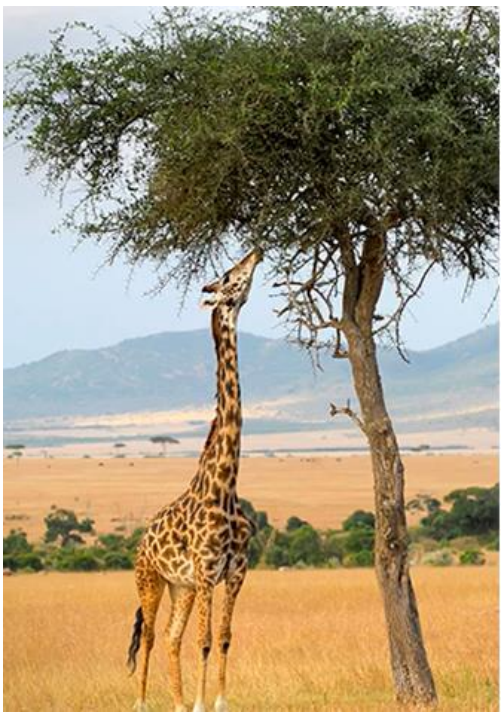
EXAMPLE:





- ***Fitness trade-offs*** – limit to an organism's ability to adapt to its environment due to finite energy capacity
  - □ Energetic demands require cost/benefit compromise for energy investment in adaptations
  - □ Adaptations are limited by existing alleles, and ancestral genes
  - □ Trade-off between reproductive success and survival of the organism
- If mutant allele alters feature making the individual survive and reproduce more efficiently, allele will increase in frequency

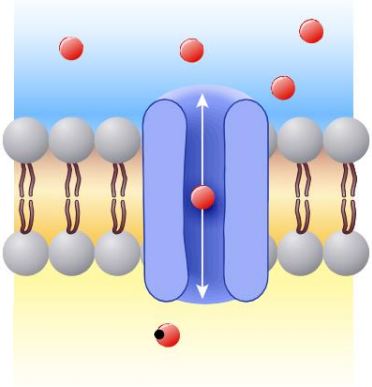
EXAMPLE:

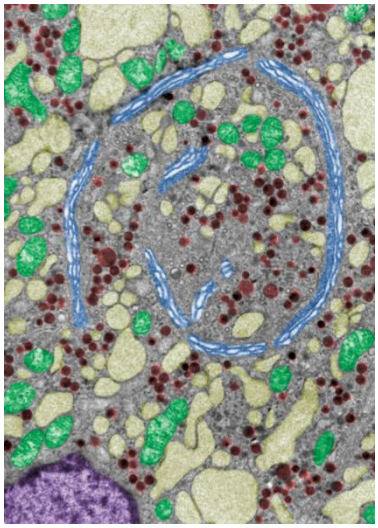


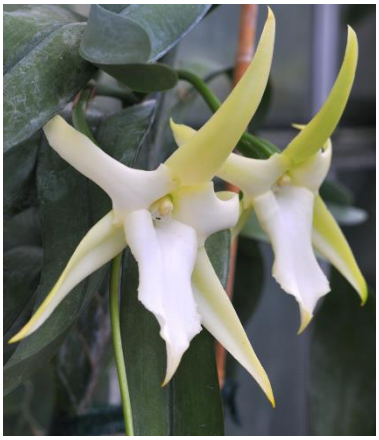
CONCEPT: ANIMAL PHYSIOLOGY

- Structure is related to function in living systems
    - □ Molecular level: hydrophobic and hydrophilic regions of membrane proteins
    - □ Cellular level: secretion cells have lots of Golgi apparatus

EXAMPLE:

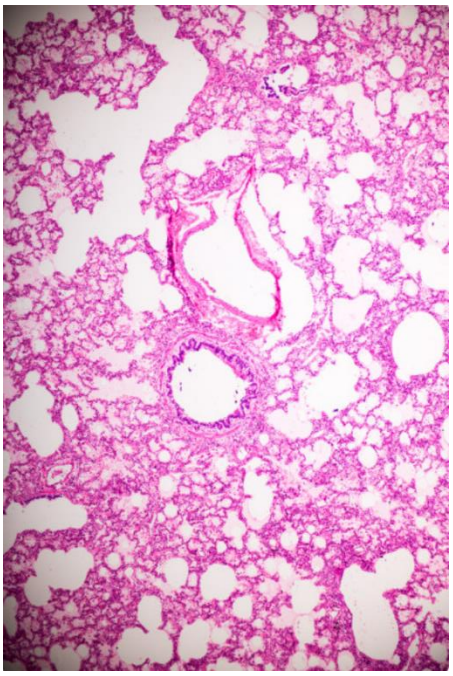


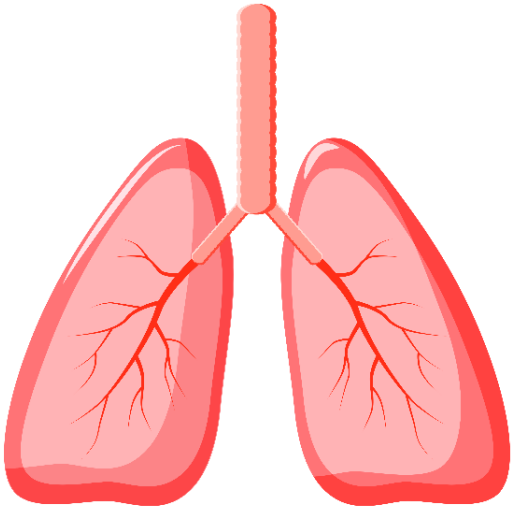


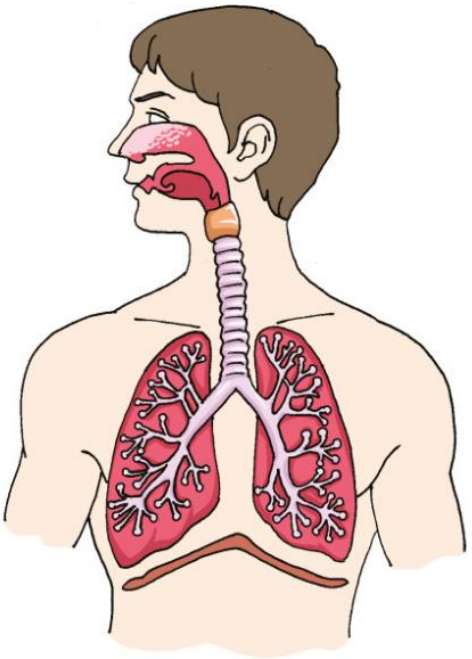


- ***Tissue*** – group of cells that carry out a specific function
- ***Organ*** – structure composed of tissues that carries out a specialized function
- ***Organ system*** – group of organs working in concert to perform a specific function

EXAMPLE:



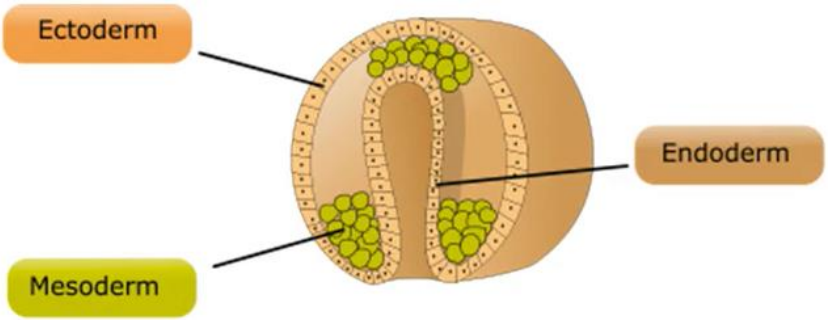




CONCEPT: ANIMAL TISSUES

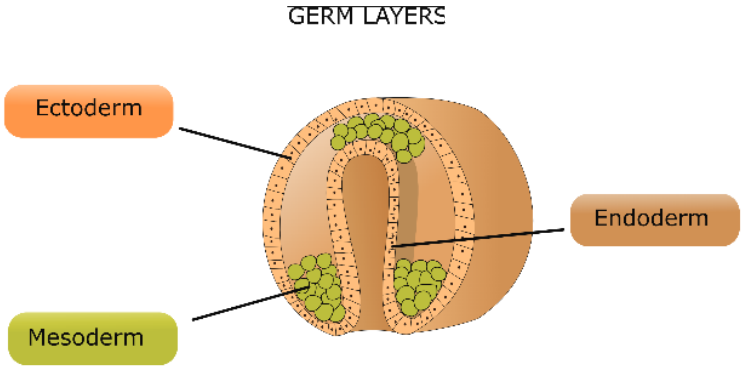
- ***Germ layers*** – embryonic tissues that form following gastrulation
  - □ ***Ectoderm*** – outer layer of cells that form nerves, adrenal medulla, skin, brain, eyes, and inner ear
  - □ ***Mesoderm*** – internal cells that give rise to organs, adrenal cortex, blood, bone, gonads, and the soft tissues
  - □ ***Endoderm*** – innermost cells that form the epithelial linings of the digestive tract, liver, pancreas, and lungs

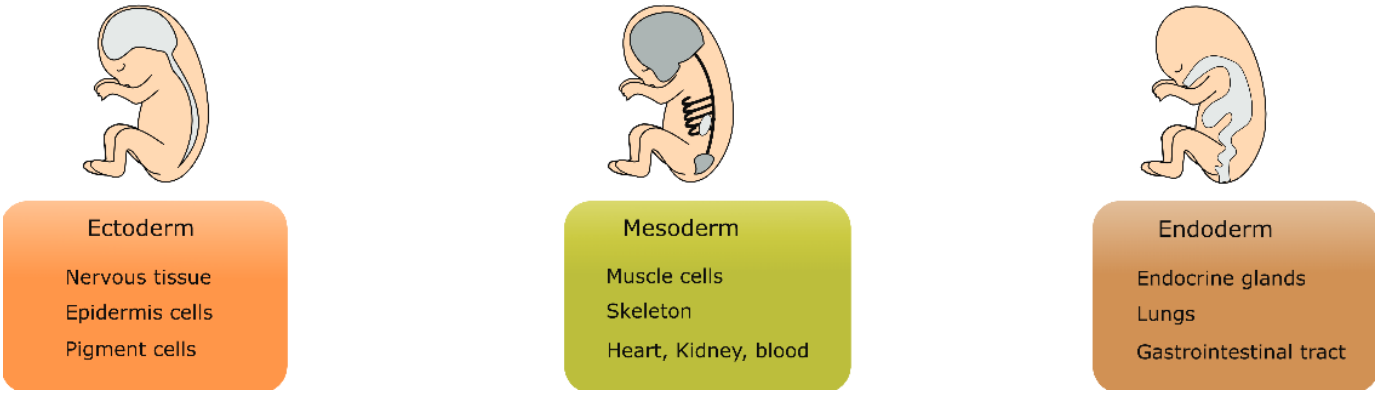
EXAMPLE:



- Adult tissues are derived from embryonic tissues
  - □ Nervous tissue is derived from the ectoderm
  - □ Muscle tissue is derived from the mesoderm
  - □ Connective tissue is derived from the mesoderm
  - □ Epithelial tissue is derived from endoderm and ectoderm

EXAMPLE:

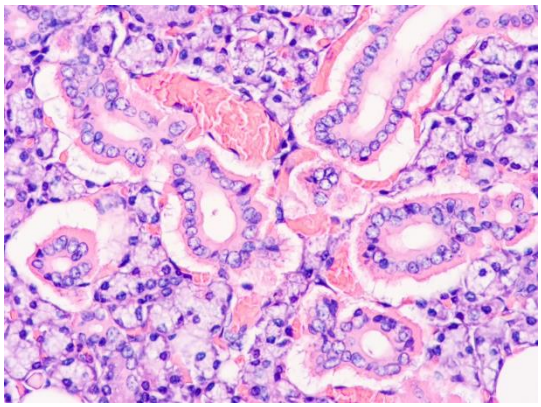


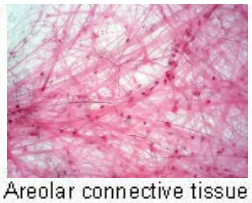


CONCEPT: ANIMAL TISSUES

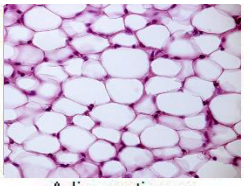
- ***Connective tissue*** – connects, separates, and cushions other tissues in the body; scattered within extracellular matrix
  - □ ***Extracellular matrix*** – array of proteins and ground substance, a gel-like substance
  - □ ***Loose connective tissue*** – helps hold organs in place and attaches epithelial tissue
    - ***Adipose tissue*** – made mostly of adipocytes, or fat cells
  - □ ***Dense (fibrous) connective tissue*** – tissue dense with collagen fibers
    - ***Tendons*** – connects muscle to bone
    - ***Ligaments*** – connects bone to bone
  - □ ***Supportive connective tissue*** – forms hard extracellular matrix, bone and cartilage provide structural integrity
  - □ ***Fluid connective tissue*** – blood, cells have a liquid extracellular matrix called plasma

EXAMPLE:

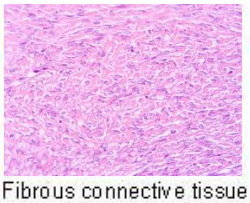




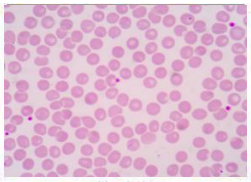
Areolar connective tissue



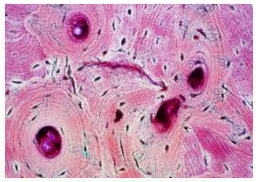
Adipose tissue



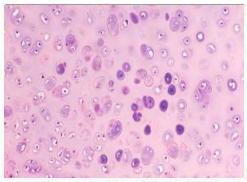
Fibrous connective tissue



Blood



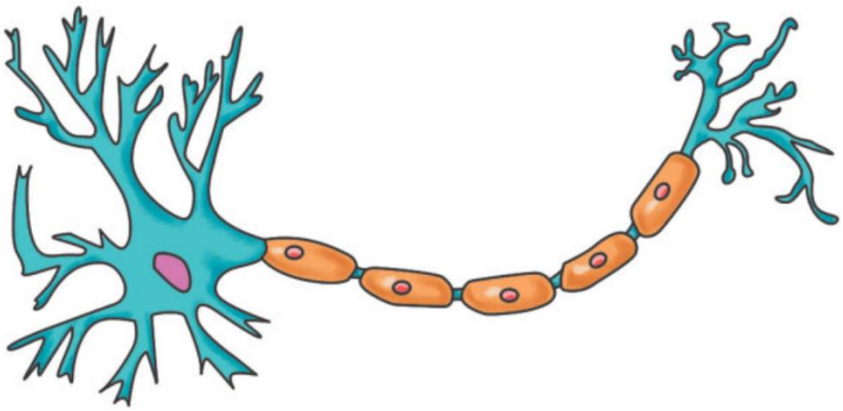
Osseous tissue

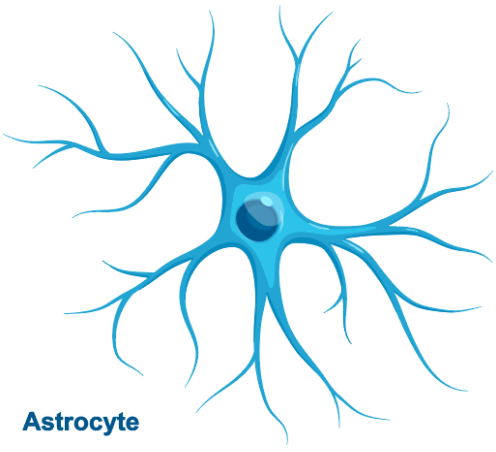


Hyaline cartilage

- ***Nervous tissue*** – conducts electrical and chemical signals, divided between central and peripheral nervous systems
  - □ ***Neurons*** – receive and transmit electrical signals by transporting ions across the membrane
    - ***Axons*** – long thin structure that transmits the electric signal, similar to a wire
    - ***Dendrites*** – branched structure that receives signals and responds to them
  - □ ***Glia*** – support cells for neurons, essential to their survival and proper functioning

EXAMPLE:



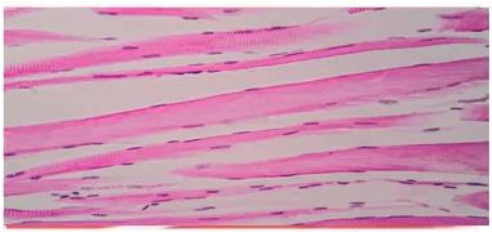
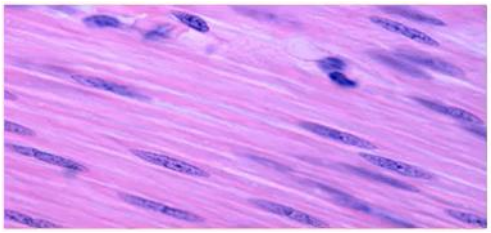
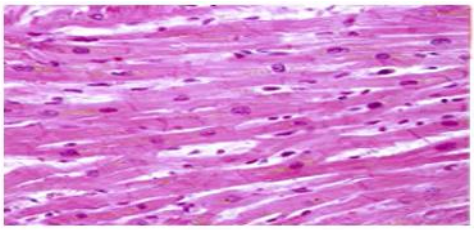


Astrocyte

CONCEPT: ANIMAL TISSUES

- ***Muscle tissue*** – contractile tissue that is unique to animals
    - □ ***Skeletal muscle*** – attached to bone, used for locomotion and posture
    - □ ***Cardiac muscle*** – only found in the heart, used to contract heart and pump blood
    - □ ***Smooth muscle*** – found in the walls of organs and vasculature

EXAMPLE:

- ***Epithelial tissue*** – lines organs and body surface, separates interior and exterior environments
    - □ Creates unique environments allowing for drastically different physical/chemical conditions
    - □ ***Apical side*** – faces toward the exterior environment
    - □ ***Basal side*** – faces the interior of the animal
    - □ Basal lamina – extracellular matrix on basal side that the epithelium sits on

EXAMPLE: