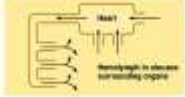
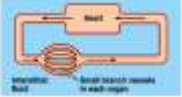



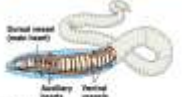
+ Kingdom Animalia
Animal Adaptations

+ **Transport**
Circulation - flow of body fluid (hemolymph/blood) to collect and deliver the following to necessary organs to supply ALL CELLS:

1. Gases - oxygen/carbon dioxide
2. Nutrients
3. Waste products
4. Hormones/cellular signals

+ **Two Types of Circulatory Systems**

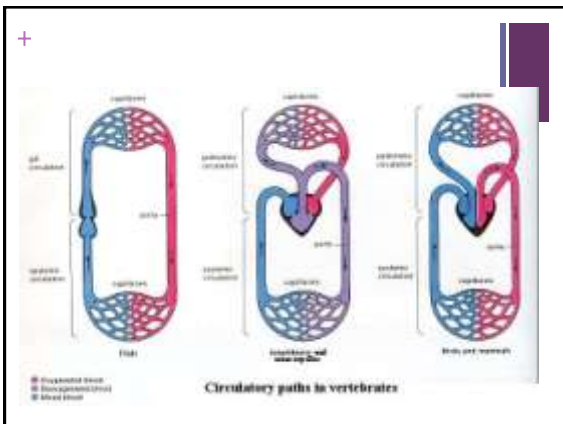
Open Circulatory System	Closed Circulatory System
 <p>Hemolymph in central cavity surrounding organs</p>  <p>Blood in vessels with small branch vessels in each organ</p>	

(A) Open circulatory system
(B) Closed circulatory system

+ **Two Types of Circulatory**

Open Circulatory System	Closed Circulatory System
<ol style="list-style-type: none"> 1. Pump (heart) 2. Body fluid = hemolymph 3. No blood vessels 4. ALL body fluids mix <p>PROS? CONS?</p>	<ol style="list-style-type: none"> 1. Pump (heart) 2. "Blood" is kept separate from other body fluids by BLOOD VESSELS. 3. Body fluid = blood 4. Blood has different concentrations of gases and nutrients than other body fluids. <p>PROS? CONS?</p>



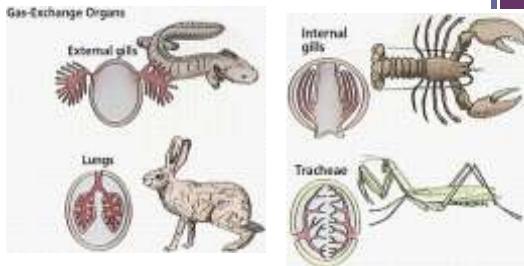
+ **Respiration: Gas Exchange**

What's needed for respiration:

- Moist surface for gas exchange.
- Lots of surface area
- Concentration gradient of both O₂ and CO₂
- Ability to: deliver O₂; remove CO₂
- Respiratory pigment = carries gases in fluid
- hemoglobin

■ ALL living cells (in an animal) need a constant supply of O₂ for cellular respiration (metabolism)

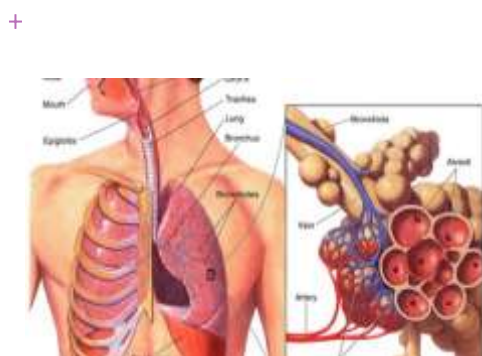
+ Comparison of Respiratory Systems



+ Respiration: Mammals

HIGHER METABOLISM =
HIGH DEMAND FOR OXYGEN

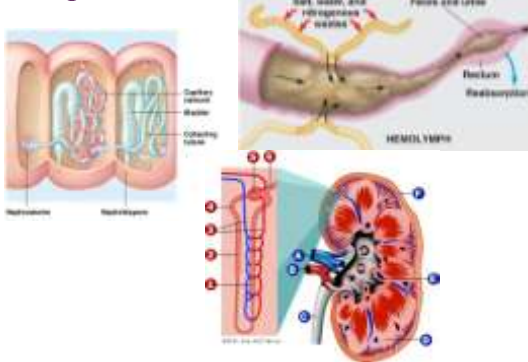
1. Diaphragm
2. Airways in lungs are highly branched.
3. Alveoli = thin-walled air sacs
 - Increase surface area



+ Excretion and Transport

- ALL living cells generate waste products.
- DNA and protein metabolism generates NITROGEN-waste products.
- Waste products either diffuse or are pumped out of the cell.
- Circulatory system must:
 - Remove waste from area of production.
 - Carry waste to organ of excretion.


+ Organs of Excretion



+ Nutrition and Transport

- ALL living cells need a supply of glucose for metabolism, and nutrients to build (synthesis) needed molecules (ex. DNA, ATP).
- Blood/hemolymph delivers glucose and nutrients to ALL living cells in animal.
- Food must be digested.
- Nutrients must be absorbed into blood stream (hemolymph).
- Digestive wastes are very bulky, and must be removed.

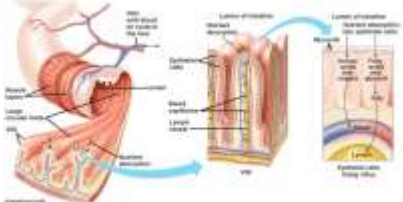
+ Nutrition:



+ Nutrition: Mammals

HIGHER METABOLISM → MORE NUTRIENTS, FASTER!

- villi/microvilli- folds in the lining of small intestines
- Increase surface area



+ Reproduction & Development

- Reproduction**
 - ALL organisms need to have cellular reproduction.
 - ALL species need to have organisms producing more organisms.
- Development**
 - physical changes to body
 - Ex. Metamorphosis, puberty

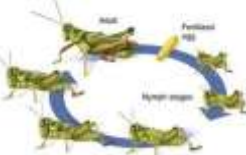

+ Reproduction

Sexual Reproduction	Asexual Reproduction
<ul style="list-style-type: none"> genetic contributions from two parents. PROS: leads to diversity within population CONS: takes longer; metabolically expensive 	<ul style="list-style-type: none"> genetic contribution from a single parent PROS: fast; less energy required CONS: decreases diversity

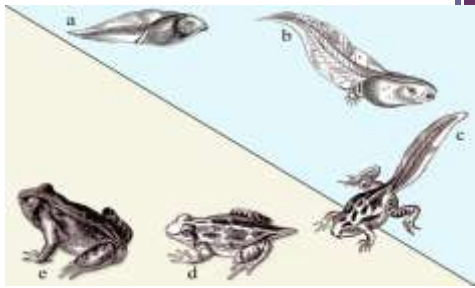
+ Fertilization

Internal Fertilization	External Fertilization
<ul style="list-style-type: none"> sperm combines with egg inside organism. PROS: increases likelihood of fertilization; fewer gametes (sperm/eggs) wasted. CONS: fewer eggs actually fertilized at one time 	<ul style="list-style-type: none"> sperm combines with egg outside organism. PROS: more eggs fertilized at one time. CONS: more gametes needed to ensure fertilization

+ Metamorphosis

Incomplete	Complete
	

+ Amphibian Complete Metamorphosis



+ Reproduction: Mammals

- Internal fertilization
- Some degree of internal development
- Different groups of mammals are classified by development:
 - Monotreme: egg-laying mammal
 - Marsupial: pouched mammal
 - Placental: long period of gestational development.

+ Egg vs. Placenta

Egg

- While in egg → no nourishment from mom
- Development limited by time spent in egg
- Time in egg limited by:
 1. Prepackaged nutrients
 2. Accumulation of wastes

Placenta

- Complex organ; network of maternal and offspring blood vessels
- Constant exchange of gases, and nutrients from mothers blood.
- Allows wastes to be eliminated from "womb".

+



+ Placentals: Womb Service

