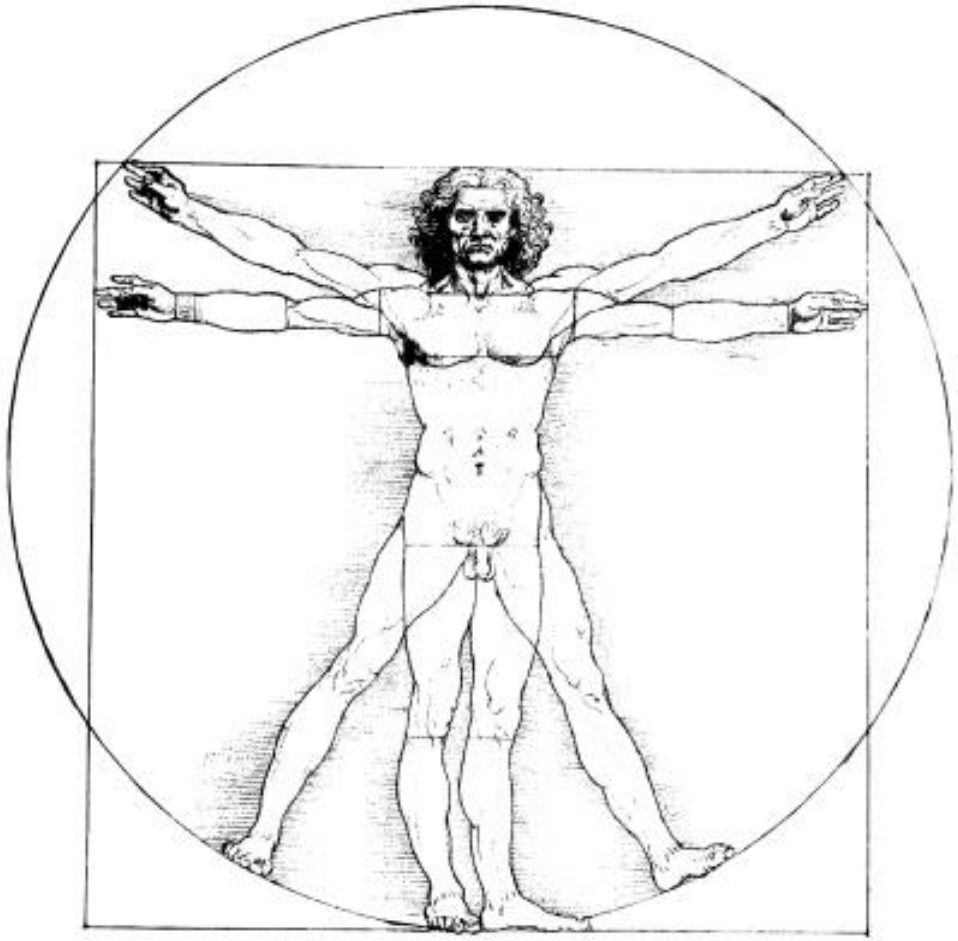
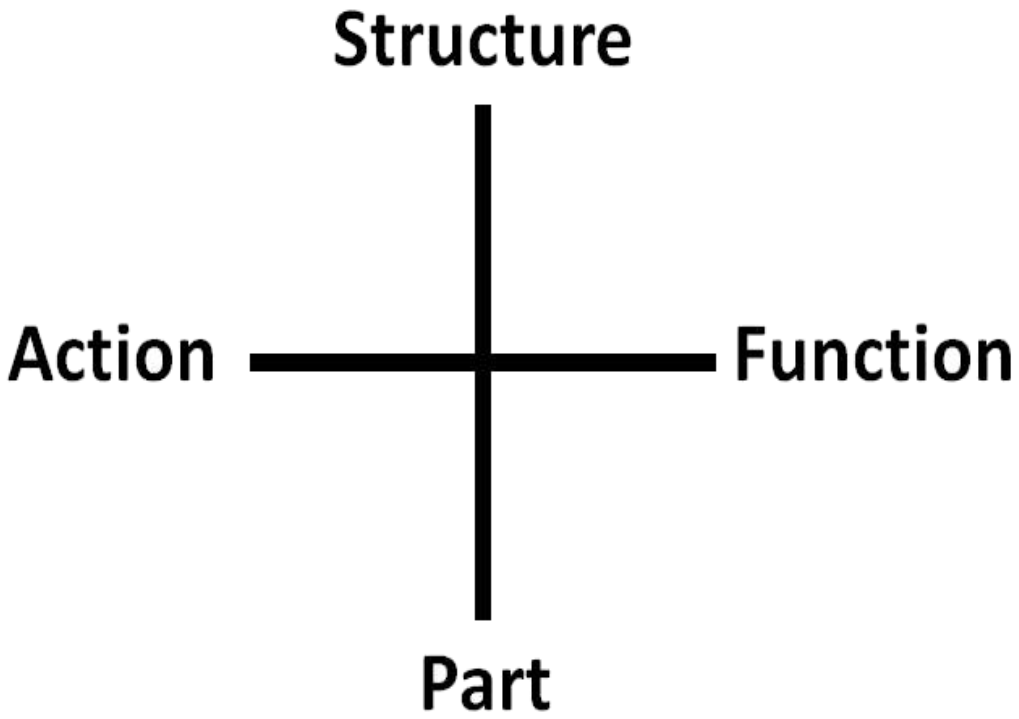
What is Anatomy & Physiology?

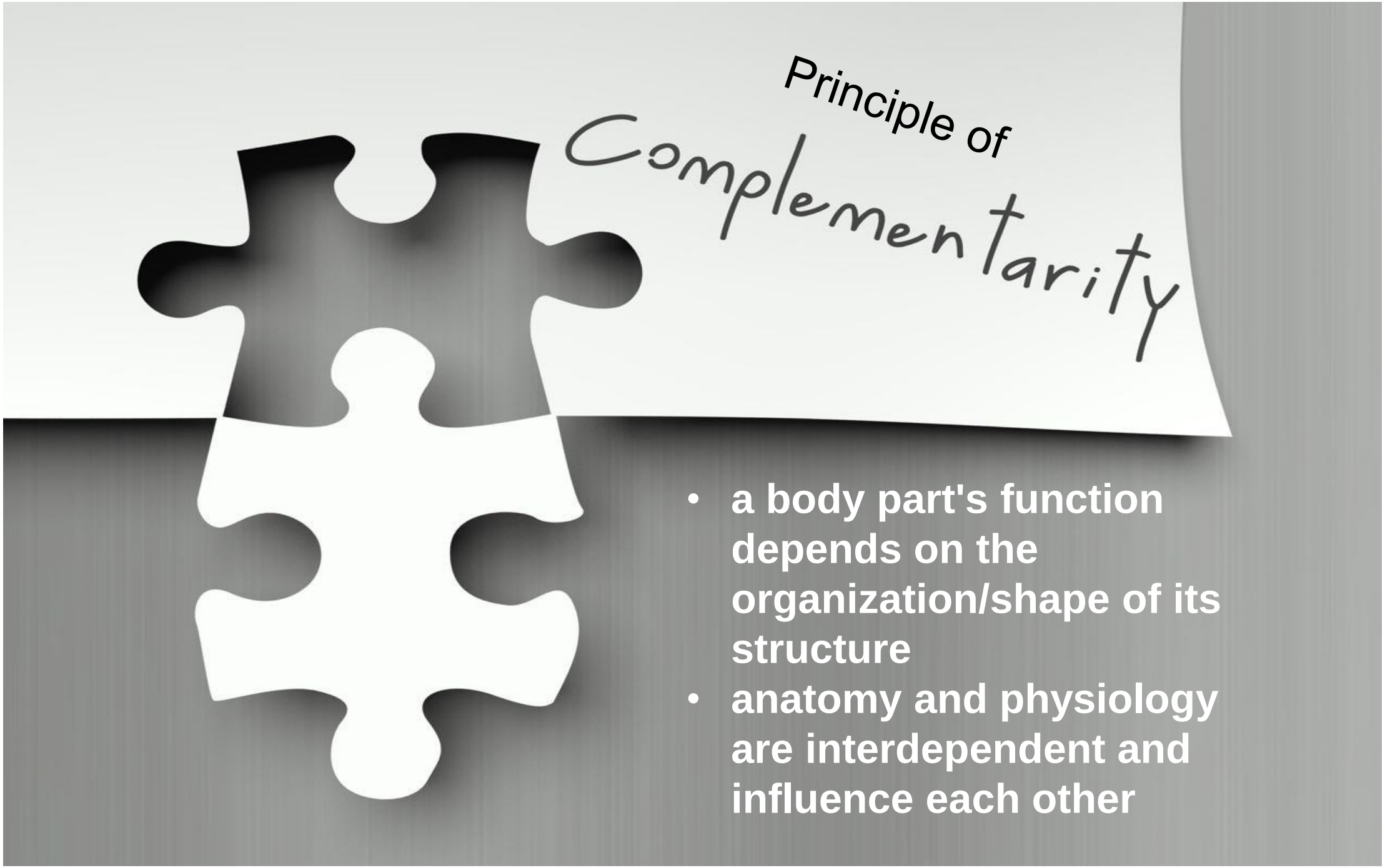
Big Ideas:

1. How does the body maintain homeostasis?
2. How are structure and function interdependent?

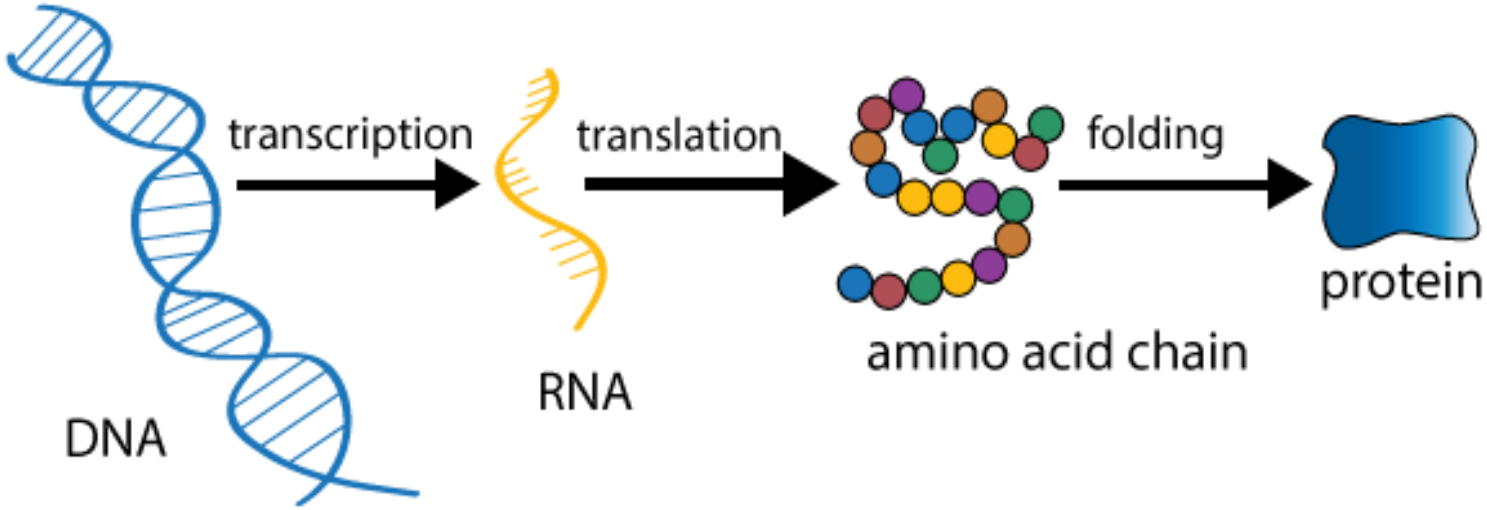


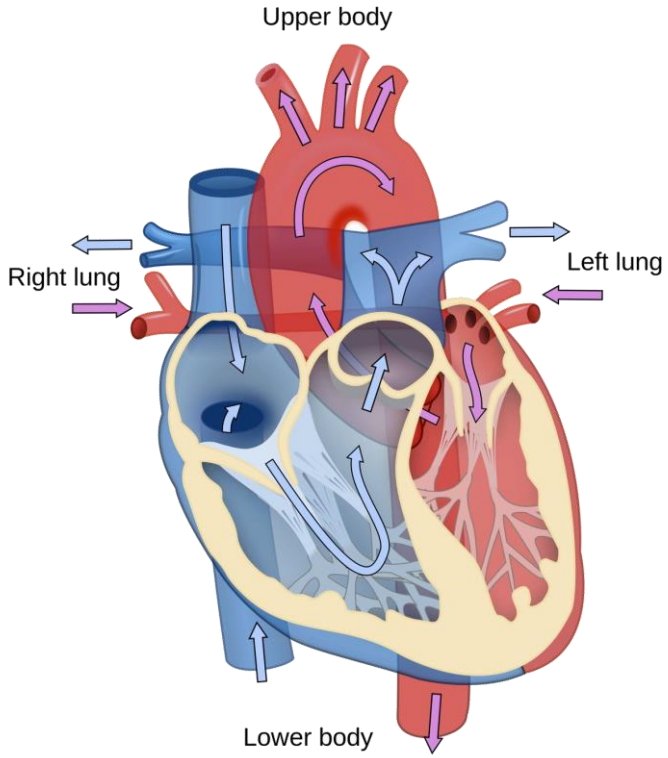
anatomy - structure of body parts and how they are organized
anatomy = structure
physiology - functions of body parts; what they do and how they do it
physiology = function
ANATOMY is to **STRUCTURE,** what **PHYSIOLOGY** is to **FUNCTION.**





- **a body part's function depends on the organization/shape of its structure**
- **anatomy and physiology are interdependent and influence each other**


transcription
translation
folding
protein
DNA
RNA
amino acid chain

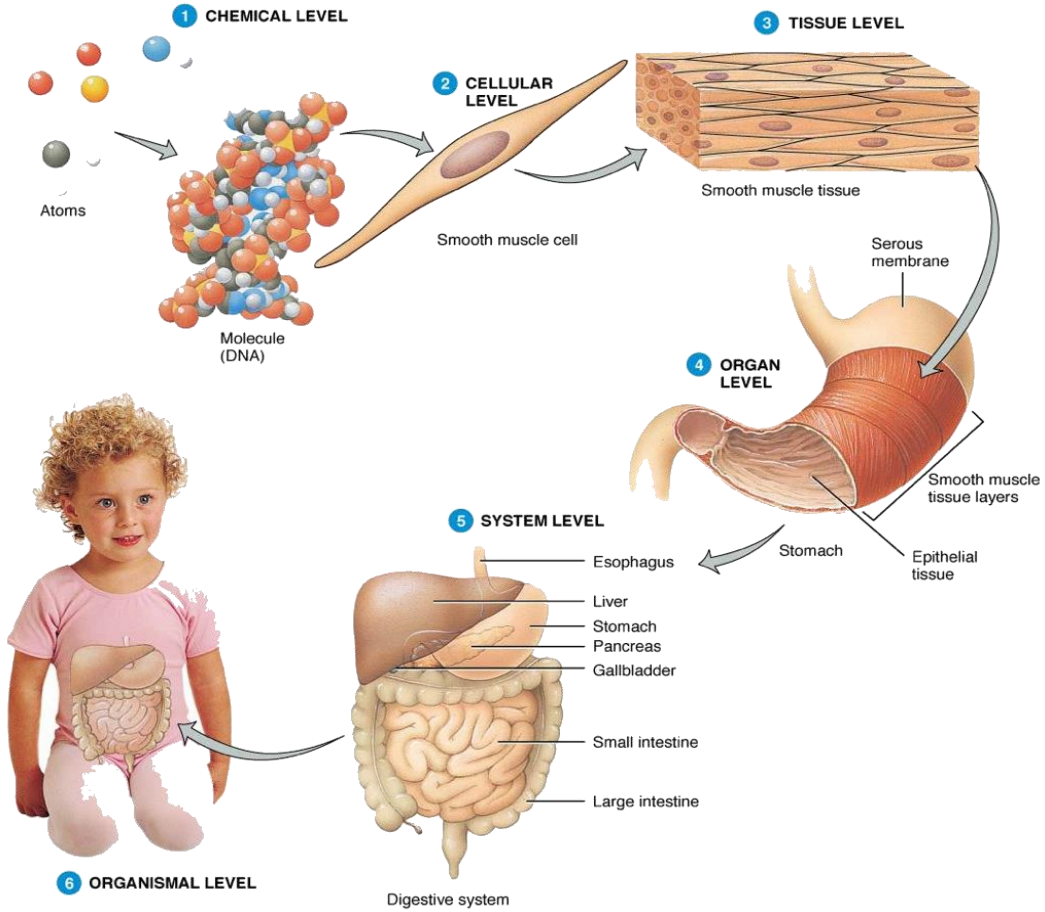

Upper body
Right lung
Left lung
Lower body

Levels of Organization

chemical ➡ cellular ➡ tissues ➡ organs ➡ organ systems ➡ organisms

complexity increases with each level

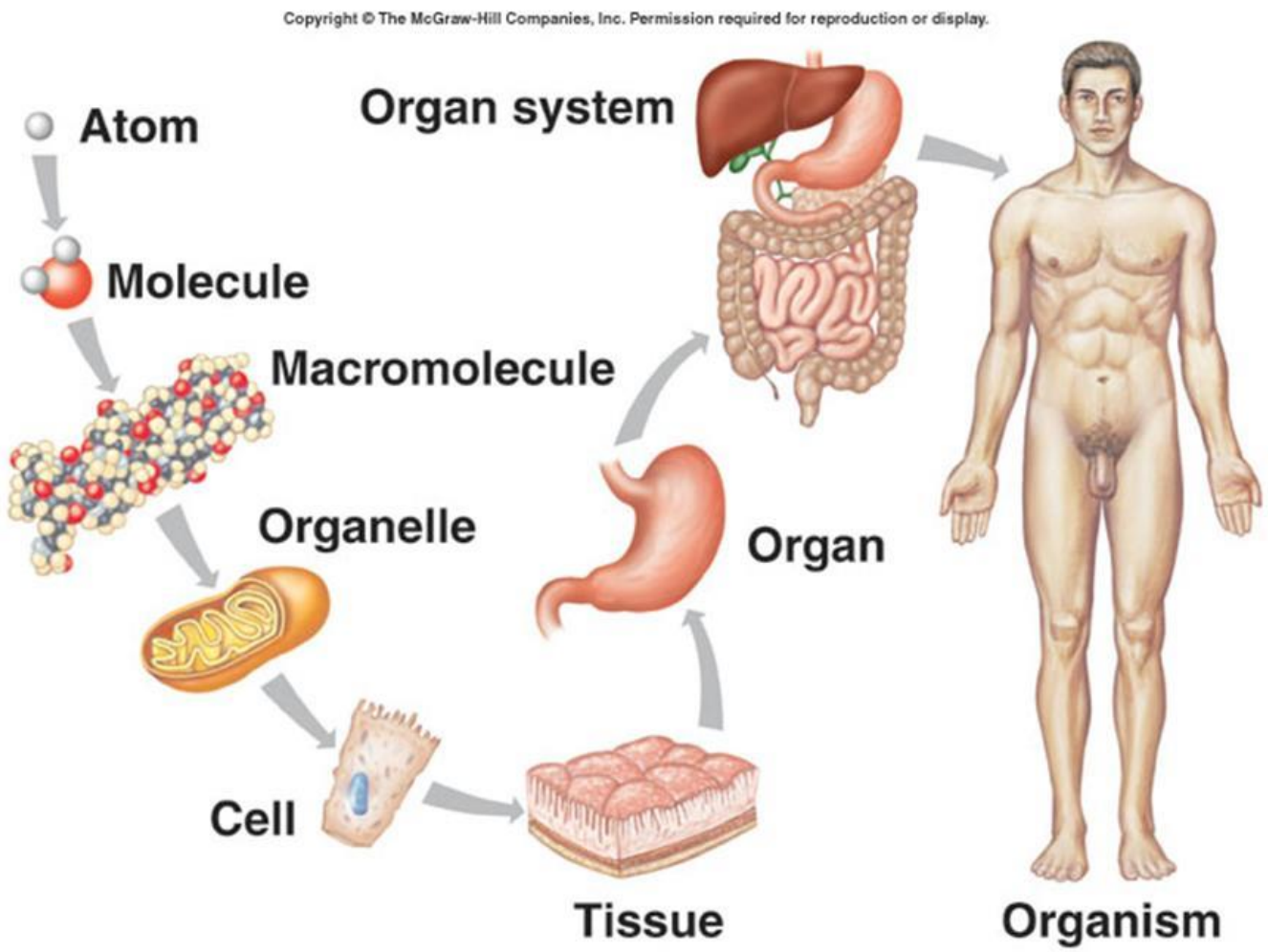
each level relies on the structure and function of the level below it



nose goes

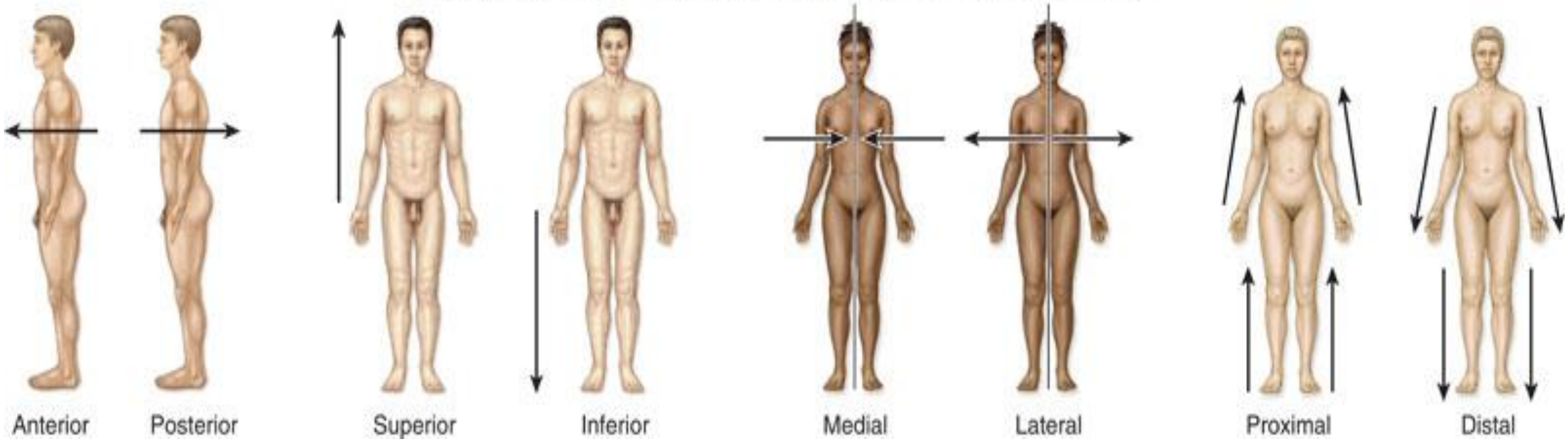
Describe the levels of organization.

Fig. 1.1



Anatomical Terminology

How do we talk about the body?

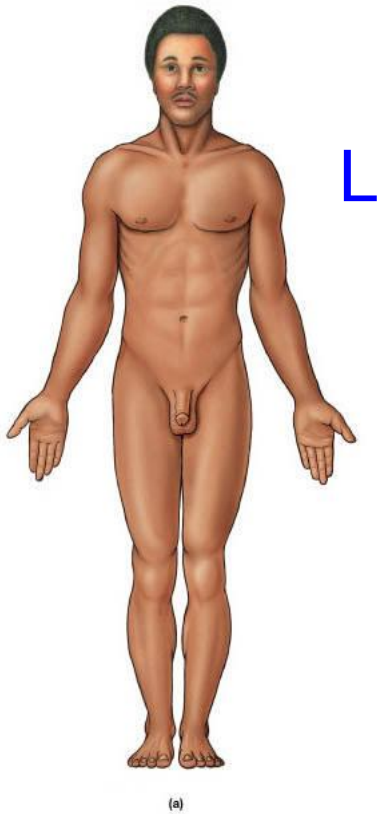


Anatomical Position

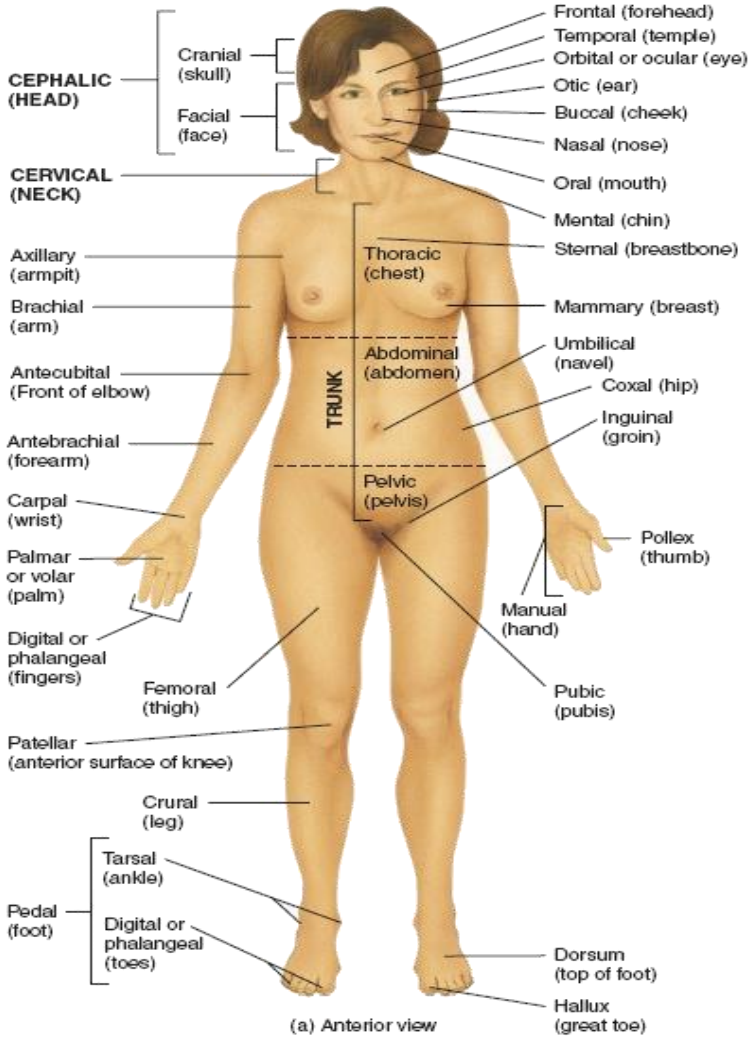
standing erect, face forward, palms forward

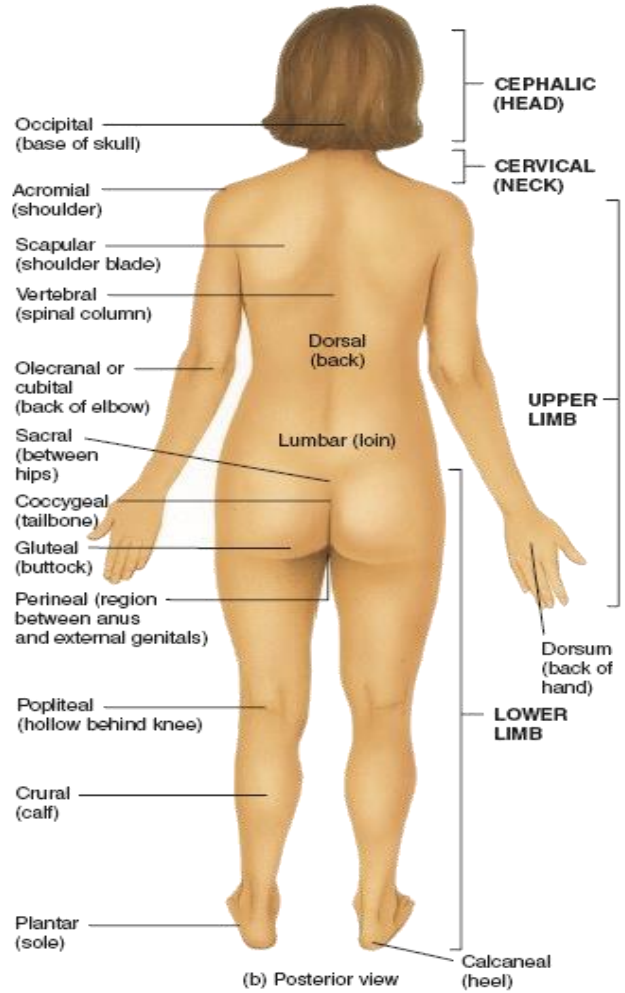
"right" and "left" refer to the specimen's right and left, NOT YOURS

Righ
t



Left

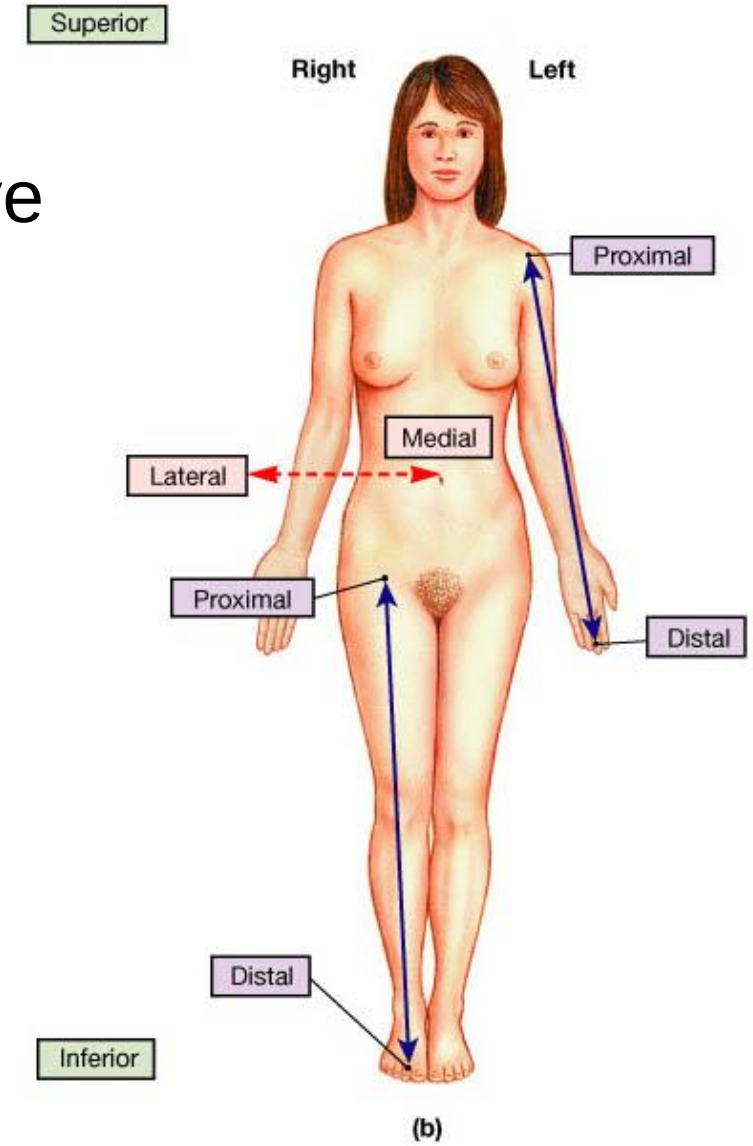




Relative Position Terms

superior - body part above another or closer to the head

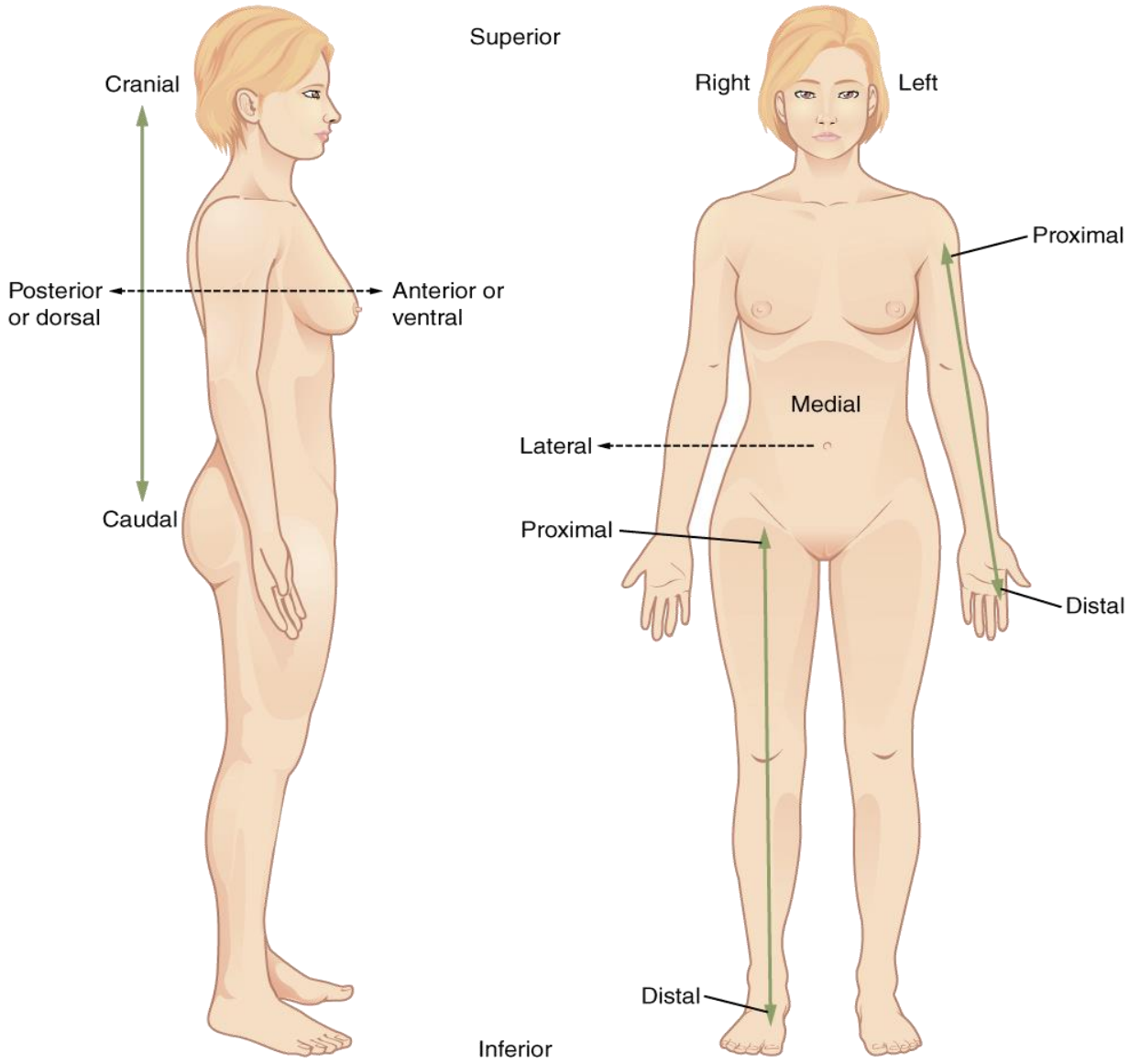
inferior - body part below another or toward the feet



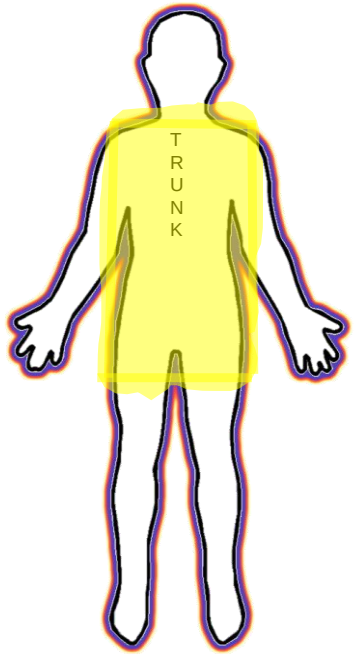
Relative Position Terms

medial - toward the body's imaginary midline

lateral - away from the body's imaginary midline



Relative Position Terms

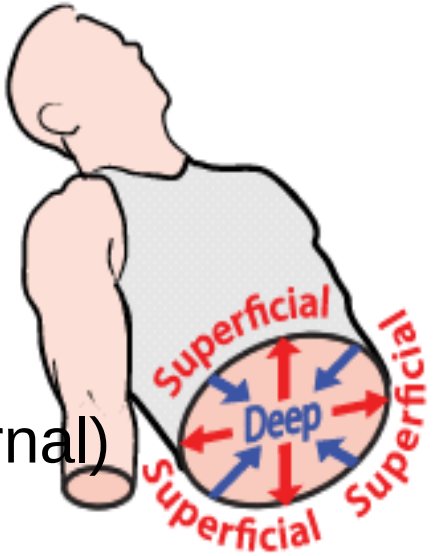


proximal - closer to the point of attachment to the trunk

distal - farther from the point of attachment to the trunk

superficial - near the surface

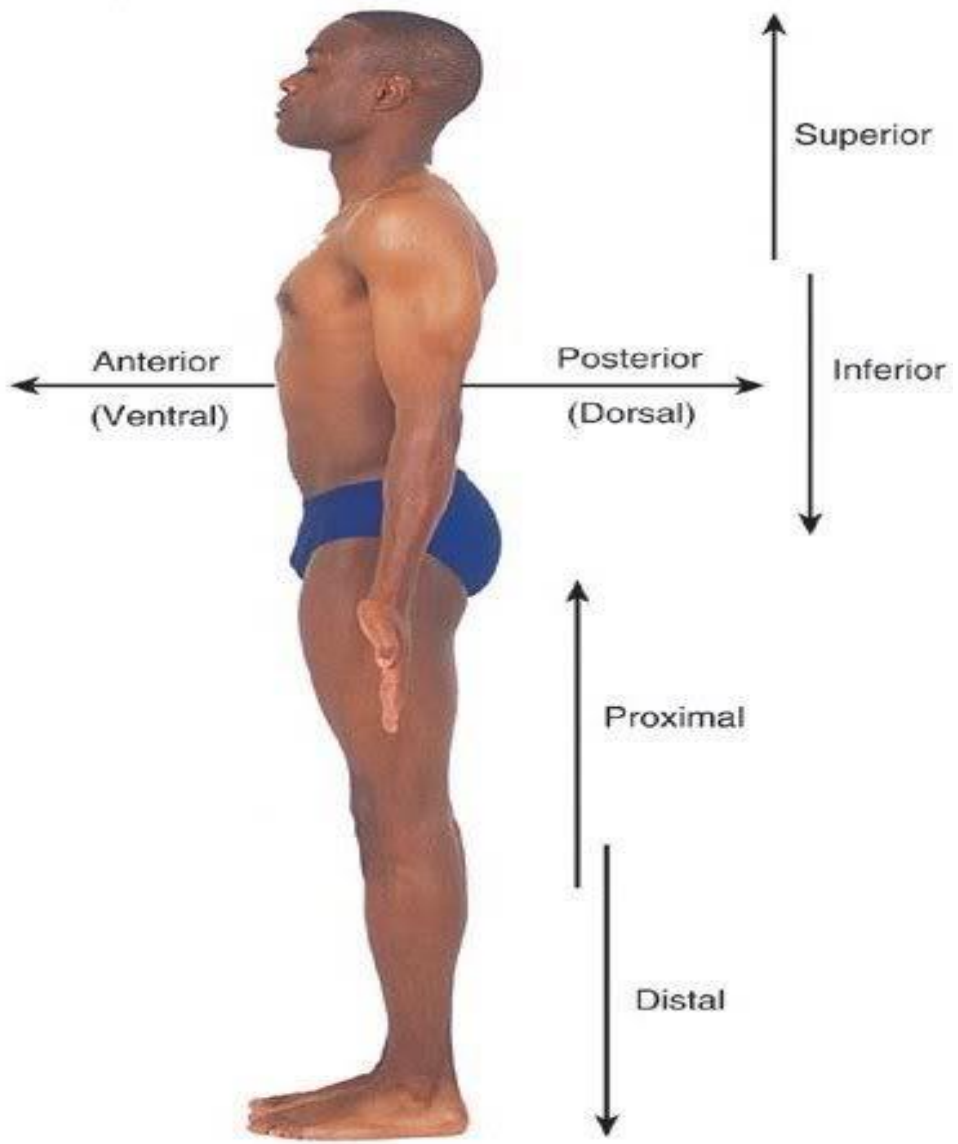
deep - away from the surface (internal)



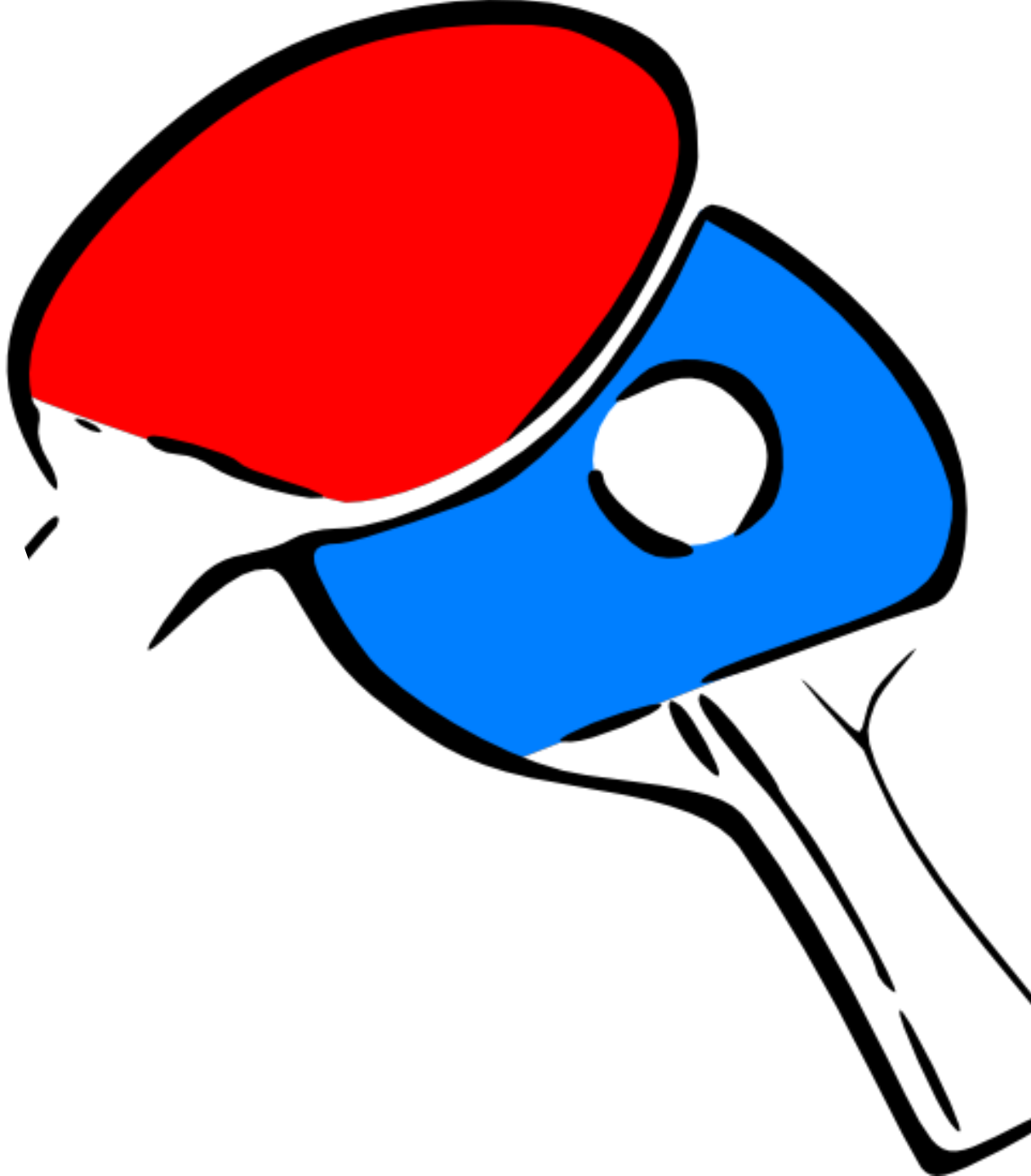
Relative Position Terms

anterior (ventral) - toward the front

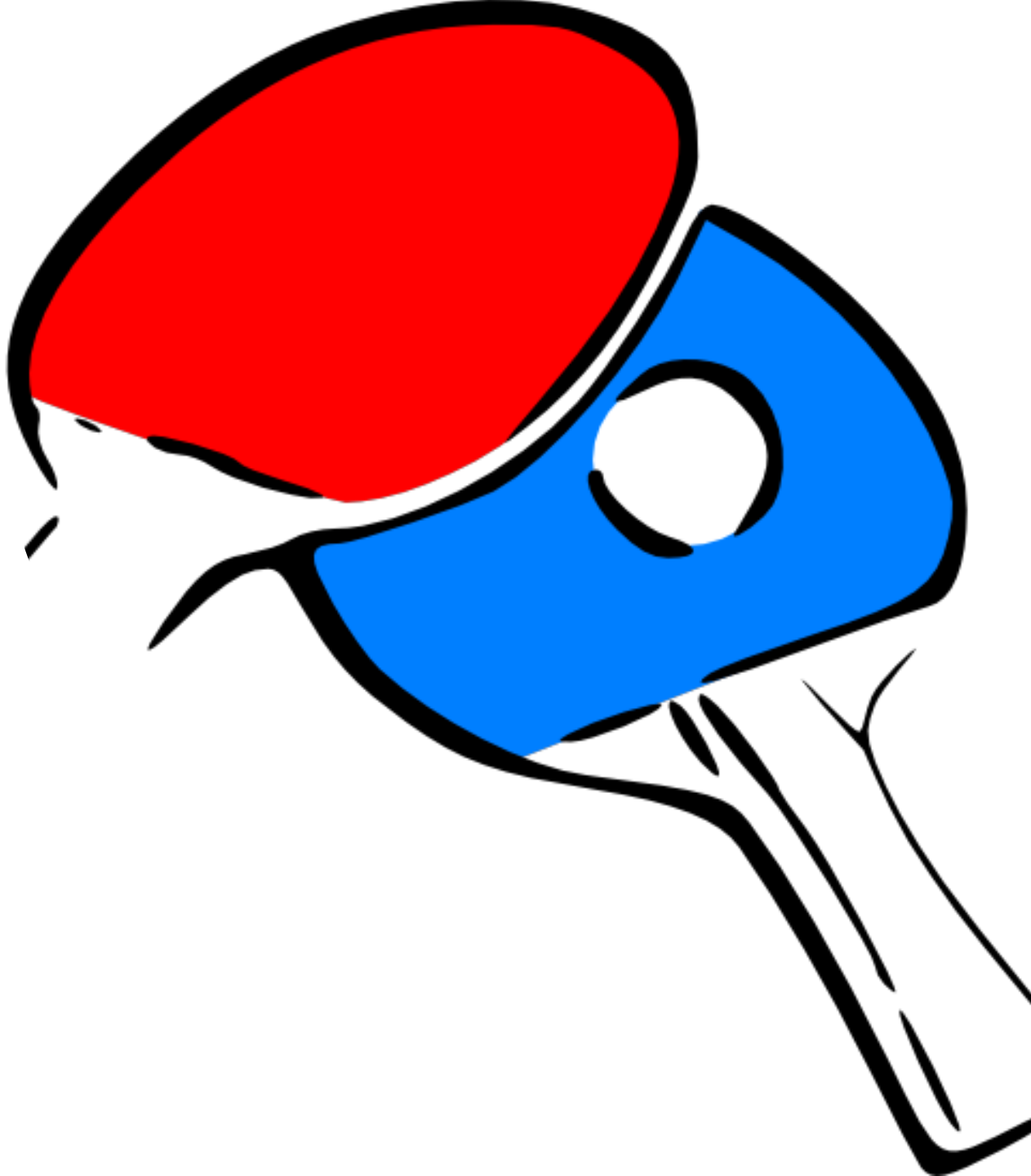
posterior (dorsal) - toward the back



Ping pong back & forth describing the position of the elbow to the knee.



Ping pong back & forth describing the position of the nose to the left eye.

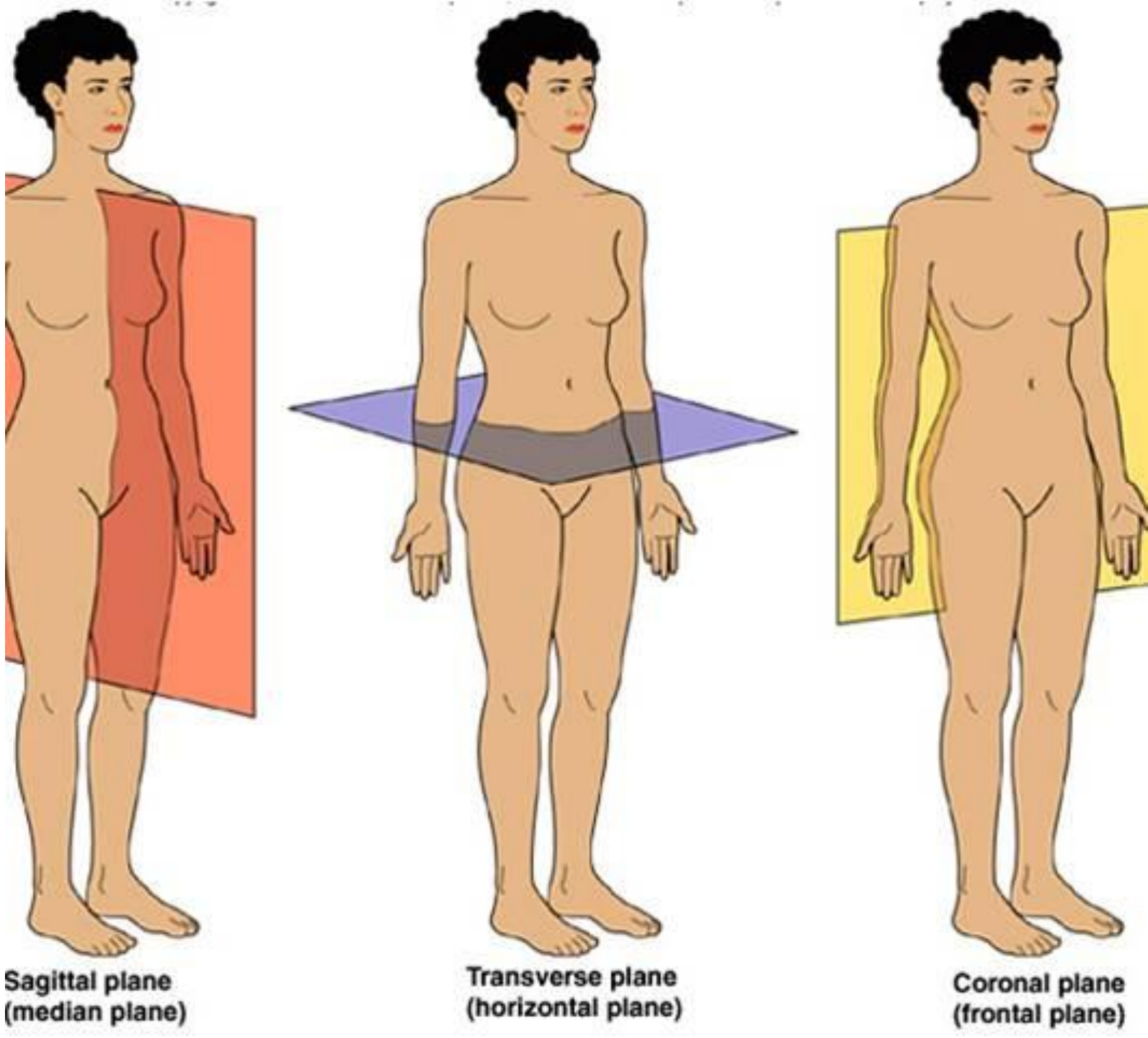


Body Sections (Planes)

- **sagittal** - divides the body into a left and right - passes through the body's imaginary midline

- **transverse** (horizontal) - divides the body into superior and inferior (top and bottom)

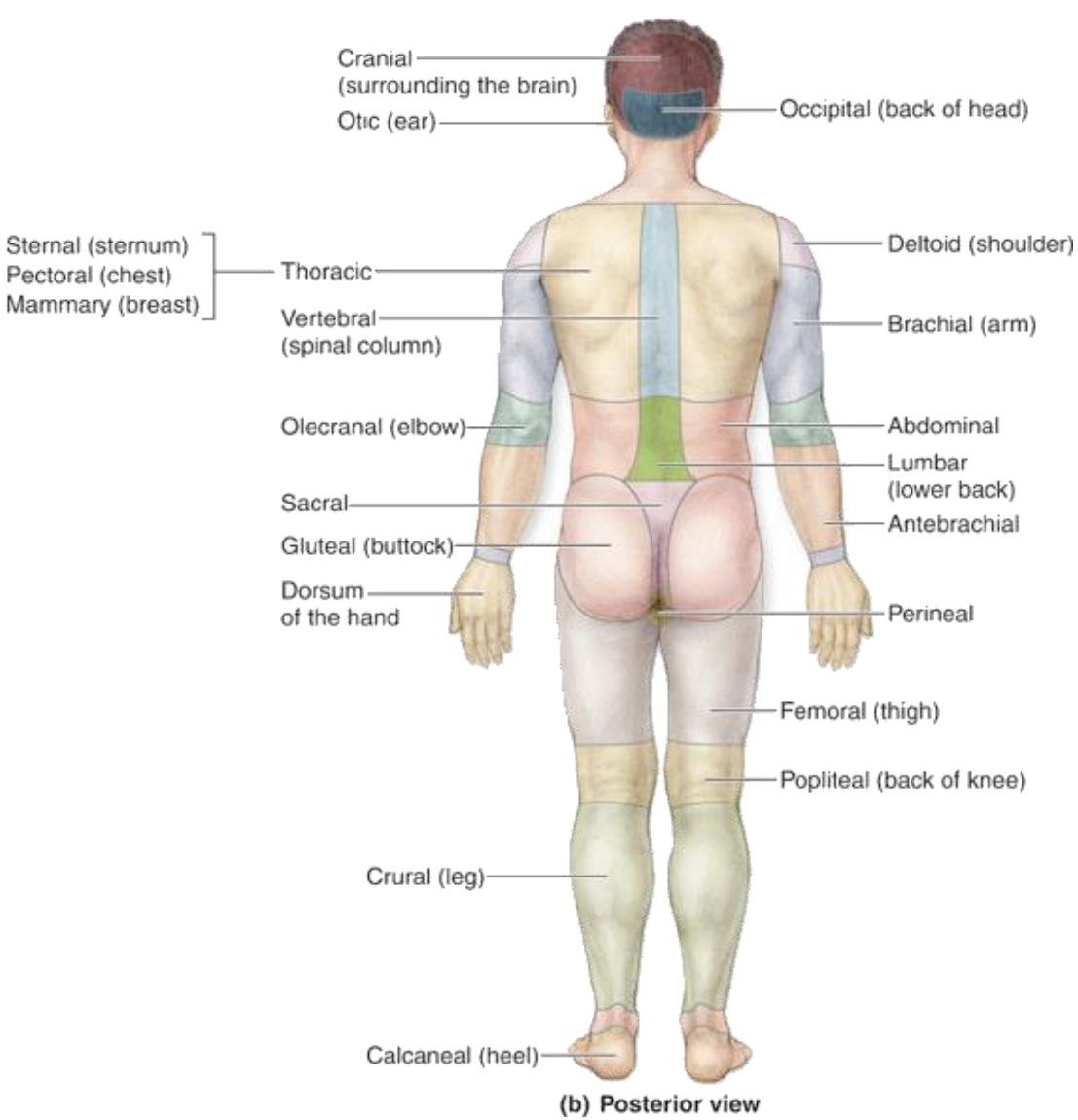
- **coronal** (frontal) - divides the body into an anterior and posterior (front and back)



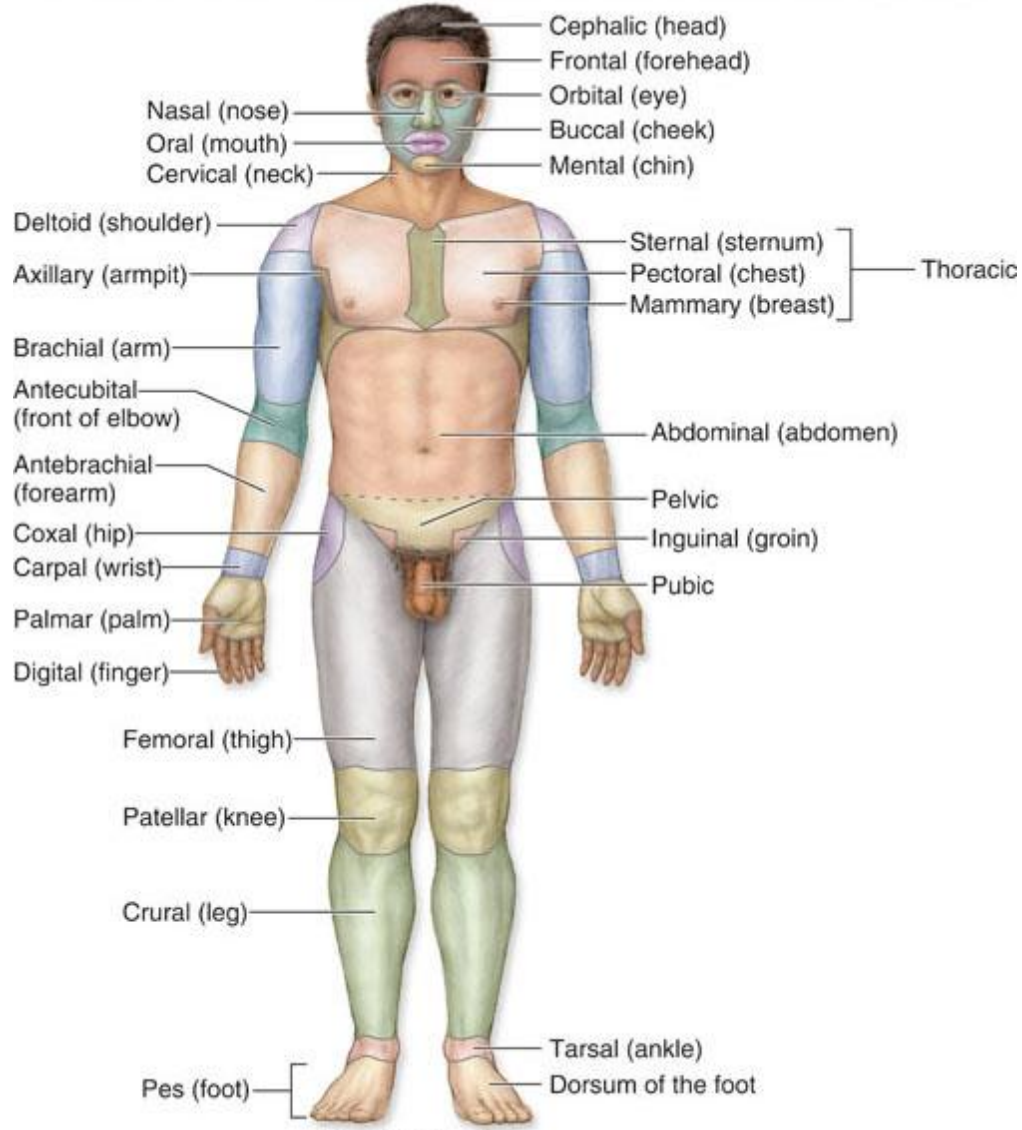
Body Regions & Parts

- cranium - skull
- cephalic - head
- axillary - armpit
- brachium - arm
- antebrachium - forearm
- carpal - wrist
- digital (phalanges) - fingers
- patellar - kneecap
- tarsal - ankle
- pedal - foot
- femoral - thigh
- inguinal - groin
- umbilical - navel

- abdomen - stomach
- mammary - breast
- thoracic - chest
- cervical - neck
- orbital - eye
- acromial - shoulder
- dorsal - back
- olecranal - elbow
- lumbar - lower back
- gluteal - buttocks
- calcaneal - heel
- plantar - sole foot
- vertebral - spine



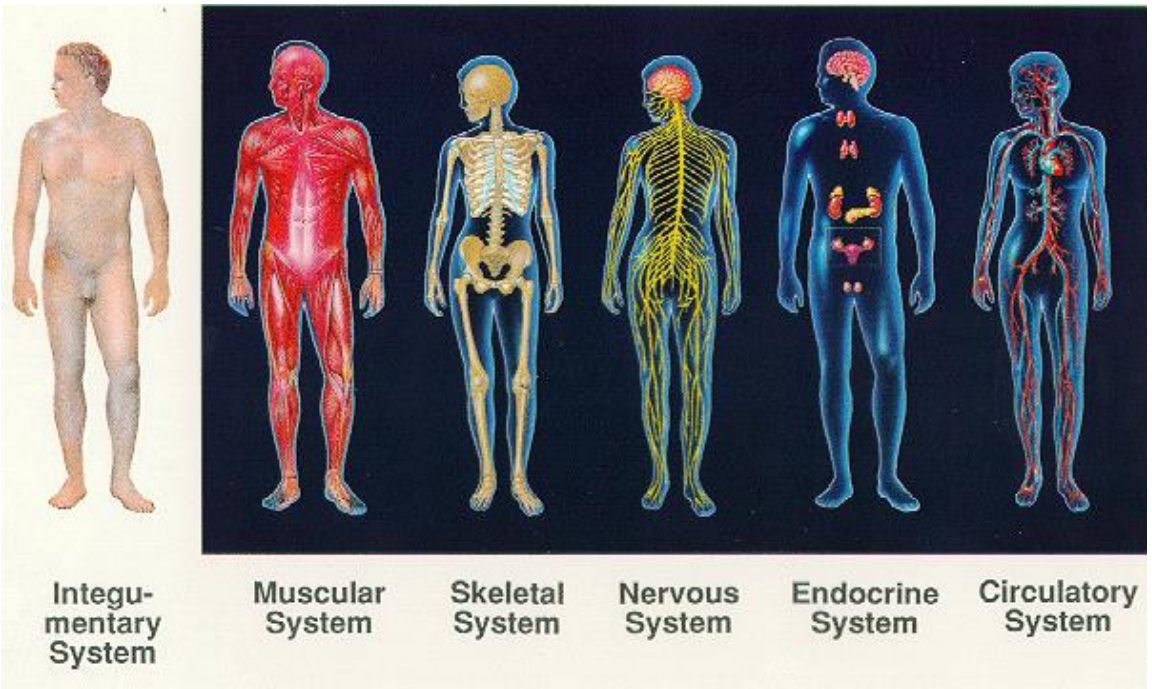
(b) Posterior view

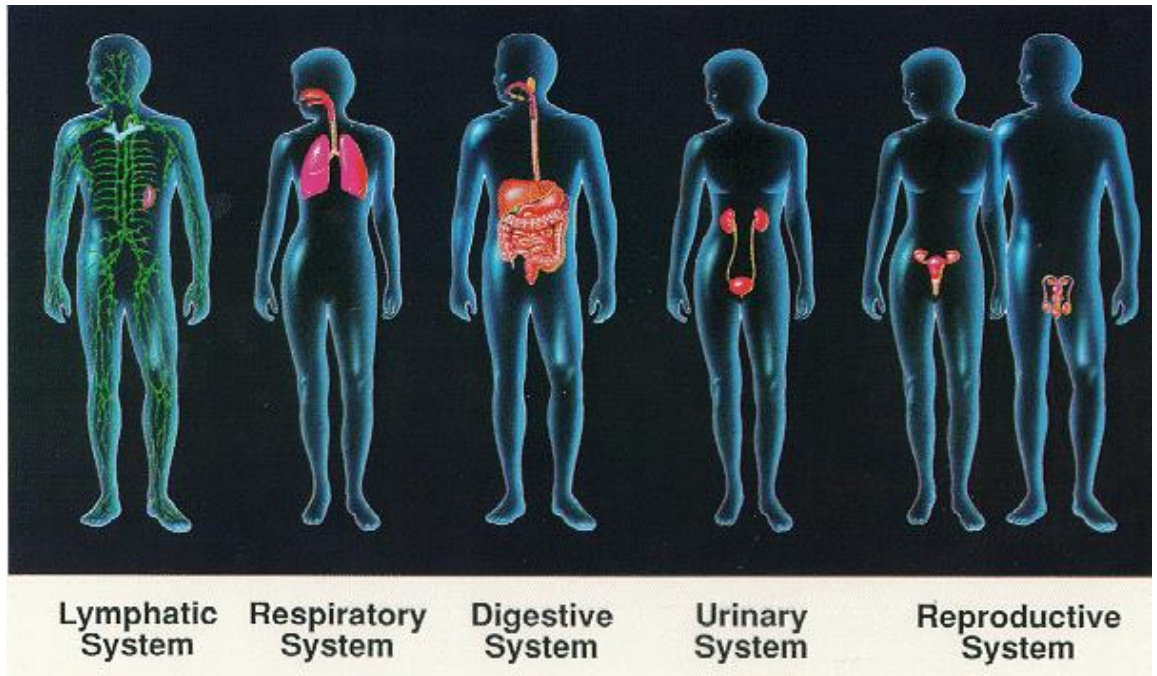


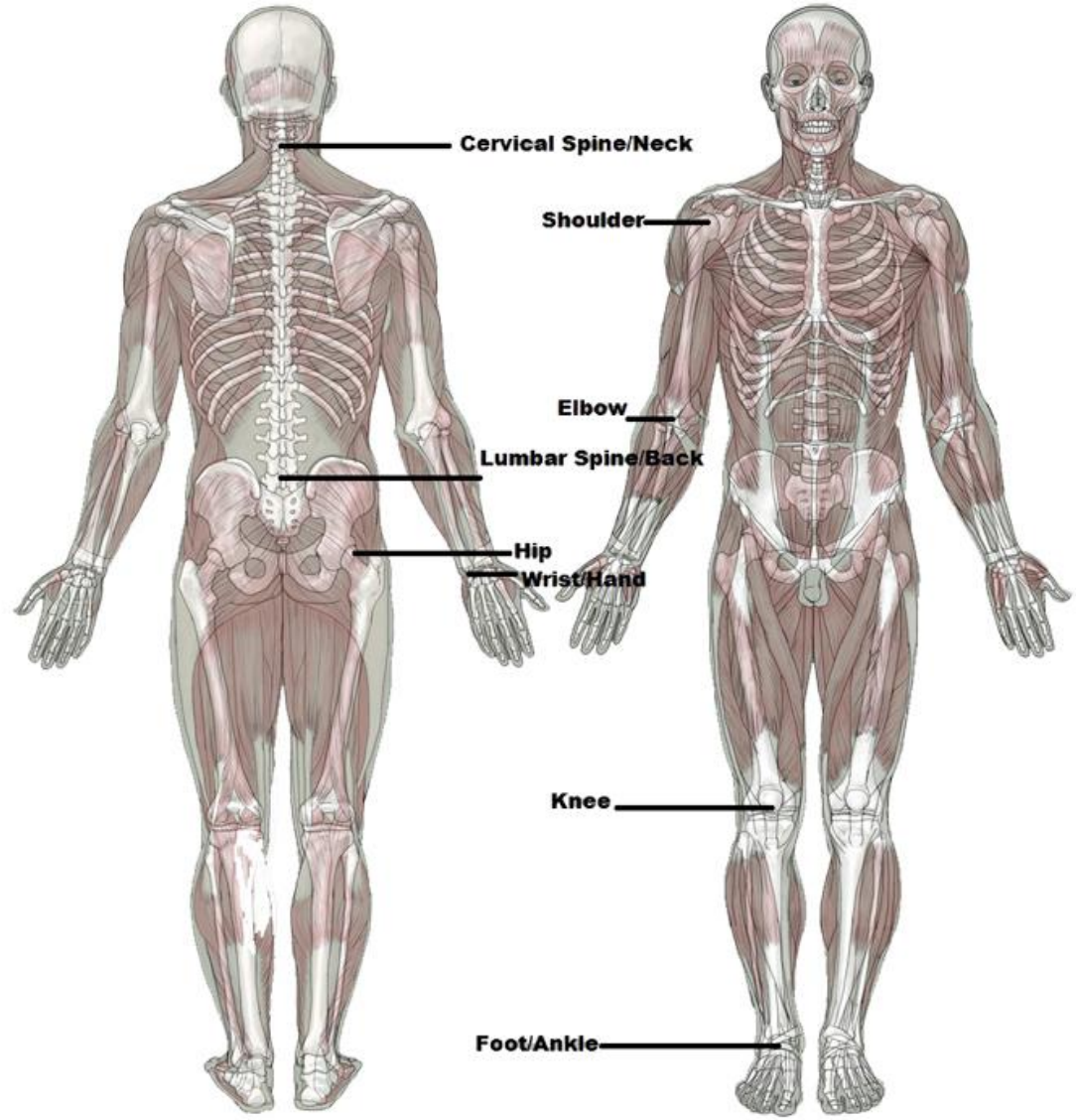
(a) Anterior view

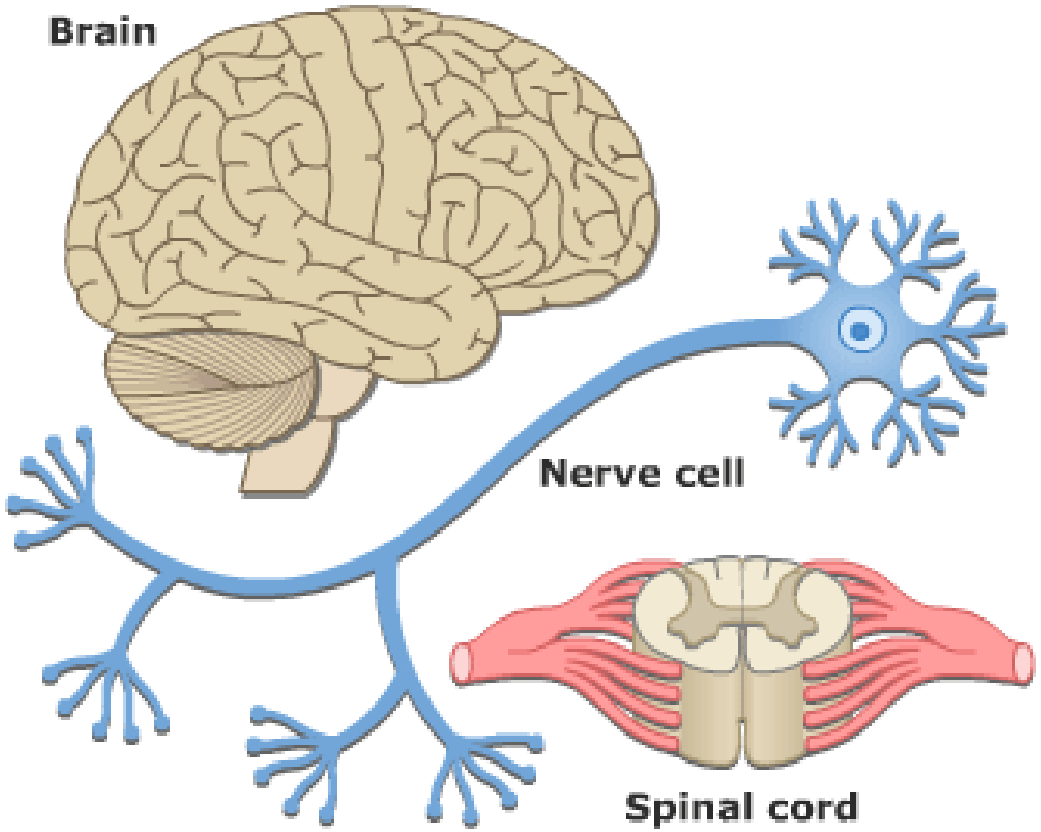
Trade off being Simon...use your anatomical terms to touch different body parts

NO TOUCHY YOUR MAMMARIES, GLUTEUS, OR INGUINAL!


Integu-
mentary
System
Muscular
System
Skeletal
System
Nervous
System
Endocrine
System
Circulatory
System

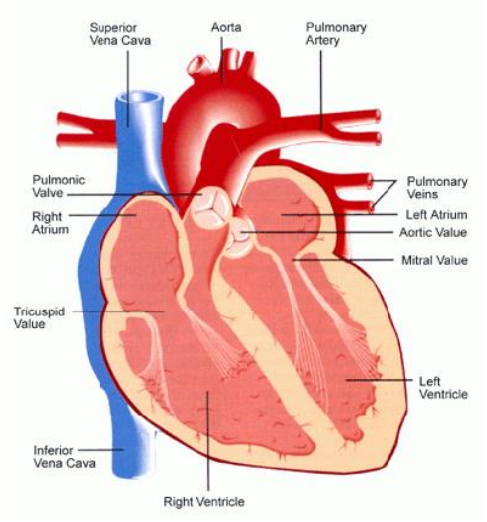

Lymphatic
System
Respiratory
System
Digestive
System
Urinary
System
Reproductive
System

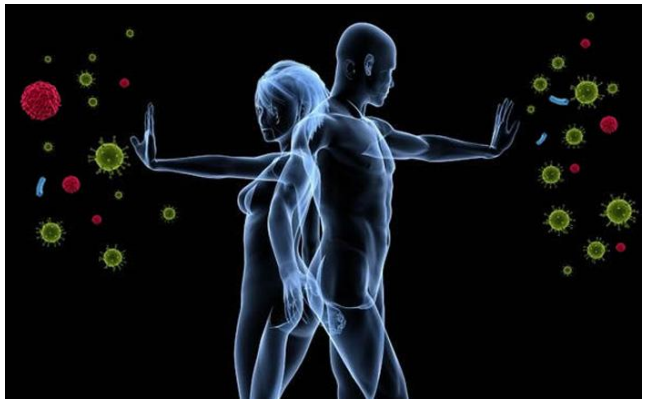

Cervical Spine/Neck
Shoulder
Elbow
Lumbar Spine/Back
Hip
Wrist/Hand
Knee
Foot/Ankle



Regulation & Integration

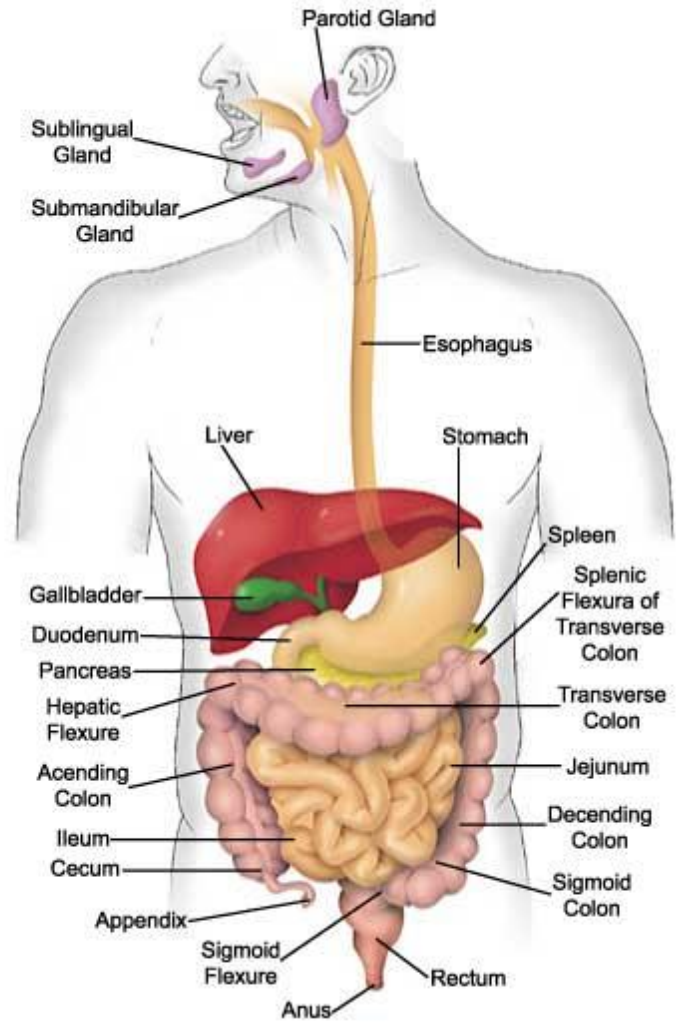
- Nervous System
- brain, spinal cord, nerves, sense organs
- Endocrine System
- glands and hormones

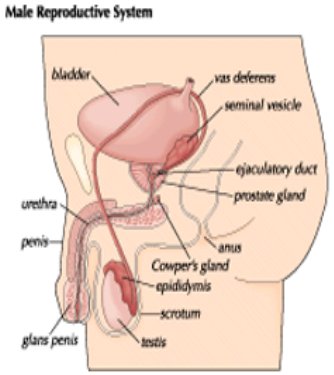


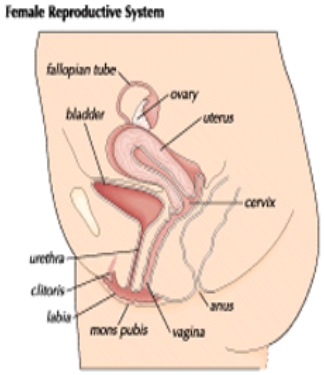


Maintenance Part 1 - Transport

- Cardiovascular System
- heart, blood vessels, and blood
- Lymphatic System & Immunity
- lymphatic vessels, lymph fluid, lymph nodes, thymus, and spleen


Parotid Gland
Sublingual Gland
Submandibular Gland
Esophagus
Liver
Stomach
Spleen
Splenic Flexura of Transverse Colon
Gallbladder
Duodenum
Pancreas
Hepatic Flexure
Transverse Colon
Acending Colon
Jejunum
Decending Colon
Ileum
Cecum
Sigmoid Colon
Appendix
Sigmoid Flexure
Rectum
Anus





Continuity - Human Life Cycle

- Reproductive Systems
- male - scrotum, testes, epididymides, vas deferentia, seminal vesicles, prostate gland, penis, urethra, sperm
- female - ovaries, uterine tubes, uterus, vagina, clitoris, vulva, egg cells
- Pregnancy, Growth, Development
- Genetic Inheritance

Work together to provide the basic function of each system below.

Absorption & Excretion

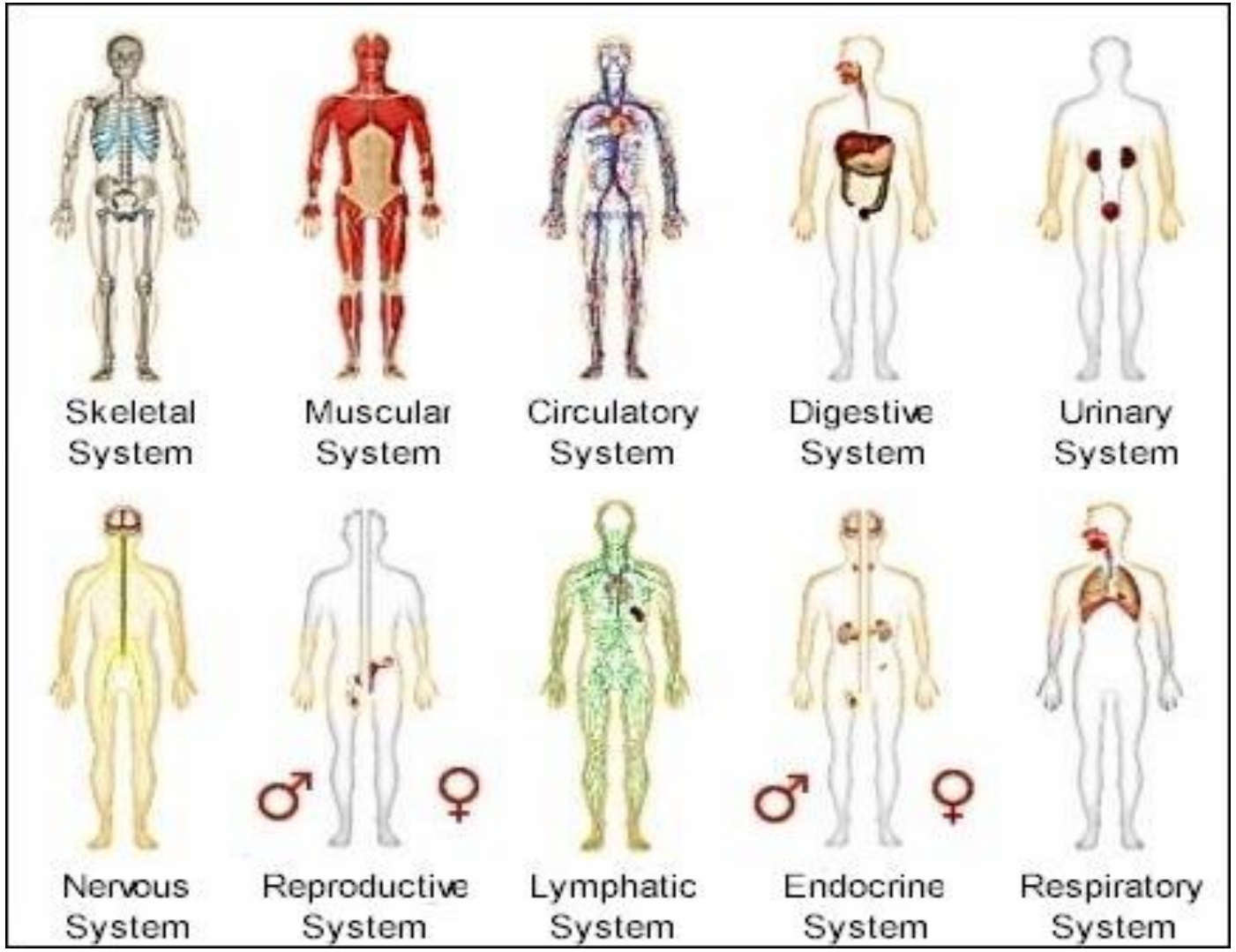
Regulation & Integration

Support & Movement

Human Life Cycle

Transportation

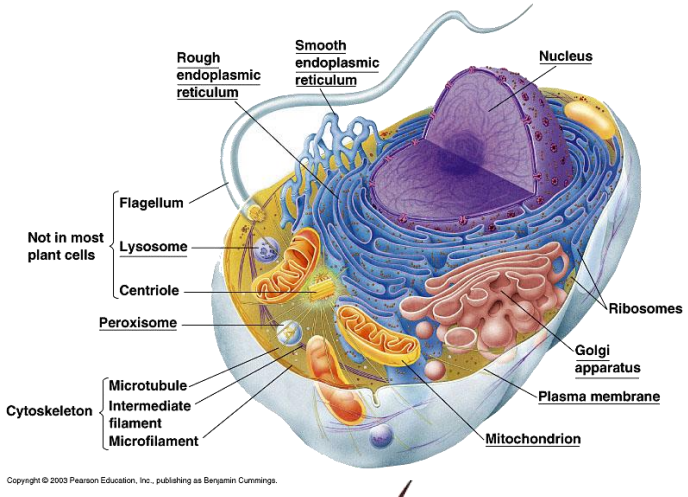
Homeostasis

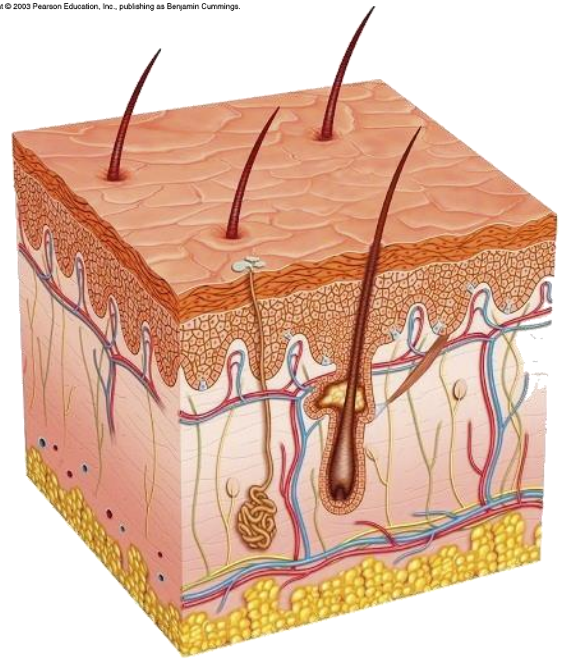


***Don't forget Integumentary System!**

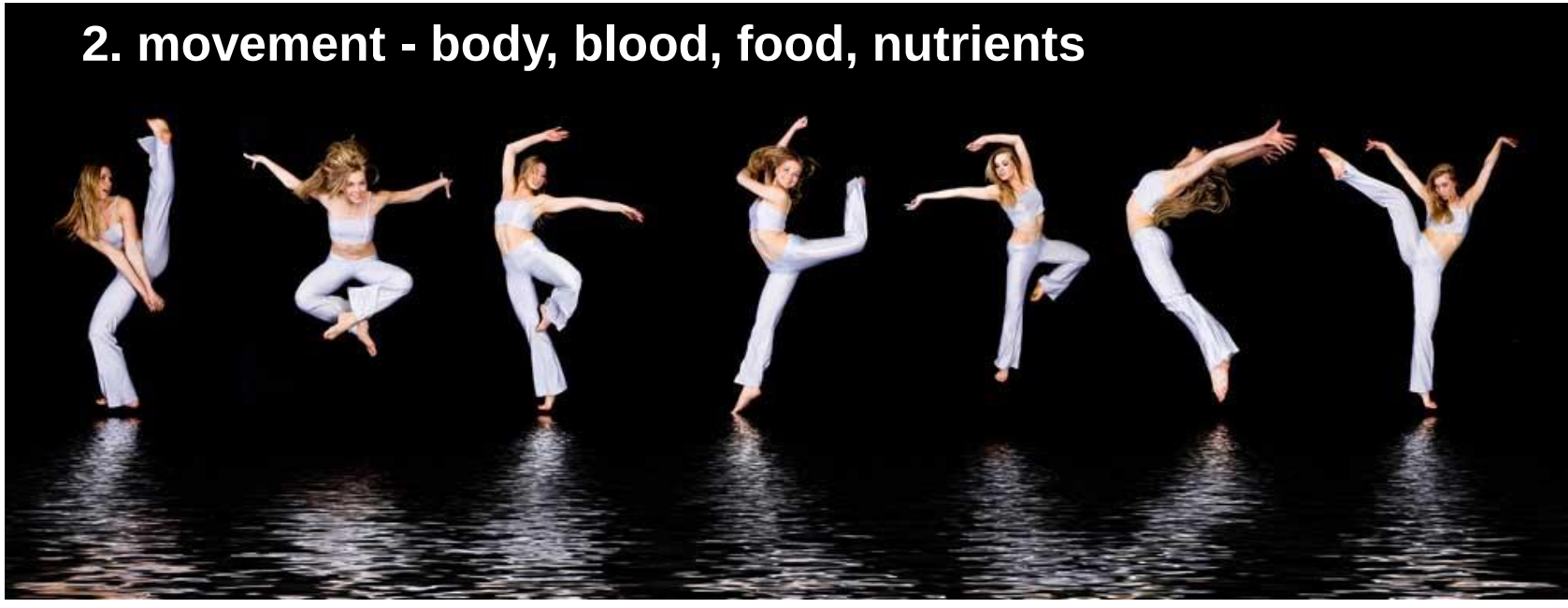
NECESSARY LIFE FUNCTIONS

1. maintains boundaries





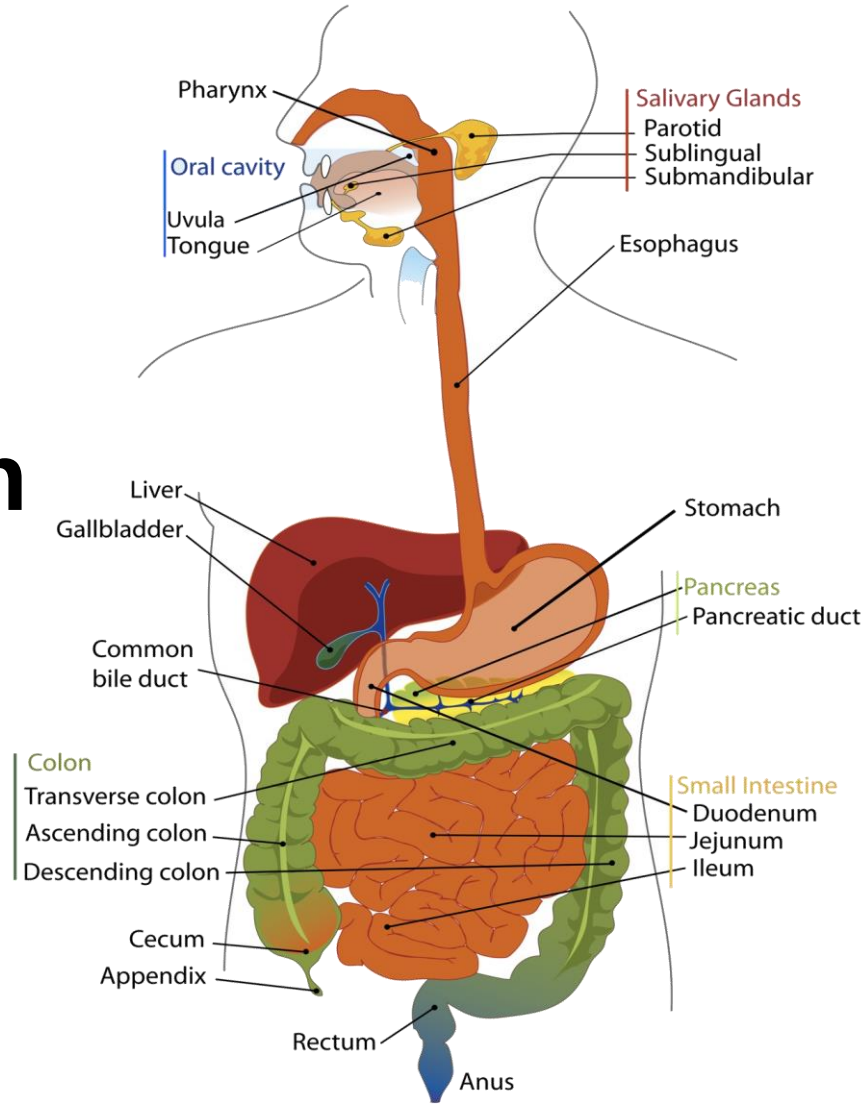
2. movement - body, blood, food, nutrients



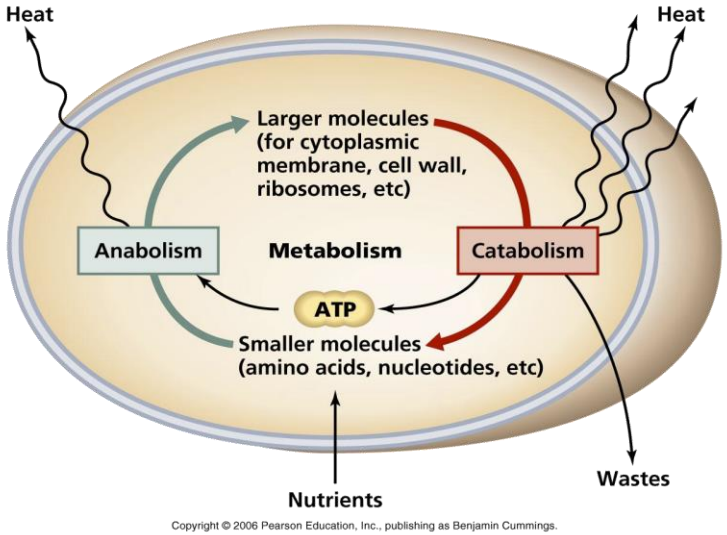
NECESSARY LIFE FUNCTIONS

3. responsiveness (irritability)

4. digestion



NECESSARY LIFE FUNCTIONS



5. metabolism

6. excretion

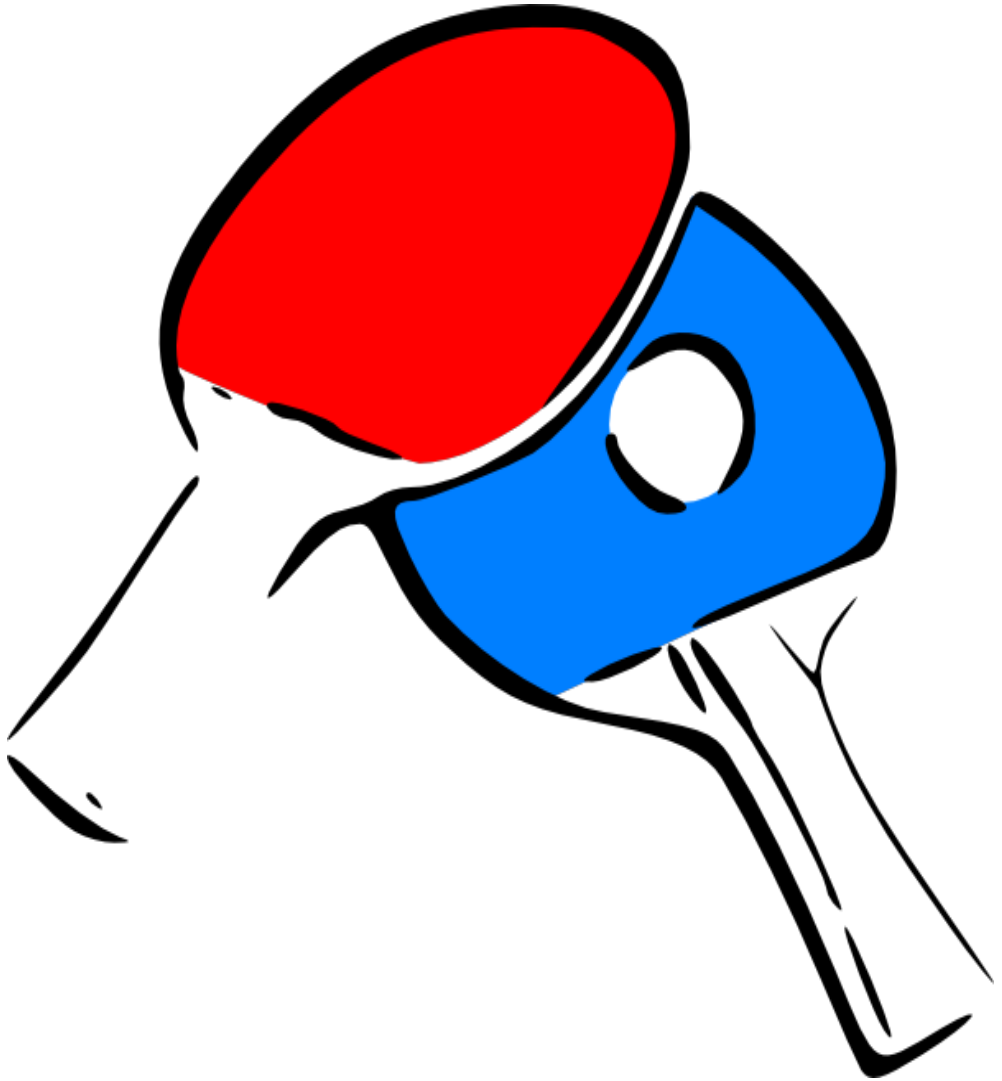
7. reproduction

8. growth

Survival Needs from the Environment

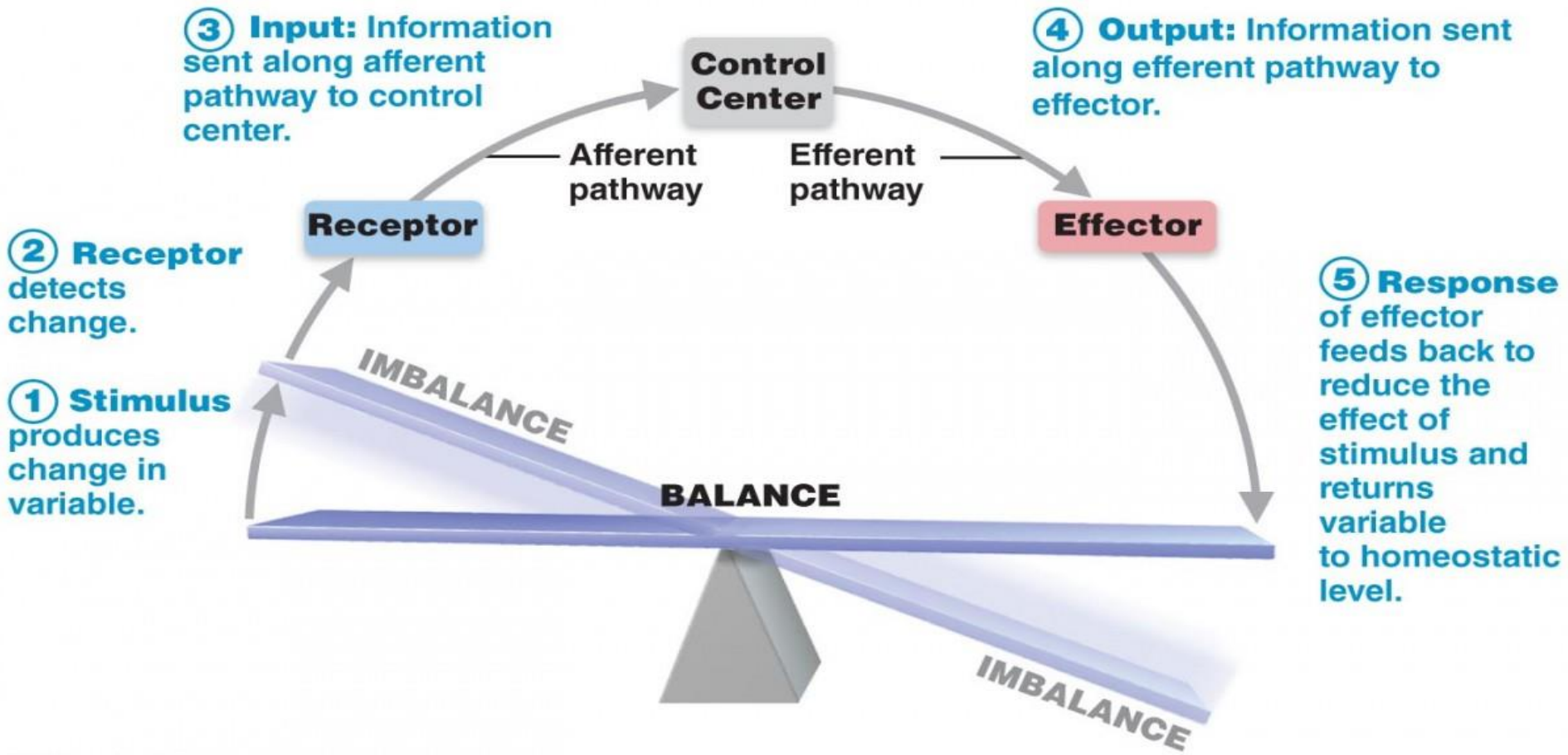
- water - most abundant chemical in the body, required for proper metabolism
- nutrients - chemical substances used for energy and cell building
- oxygen - needed for cellular respiration (ATP)
- normal body temperature - required for proper metabolism and cellular function
- appropriate atmospheric pressure - important for respiration
- vital signs - observable body functions that reflect essential metabolic activities, body temperature, blood pressure

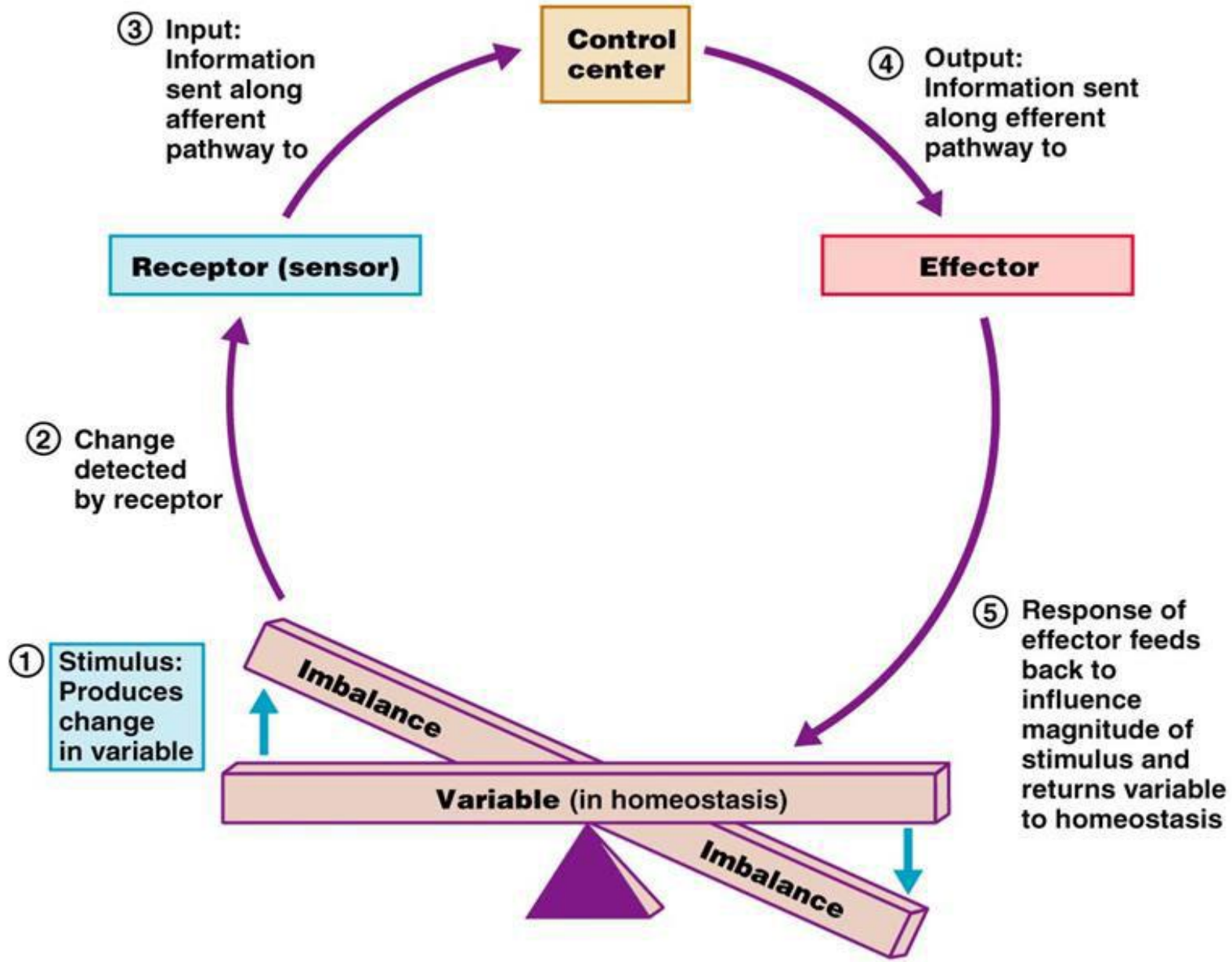
Ping pong back & forth describing the 8 life functions and 5 survival needs



Homeostasis

homeostasis - stable internal environment
dynamic process because physiological variables are constantly changing
returns the body to a set point (blood pH = 7.35, 98.6ºF, 120/80 mmHg)
imbalances result in disease




③ Input: Information sent along afferent pathway to
Control center
④ Output: Information sent along efferent pathway to
Receptor (sensor)
Effector
② Change detected by receptor
⑤ Response of effector feeds back to influence magnitude of stimulus and returns variable to homeostasis
① Stimulus: Produces change in variable
Imbalance
Variable (in homeostasis)
Imbalance

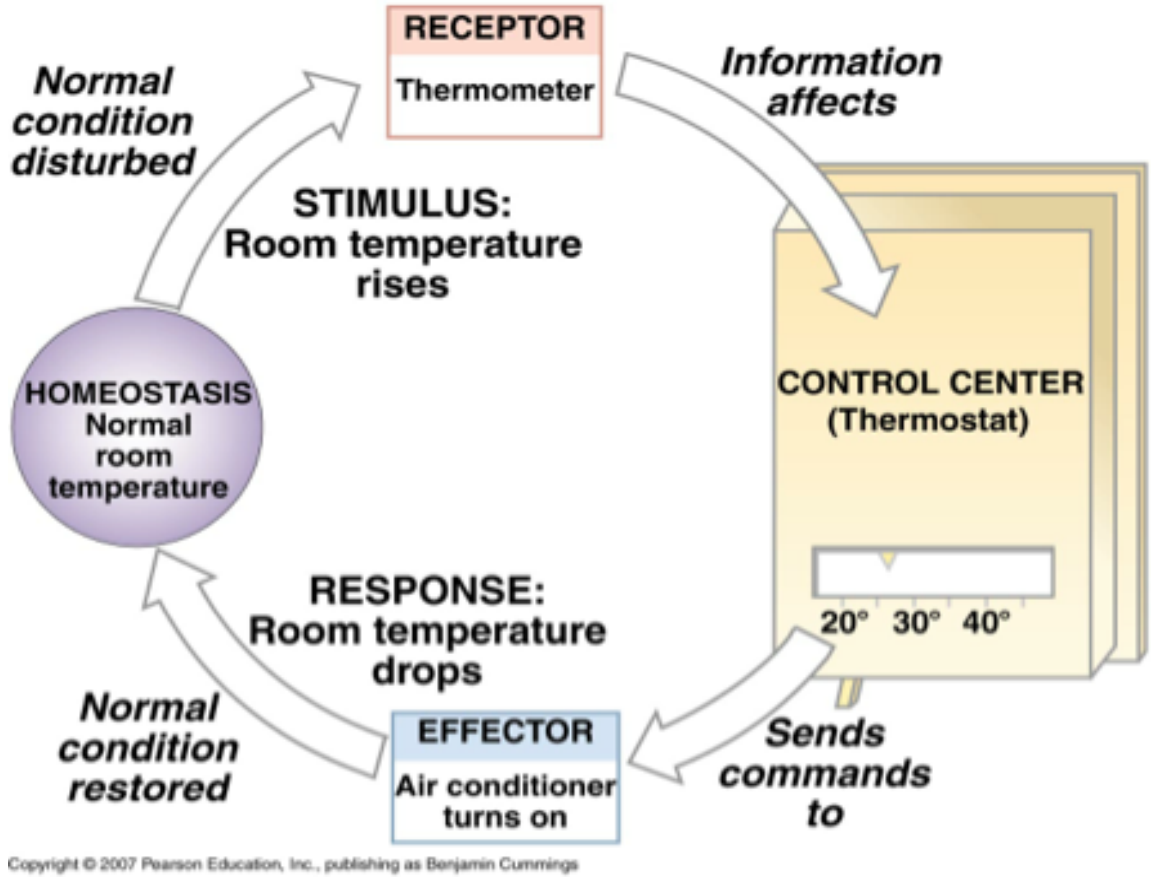
Homeostatic Regulation

adjustments in physiological systems to maintain a stable internal environment
requires a (stimulus), receptor, control center, effector, (response)
(stimulus) - change in internal environment
receptor - sensitive to a specific stimulus (heat, pH, pain, light, sound, ion concentration, etc.)
control center - compares stimulus to set point (too high, too low)
effector (muscle or gland) - correct or reinforces the stimulus
(response) - change is corrected back to set point

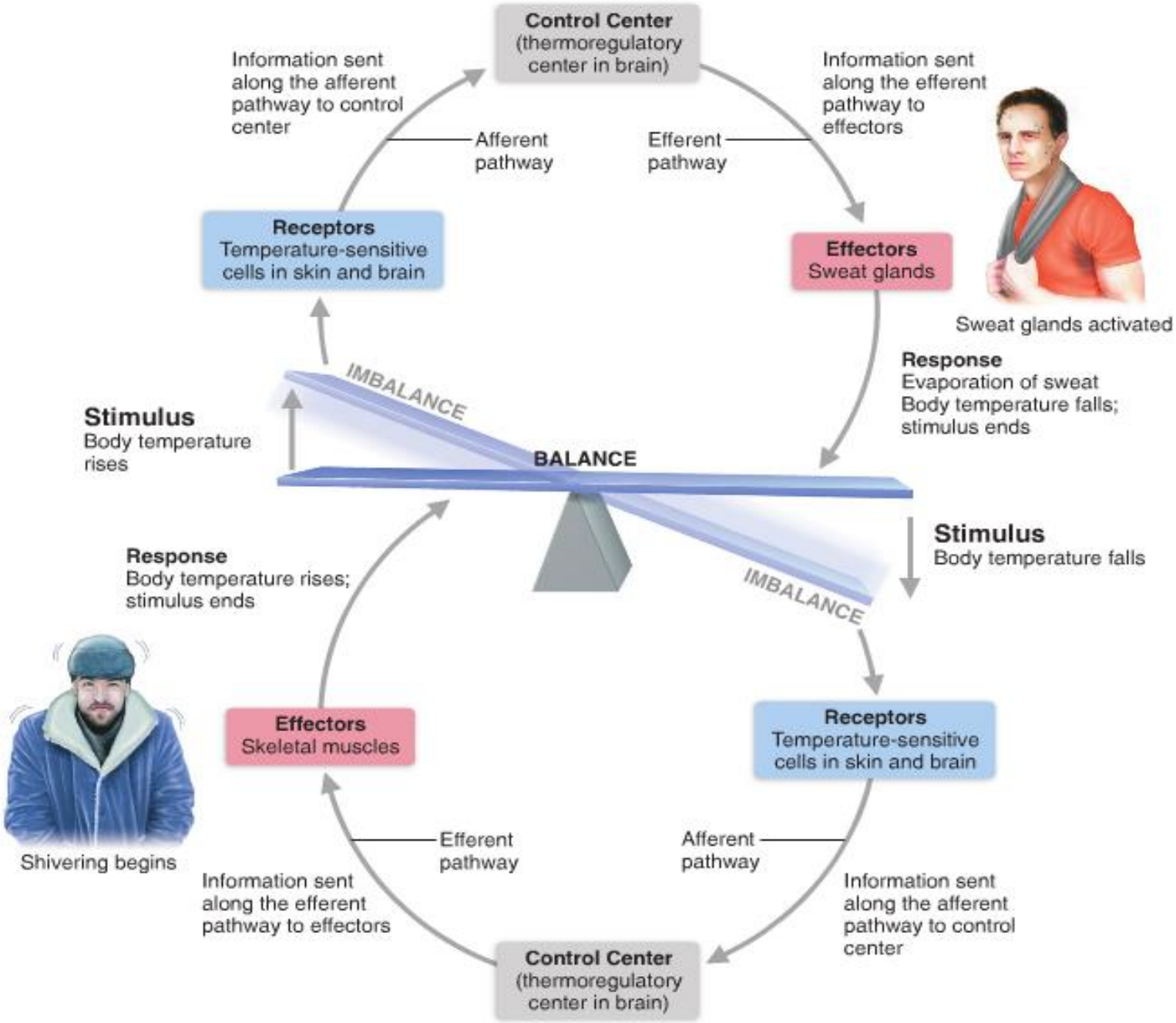
Negative Feedback

negative feedback - when a stimulus rises or falls outside normal (set point), the receptor triggers an automatic response that CORRECTS the initial stimulus
negative feedback CORRECTS the stimulus

ex. thermostat
normal room temp → temp rises (stimulus)
registers with thermometer (receptor) → send
info to thermostat (control center) turns → on
air conditioner (effector) room temp → drops
(response) normal room → temp (set point)
→



ex. body temperature

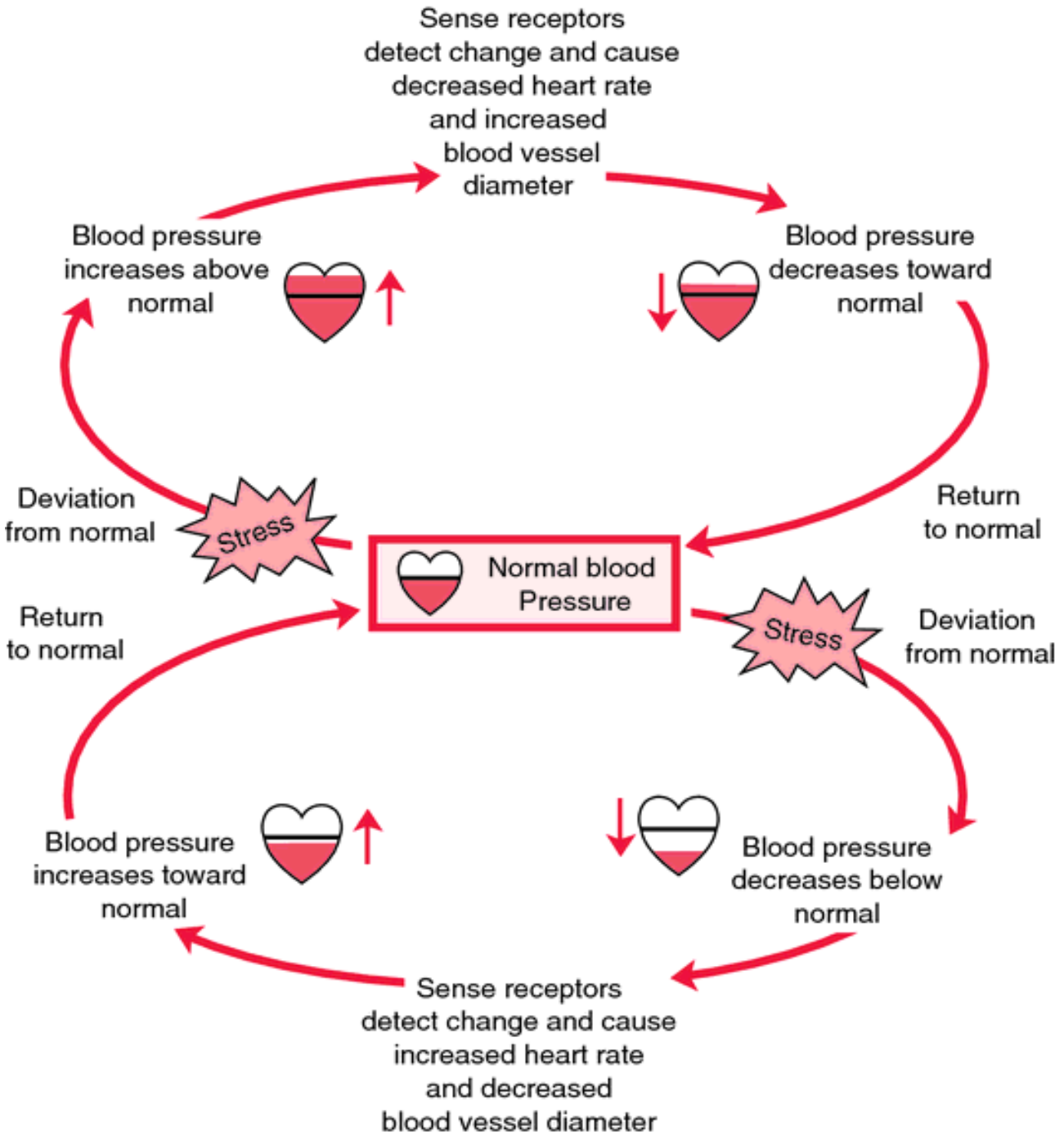


NOSE GOES

Negative Feedback

Winner.. Try to identify the stimulus, receptor, control center, effector, and response in this example.

Nonwinner...can you come up with another example of negative feedback in the body.



Positive Feedback

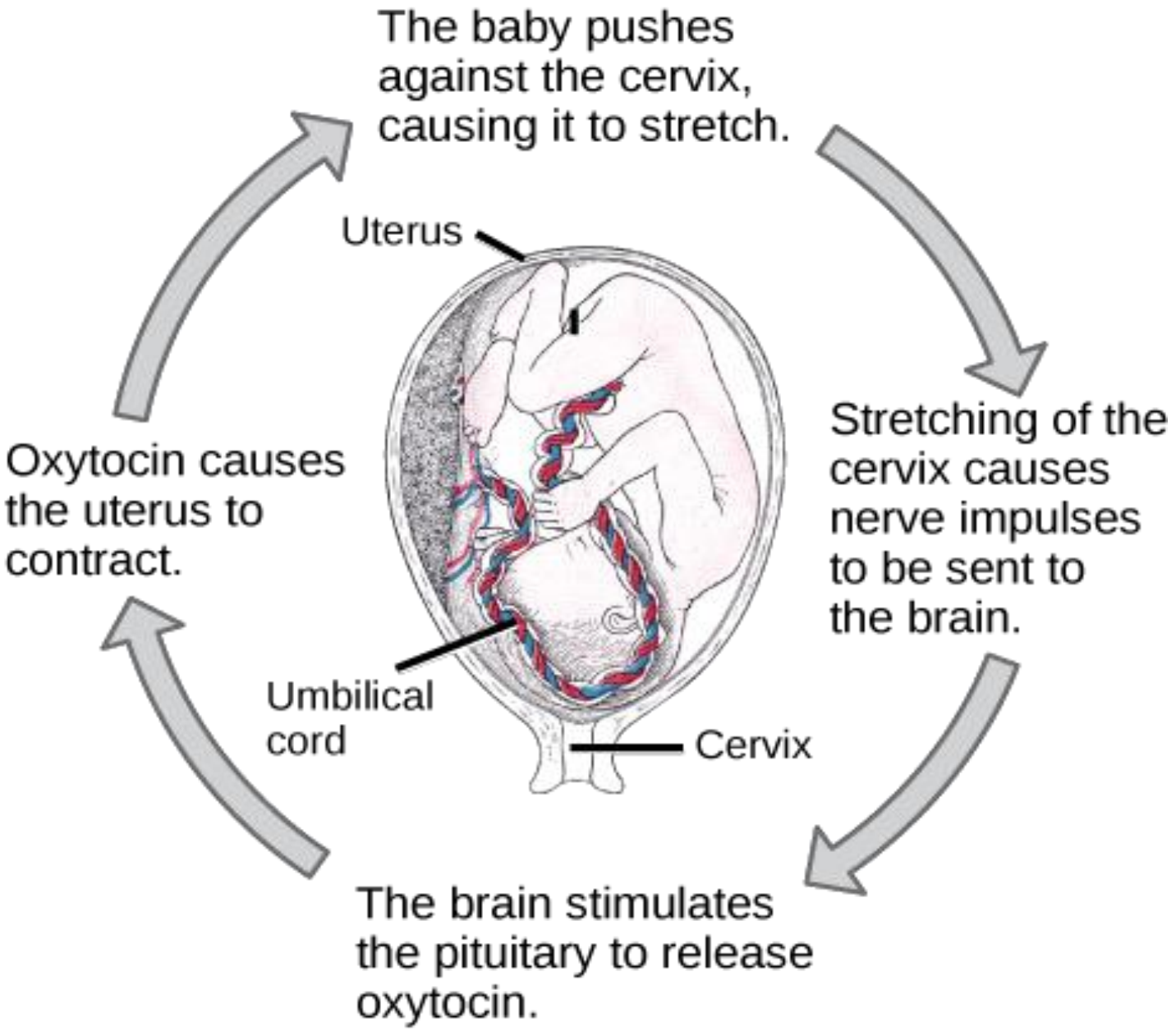
positive feedback - initial stimulus produces a response that REINFORCES the stimulus
positive feedback REINFORCES the stimulus
accelerates processes that need to be completed quickly (blood clotting or child birth)

Best 2 out of 3

Positive Feedback

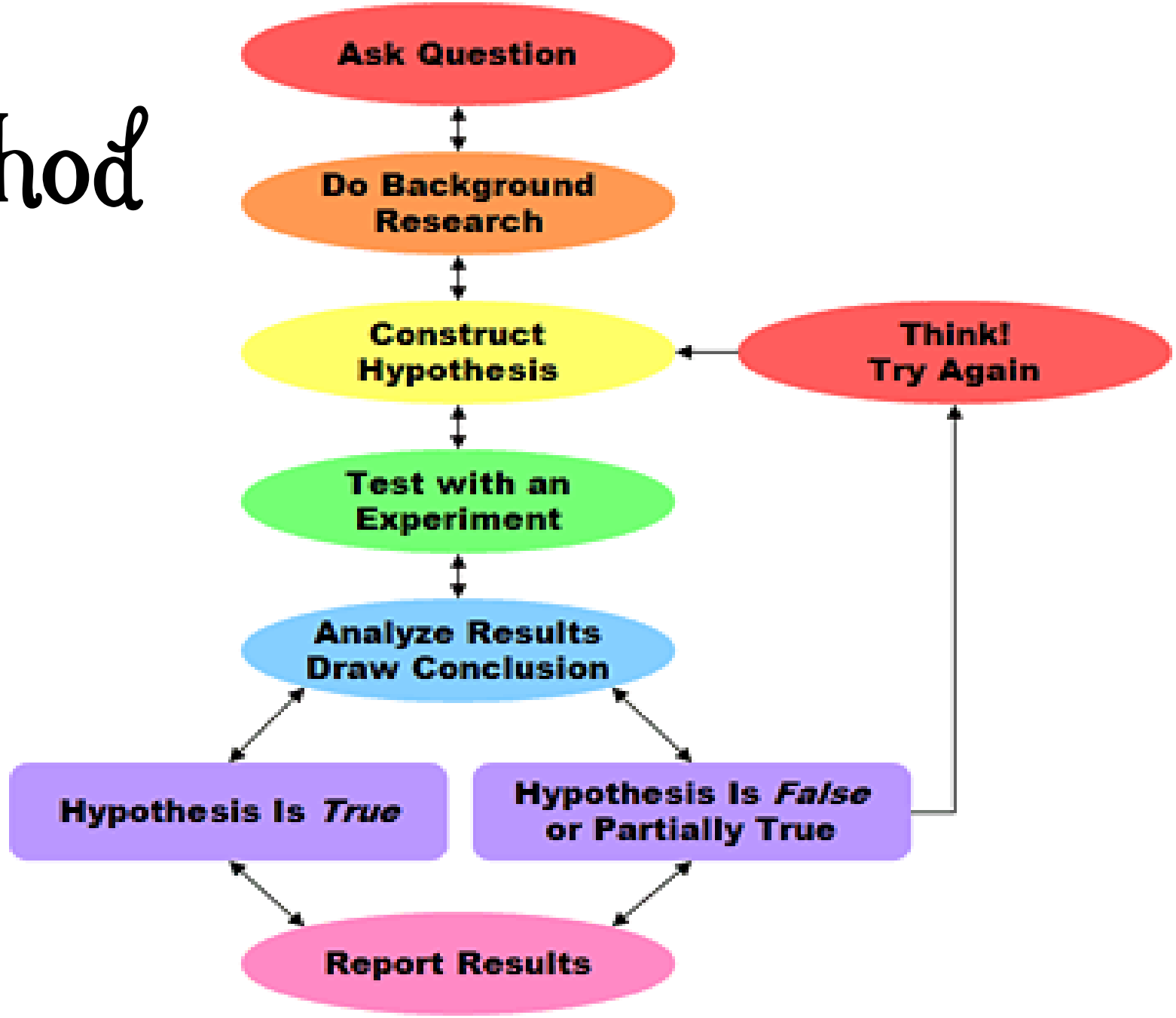
Winner...explain why this is an example of positive feedback.

Nonwinner... identify stimulus, receptor, control center, effector, and response.

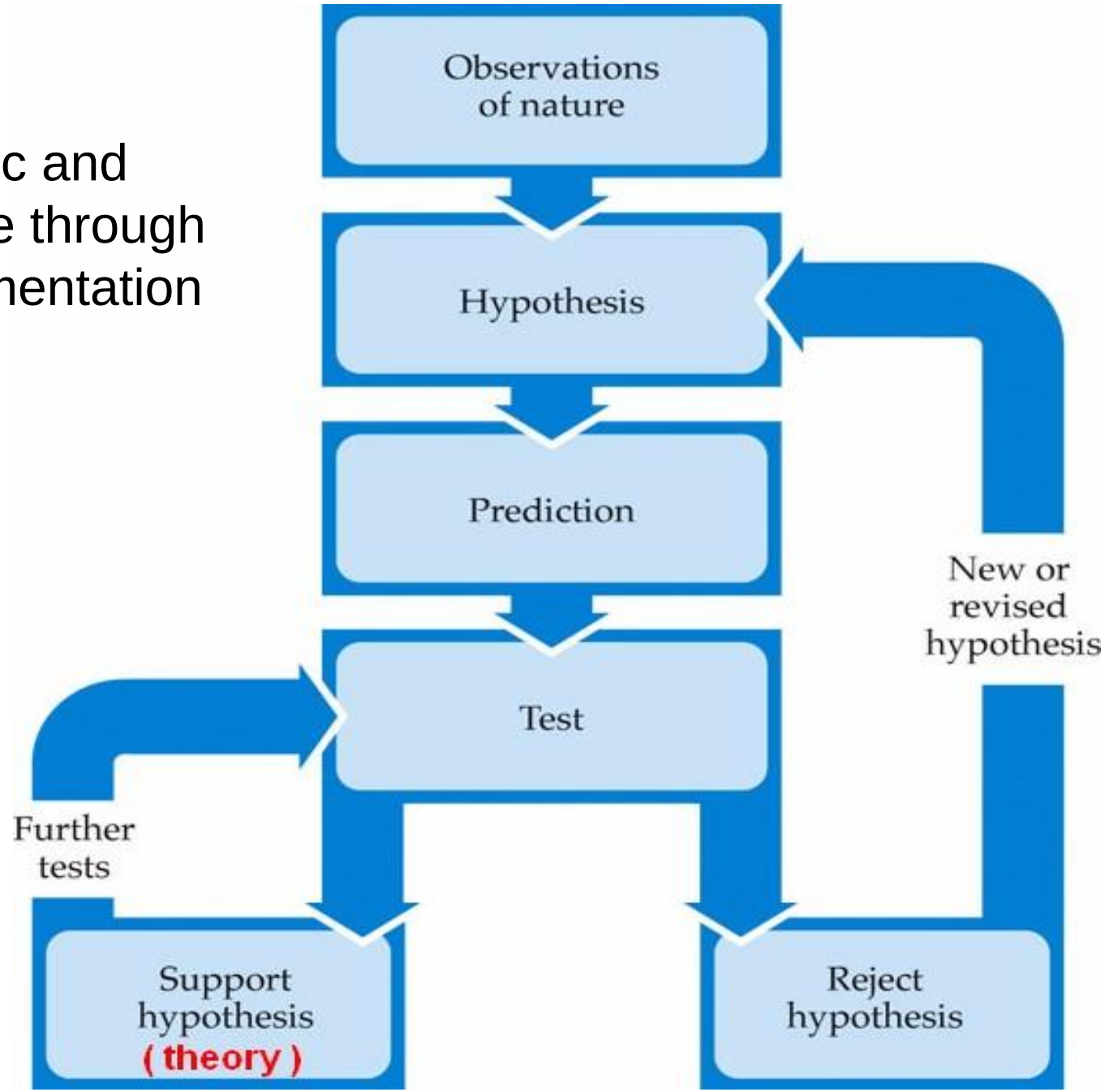


scieNtiFic method

*a ***process*** NOT a product



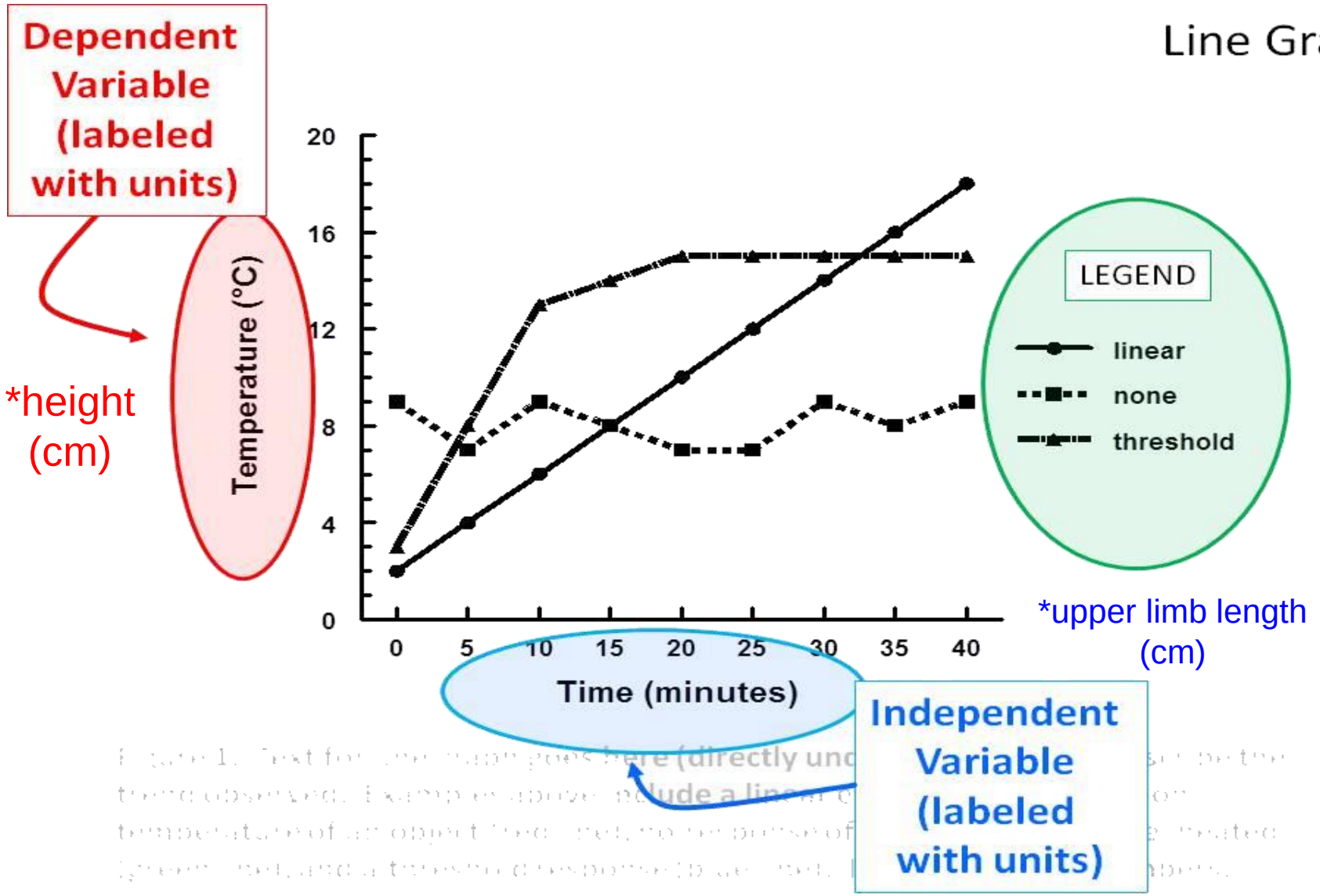
*specific and testable through experimentation

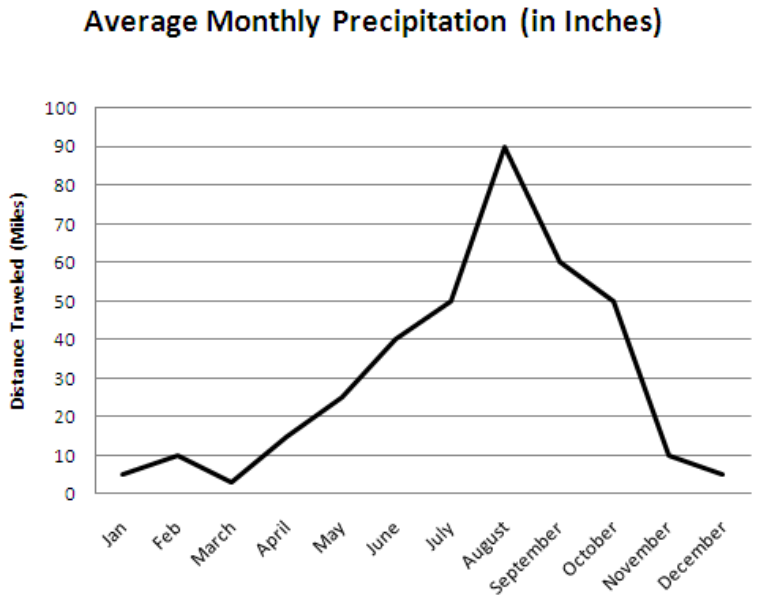


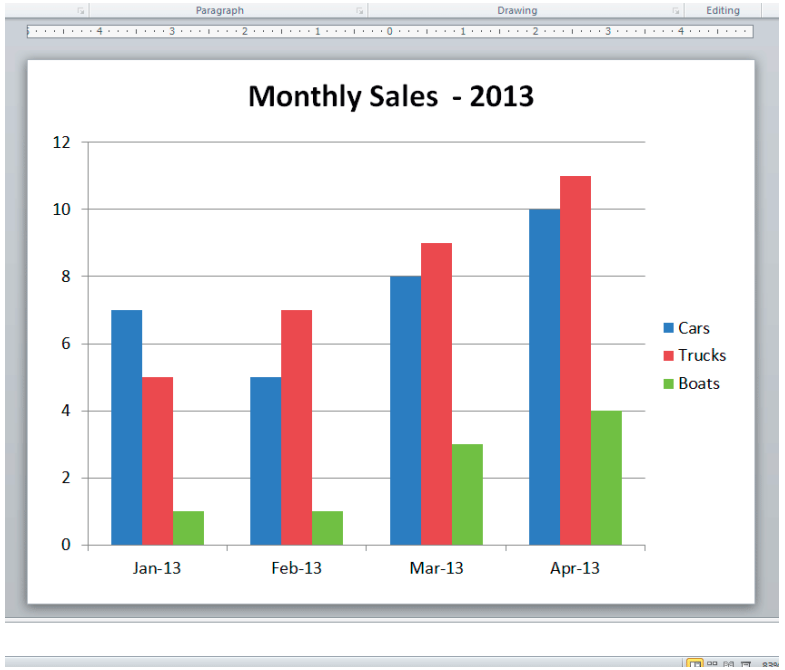
#failureisnotpermanent

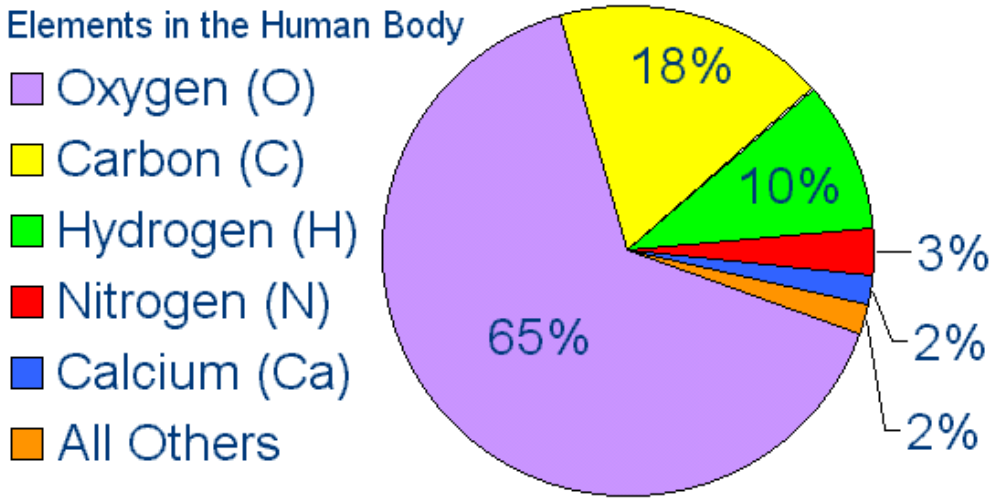
Graphing Data

Good graph titles should be detailed, specific, and not awkward!









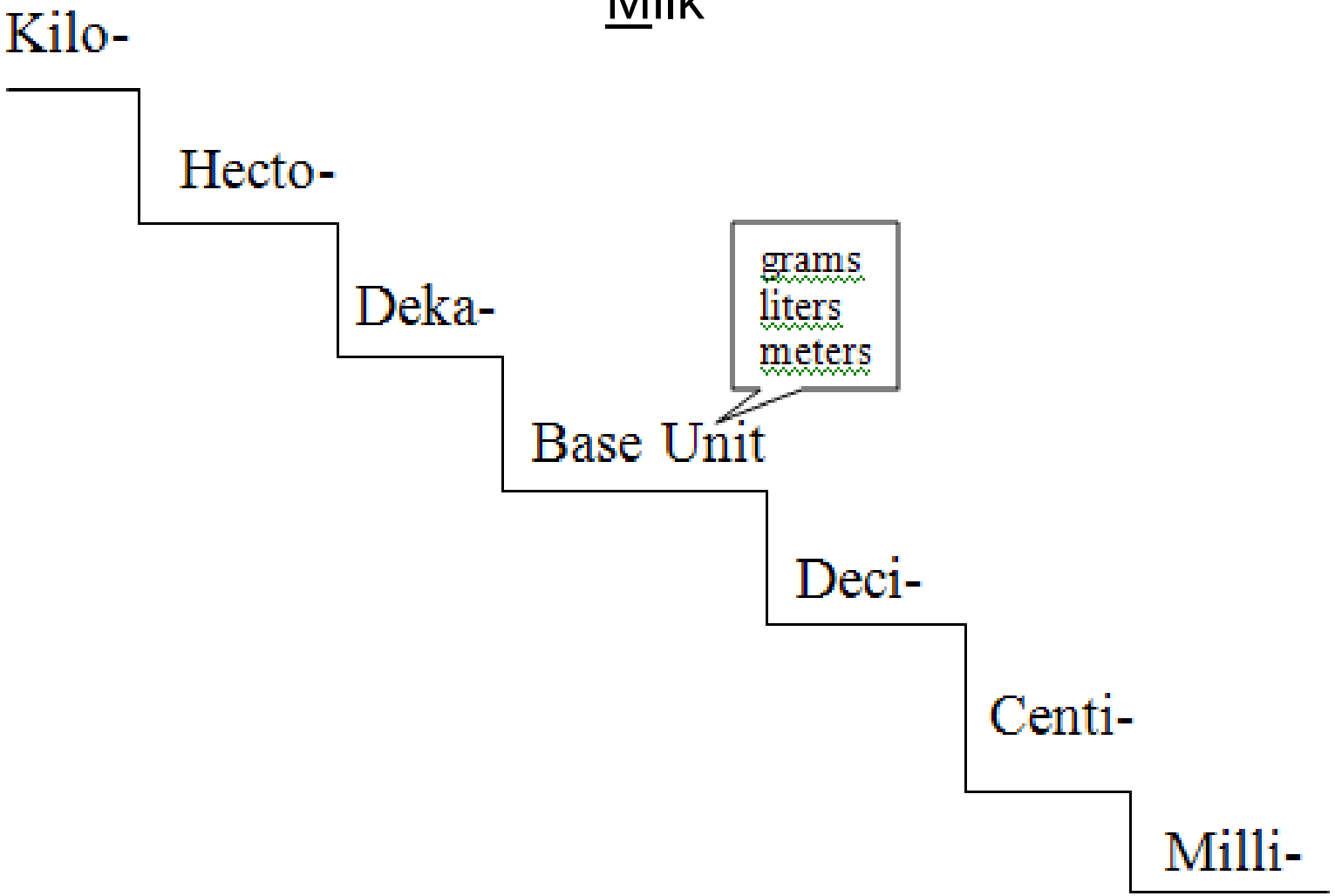
line graph - trend (often over time)

bar/column - comparison

circle/pie - breakdown of a fixed amount

Metric System

King Henry Doesn't (Usually) Drink Chocolate Milk



Sample problem

Move the decimal to the left

$$K \Leftrightarrow h \Leftrightarrow da \Leftrightarrow b \Leftrightarrow d \Leftrightarrow c \Leftrightarrow m$$

Move the decimal to the right

Convert the following

53 hg = _____dg

Start with 53.

Move the decimal 3 spaces to the right 53.

Fill in the empty spaces with zeros 53000 dg

English - Metric Conversions

For example:

1 kilometer (km) = 0.62 mile (mi)
1 kilometer (km) = 3280.8 feet (ft)
1 meter (m) = 3.28 feet (ft)
1 centimeter (cm) = 0.39 inch (in)
1 millimeter (mm) = 0.039 inch (in)
1 inch (in) = 2.54 centimeters (cm)
1 inch (in) = 25.4 millimeters (mm)
1 foot (ft) = 0.30 meter (m)
1 yard (yd) = 0.91 meter (m)
1 yard (yd) = 0.00091 kilometer (km)
1 mile (mi) = 1.61 kilometers (km)

The fraction would be:

$$\frac{1 \text{ kilometer (km)}}{0.62 \text{ miles (mi)}} \qquad \frac{\text{(numerator)}}{\text{(denominator)}}$$