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
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.
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
**Relative Position Terms**

**superior** - body part above another or closer to the head

**inferior** - body part below another or toward the feet
**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
Trade off being Simon...use your anatomical terms to touch different body parts

NO TOUCHY YOUR MAMMARIES, GLUTEUS, OR INGUINAL!
The Body's 11 Organ Systems

Integumentary System
Muscular System
Skeletal System
Nervous System
Endocrine System
Circulatory System

Lymphatic System
Respiratory System
Digestive System
Urinary System
Reproductive System
Support & Movement

Skin & Integumentary System
- skin, accessory organs (hair, nails, sweat glands, sebaceous glands)

Skeletal System
- bones, ligaments, cartilage

Muscular System
- muscles, tendons, joints
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
Maintenance Part 2

Absorption & Excretion

- Respiratory System
  - nasal cavity, pharynx, larynx, trachea, bronchi, lungs, and alveoli

- Digestive System
  - mouth, tongue, teeth, salivary glands, pharynx, esophagus, stomach, liver, gallbladder, pancreas, small intestine, large intestine, rectum, anus

- Urinary System
  - kidneys, ureters, urinary bladder, urethra
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!
1. maintains boundaries

2. movement - body, blood, food, nutrients

NECESSARY LIFE FUNCTIONS
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
1. **Stimulus**: Produces change in variable.

2. **Change detected by receptor**.

3. **Input**: Information sent along afferent pathway to control center.

4. **Output**: Information sent along efferent pathway to effector.

5. **Response of effector feeds back to influence magnitude of stimulus and returns variable to homeostasis**.

**Variable (in homeostasis)**
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) — temp 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
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 and accelerates processes that need to be completed quickly (blood clotting or childbirth).
Well, this is kind of awkward...
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!
Elements in the Human Body

- Oxygen (O): 18%
- Carbon (C): 10%
- Hydrogen (H): 3%
- Nitrogen (N): 2%
- Calcium (Ca): 2%
- All Others: 65%

**Average Monthly Precipitation (in inches)**

**Monthly Sales - 2013**
- Trend (often over time)
- Comparison
- 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 \text{ hg} = \underline{\phantom{0}} \text{ dg}

Start with 53.
Move the decimal 3 spaces to the right 53 \underline{\underline{\underline{.}}}
Fill in the empty spaces with zeros 53\underline{000} \text{ 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)}}
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