Body Organization and Structure

There are many different body systems!!!!

- Your body has
- A total of 11 organ systems. The purpose of the 11 organ systems is for the human body to maintain homeostasis.
What is homeostasis?

• It’s the maintenance of a stable internal environment in your body.
• It’s the reason why your body sweat when you get too hot!! Get goose bumps when you are too cold!!
• How is your body maintaining homeostasis by sweating and creating goose bumps?

The 11 Human Body Systems

The 11 human body systems include the:

-- nervous system -- integumentary system
-- respiratory system -- digestive system
-- excretory system -- skeletal system (urinary)
-- muscular system -- circulatory system
-- endocrine system -- reproductive system
-- lymphatic (immune) system
The Nervous System

**Purpose:** to receive and send electrical signals throughout the body

**Major Organs and Their Functions**

**Brain** – control center of the body, where all processes are relayed.
   -- consists of **cerebrum** (controls thought and senses) and **cerebellum** (controls movement)

**Spinal Cord** – sends instructions from the brain to the rest of the body and vice versa

**Nerves** – conduct impulses to muscle cells throughout the body

The Endocrine System

**Purpose:** to control growth, development, metabolism and reproduction through the production and secretion of hormones

**Major Organs**
   - hypothalamus
   - pituitary gland
   - thyroid
   -- parathyroid
   -- adrenal glands
   -- pancreas
   -- testes
   -- ovaries
Endocrine cont’d

- Hypothalamus - primary link between the endocrine and nervous systems
  - Nerve cells here control the pituitary gland
- Pituitary gland - creates hormones; It is the “master gland”
- Why?
  - It’s called the master gland because its secretions regulate several other endocrine glands.
  - Because of it’s location in the brain, it can cause vision disorders if it becomes enlarged.

Other endocrine glands….

- Thyroid - secretes hormones that control the rate at which cells burn fuels from food to produce energy
- Adrenal glands - produce adrenaline and other hormones
- Adrenaline increases your heart rate and breathing rate. It is called the “fight-or-flight” response.
- When you are frightened, angry, or excited, this response prepares you to fight the danger or run from it.
Thyroid problems...

- Sometimes the endocrine system releases too much or too little of its hormones to regulate body functions (such as releasing insulin from the pancreas to regulate blood sugar levels).
- Improper release of insulin can cause diabetes (type I & II).
- Another hormone imbalance occurs when a kid's pituitary gland does not make enough growth hormone and his growth becomes stunted. Too much release can cause him to grow extremely taller than expected.

Cool FACT!!

- In short people, the stomach is found high in the abdomen and runs "horizontally". In tall people, the stomach tends to run "vertically" forming a J-shape.
The Digestive System

**Purpose:** to break down the food you eat into nutrients your body can absorb.

**Major Organs and their Functions:**

- **Mouth:** to chew and grind up food
  - saliva also begins the chemical breakdown
- **Esophagus:** pipe connecting mouth to stomach
- **Stomach:** secretes an extraordinarily strong acid (pH = 2) that leads to breakdown of food
  - once the food is broken down in the stomach and mixed with digestive juices, it is called *chyme*
- **Pancreas:** produces the hormone insulin that regulates blood sugar levels
  - also help neutralize stomach acid
- **Liver:** produces bile, which breaks down **fats** in foods;
  - (it can be about the size of a football!!)
- **Gallbladder:** pouch-like organ that stores bile for future use
- **Small Intestine:** after digestion is complete, the chyme enters the small intestine where it is absorbed into the bloodstream
  - the chyme is propelled along by folded surfaces called **villi,** on the intestine
- **Large Intestine:** removes water from the chyme and gets the waste ready for excretion
The Excretory System

**Purpose:** to rid the body of wastes, including excess water and salts

**Major Organs and Their Functions**

**Kidneys** – the main organs of the excretory system

-- Inside each kidney are microscopic filters called **nephrons**. They help **filters** out urea (excess water and other waste products) from your blood, which eventually travel out of the kidney as urine.

-- Eventually they travel through the **ureter** to the **urinary bladder**

**Rectum** – solid (food) waste travels out of the body through the rectum
The magical kidney!!

- The kidneys are surrounded and kept in their proper place in the body by fat.
- People who become too thin risk kidney damage and other urinary problems.
- As much as 1,200ml of blood passes through the nephrons each minute!!
- The kidney filters fluids from the blood, returning 99% back into the bloodstream. Where does the other 1% go?

More Cool FACTS!!

- The urinary bladder of average size can hold as much as 1L of urine!
- Your kidneys use up to ¼ of your body’s oxygen supply to perform its duties.
- A person who donates a kidney can maintain normal function. The remaining kidney enlarges, in order to carry out the functions of two kidneys!!
Something to think about???

• How does urine get it's yellow color?
• Why are their different shades of urine?
• Is the urinary system the only system that removes waste?
• Because of the pigment urochrome.
• Different shades can be caused by too much or too little salt intake.
• No, the circulatory system and respiratory system work together to remove carbon dioxide.
• The digestive tract removes a solid form of waste. This process is called defecation.

Other organs in excretory system to remove waste....

• **Skin** – sweat glands remove excess water and salts from the body
• **Lungs** – expel the waste gas carbon dioxide
• **Image of excretory system:**
Taking care of your body…

• Some beverages contain caffeine, which are diuretics. These can cause your kidney to make more urine and decrease the amount of water in the blood. It makes it harder for your kidneys to filter fluids.

• So drink plenty of water!!

Illustration of a kidney stone..

• Sometimes salt and waste collect inside the kidneys and form kidney stones (calcium deposits) that can be painful and interfere with urine flow.
The Immune System

**Purpose:** to remove infectious diseases and other pathogens from the human body

**Major Organs and Their Functions**
- **Skin** – also called the integumentary system, the skin is the body’s first line of defense
- **White Blood Cells** – help fight diseases and create antibodies.
- **Lymph Nodes** – help restore fluid lost by the blood and return it to the circulatory system

Another brainpop: immune system

The Circulatory System

**Purpose:** to deliver oxygenated blood to the various cells and organ systems in your body so they can undergo cellular respiration

**Major Organs and Their Functions**
- **Heart** – the major muscle of the circulatory system
  - pumps blood through its four chambers (two ventricles and two atria)
  - pumps deoxygenated blood into the lungs, where it gets oxygenated, returned to the heart, and then pumped out through the aorta to the rest of the body
  - valve regulate the flow of blood between the chambers
**Arteries** – carry blood away from the heart and to the major organs of the body

**Veins** – carry blood back to the heart away from the major organs of the body

**Capillaries** – small blood vessels where gas exchange occurs

**Blood** – the cells that flow through the circulatory system

-- red blood cells contain **hemoglobin**, an iron-rich protein that carries oxygen

-- white blood cells function in the immune system

-- platelets help in blood clotting

**Spleen** – helps to filter out toxins in the blood

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**What causes Heart attacks??**

- A heart attack occurs when part of the heart muscle dies because it can’t get enough blood and oxygen.

- Your valves in your heart are similar to the ones in a car.

**How?**

Avoid eating a lot of fatty foods to keep them clean and unclogged.
Strokes!!!

- Often happen when blood is interrupted from reaching the brain.
- People are at a higher risk for stroke when they become old, have high blood pressure, diabetes, migraines, high cholesterol, abnormal heart rhythms, or when they smoke cigarettes.

Closed circulatory system....

- A closed circulatory system means that the blood never leaves the system of blood vessels, which consists of arteries, veins, and capillaries.
- All vertebrates (including humans), annelids (ex: earthworms), and cephalopods (squids, octopus) have a closed circulatory system.
Cool Fact!!!

- arthropods, mollusk, and some other invertebrates all have an open circulatory system.
- That means they do not have a “true heart”. Instead they have muscular blood vessels called tubular hearts that pump the blood along.
- These creatures also lack capillaries. Instead the blood is pumped into small open cavities called sinuses.

How do these simple animals survive such a set up for their blood supply?

- Thanks to tiny holes called spiracles in their abdomen, their blood comes into direct contact with the air, in order to receive the needed oxygen supply.
“The Respiratory System”

TLW Identify the structures and functions of the Respiratory system.
TLW Trace the flow of oxygen throughout the human body.

What is the Respiratory System?

• The respiratory system is one of systems within the human body.
• The respiratory system involves many parts of your body such as the lungs, nose, mouth, trachea, and pharynx just to name a few.
Something to think about

• Question:
  • When dealing with the respiratory system,
    How is your body
    Similar to cars and other vehicles?

A: Similar to cars and other vehicles

Your body also runs on “gas”! Every time you inhale your body takes in oxygen, and releases carbon dioxide whenever you exhale.
Did you know??

• For a while, people thought the purpose of breathing was to cool the blood.

Primary functions of the Respiratory system include:

• Supplies blood with the oxygen that is needed in order to delivered to all parts of the body during cellular respiration.
• Releases toxic gases such as carbon dioxide from the body in order to help regulate the body.
So Where does it all begin?

- Air (along with food and drinks) must first enter the body through your **mouth** or **nose**.
  - (Air passes over your vocal chords, allowing you to speak. This is called your **Larynx** or “voice box”.)

- Air (along with food and drinks) then travel down your **throat** which is also called the **Pharynx**.

- So how do you keep from choking if it all travels along this pathway?

Simply Put

- The throat splits in two:
  - The front part becomes your **trachea** to send air to the lungs. The trachea (or windpipe) is what connects your **pharynx** to your **lungs**.
  - The back part of the throat becomes the **esophagus** for food and drinks to pass to your stomach.
Continuing along the pathway:

- As food travels down the esophagus, a small flap of skin known as the epiglottis opens and closes to prevent food from going into the trachea.
- Air enters the trachea. It will continue to travel along a pathway and eventually the trachea will split in two.

In your chest

- The trachea splits into two branches like the limbs of a tree (one attached to each lung).
- These branches are called bronchi.
BRONCHI
• THE TWO BRONCHI then subdivide into smaller branches called bronchioles. They then split into millions of tiny air sacs called alveoli.
(Kind of like the leaves on a tree)
Because there are so many of these tiny vessels, air can enter all parts of your lungs.

ALVEOLI
• Are in tiny clusters like grapes.
• Do most of the main work of trading gases with your blood.
• They transport oxygen into the veins (that lead to the heart).
• Also take away CO2 carried away from the heart and out of the body.
“SO HOW IS GAS TRADED EXACTLY?”

- It is in the alveoli where little tiny red blood cells known as CAPILLARIES are found. They help carry oxygen into your bloodstream.

SOMETHING TO THINK ABOUT?

- Everyone (girls and boys) has a hairy chest!!!!!

- What do you think this means?
Although you can’t see it:

• Just like the hair that lines your nose to keep dust particles out, the lungs are lined with hair-like structures called cilia that lines your trachea. These hairs help sweep any foreign particles out of your lungs and chest cavity. That’s why we all sometimes cough and sneeze!!!!!!

DIAPHRAGM

• IS A LARGE MUSCLE THAT IS ALSO IMPORTANT TO YOUR BREATHING.
• It separates the chest from your abdomen (stomach cavity).
• As you breathe inward, the diaphragm pushes downward to enlarge the chest cavity and pull air in.
• As you exhale, it moves upward and pushes air out. In turn the chest cavity decreases in size.
So why do you hiccup????

• Hiccups are involuntary contractions of the Diaphragm!!

Ways to Care for your Respiratory System

• Get regular exercise
• Practice good posture
• Take Deep Breaths
• Don’t Smoke
• Don’t breathe dirty air and keep your passages clean if you have a cold or cough.
Okay, enough already!!!

• But before I “overexert” my respiratory system. Here’s something to think about…….

Did you know????

• Your right lung takes in more air than your left lung. That’s because the right lung has three lobes while the left lung only has two. The left lobe is smaller because it shares space with the one you love…….your heart!
Okay a few more things!!

- Women have a sharper sense of smell than men.
- The nose can recognize about 10,000 different smells.
- Within a 24 hour period you take at least 24,000 breaths on average.
- By the time you are 70, you would have taken at least 600 million breaths of air.

Something to think about..... • Skeletal System

What are five problems you would have if you lacked bones?
Without the skeletal system, your body would not:

- Have Structure and protection
- Have any Support (framework)
- Be able to store minerals
- Be able to make red blood cells
- Have movement

Functions of Skeleton System

Skeletal system provides a structure for the body. It includes a vertebrae of spine and supports upper body and head.

Types of Bones

- **Small bones**: includes bones in legs and arms
- **Short bones**: bones in wrist and ankles
- **Flat bones**: in skull and protect organs like the rib cage
- **Irregular bones**: facial bones or vertebrae bones

http://www.mnsu.edu/emuseum/biology/humananatomy/skeletal/skeletalsystem.html
The outside of a bone

- All bone is lined by a tough outer surface membrane (or covering) called the periosteum.
- This helps attach muscles and tissues to the bone with the help of tendons and ligaments.

What’s inside a bone?

- If you look inside a bone, you will notice there are two different kinds of bone tissue:
- Just under the periosteum is Compact bone. It does not have any visible open spaces.
- Spongy Bone has many open spaces. It provides most of the strength and support for a bone.
Down to the Marrow…

- Bones contain a soft tissue inside of them called **marrow**.
- **Red Marrow** (in spongy bones) produce red blood cells.
- **Yellow marrow** stores fat.

Growing Bones…

- Did you know that most of your skeleton used to be soft and rubbery? Most bones start off as soft rubbery tissue called **cartilage**. When you were born you had little true bone.
- But as you grew cartilage was replaced by bones. Cartilage is still found in the tip of your ears and in your nose. Some places in your body never become bone!!
The Skeletal System

Bones are where new blood cells are generated (in the marrow), and require the mineral calcium for strength.

Major Bones of the Human Body

-- femur (thigh bone) -- humerus (upper arm)
-- radius and ulna (lower arm) -- cranium (skull)
-- sternum (breastbone) -- clavicle (collar bone)
-- fibula and tibia (calf) -- vertebrae (back)
-- scalpula (shoulder) -- pelvic bone
-- coccyx (tail bone)
-- phalanges (fingers/toes)

Care and Problems of the Skeleton System

Care of the Skeletal System

Ways to care for the Skeletal system is to eat foods that contain calcium, vitamin D, and phosphorus, they can help prevent the development of certain skeletal disorders.

Problems of the Skeletal System

Problems of the skeletal system can be a result of poor nutrition, infections, sports, and recreational injuries and poor posture. Osteoporosis and dislocation of the joints are also other problems of the Skeletal System.
Joints

• Joints are the point where bones meet.

Types of Joints

• **Ball-and-socket joints** - formed when a rounded head of one bone fits into the rounded cavity of another bone. It’s like a joystick on a computer game. The shoulder allows your arm to move freely in all directions.

• **Hinge joints** - would include elbow, knee, ankle, and fingers. Allows bone to bend and straighten. Like a hinge on a door, you can flex and extend your legs and arms.

• **Sliding joints** - allow bones in the hand to glide over one another, giving some flexibility to the area.

• **Pivot joints** - are located where your neck and head connect to one another.

Joints are kept together with strong elastic bands of connective tissue called **ligaments**.

The Muscular System

**Purpose:** works with the skeletal and nervous system to produce movement, also helps to circulate blood through the human body.

--- muscle cells are fibrous

--- muscle contractions can be voluntary or involuntary

**Major Muscles in the Human Body**

-- biceps (front arm)

-- triceps (back arm) -- deltoids (shoulder meets arm)

-- glutes (buttocks) -- hamstrings (thighs/back of legs)
Muscles can be both **Voluntary** and **Involuntary**.

**Involuntary**
Some involuntary functions of the muscular system are muscles to help you **breathe**, make your heart beat, and help move food through the digestive system.

**Voluntary**
Some voluntary functions of the muscular system are like playing piano, running, playing video games, and throwing a ball.

**Types of Muscle Tissue**

- **A) Smooth** — found in the digestive tract of your body.
- **B) Cardiac** — found only in your heart.
- **C) Skeletal** — attached to your bones for movement.

Skeletal muscle is also referred to as **striated muscle tissue**.

*striated muscle is under voluntary control. Its fibers are long and thin and are crossed with a regular pattern of fine red and white lines.*
• The red and white lines give the muscle its distinctive appearance and its name.
• Strands of tough connective tissue called tendons connect your skeletal muscle to your bones.
Objectives:

• Describe the major functions of the integumentary system.
• List the major parts of the skin, and describe their functions.
• Describe the structure and function of the hair and nails.
• Describe some common types of damage that can affect the skin.

The Integumentary System

• Includes the skin, your hair, and your nails.
• Like all organ systems, the integumentary system helps your body maintain a healthy internal environment and a sense of “homeostasis”!
“Something to think about”

• When do you see dogs “panting”?  
• Why do dogs pant?

Answer:

• Dogs usually pant on hot days or after a strenuous activity!!!!
• Dogs CAN NOT SWEAT so they pant to cool them down on hot days. This helps them regulate their body temperature.
The Skin

- Has several important functions:
  - A) acts as a protective shield against water (like a raincoat)
  - B) is a defense against germs
  - C) helps control your body temperature
  - D) works as a sense organ

Did you know????

Your skin weighs twice as much as your brain!
Your skin has two layers:

- **Epidermis**--the outer layer, but also the “thinnest” layer. It is replaced every 28 days by new cells.
- **Dermis**----is the inner layer and “thickest” layer.

Your Dermis (inner layer)

Contains your **OIL GLANDS** to keep it soft and waterproof

- Also contains **SWEAT GLANDS** to hold your body waste and also water.
- Body waste and water combine and make sweat that you release through tiny holes called pores.
Your skin has a life cycle

- Like all cells, your skin cells go through a life cycle.
- Your top layer of skin cells die and shed as you bathe, new skin cells underneath replace the old skin cells you lose. This normally occurs every 28 days.

“MELANIN”

- Gives your skin its color.
- Ex: freckles, and moles
- The more you have the darker you may appear.
Do’s and Don’ts

- Do:
  - Wash your face twice daily with soap and warm water.
  - Drink plenty of water
  - Lots of exercise
  - Well balanced diet

- Don’t:
  - Scrub your face with a towel, blot dry instead
  - Use heavy makeup
  - Rub affected areas with hard towel when drying off
  - Pick at infected areas

Take care of your skin!!!

- Limit exposure to the sun!!!
- The sun’s rays can cause skin cancer or other damage
- Wear protective sunscreen and suntanning lotion
And just so you know!!!

- You can possibly get a sun burn even on cloudy days!!!
- Why??
- Ultraviolet rays are present even when bright sun is not!!!!

Problems with the skin:

- Because you are going through so many changes at your age, sweat builds up in certain areas (such as under your arms and feet) and it feeds on bacteria.
- So keep it clean!!!!!
"Acne"

- Occurs when pores of your skin “clog up” with oil.
- Happens a lot during the teenage years, and it's normal.
- It's because of the hormones that produce your body's oil glands become larger.

"Acne"

- Whiteheads occur when oil is trapped in the pores
- Blackheads occur when whiteheads are exposed to air and darkness
- Pimples are the most severe!!!!!
“YOUR HAIR”

• PROTECTS skin from ultraviolet light
• Keeps particle (such as dust and insects) out of your eyes and nose.
• REGULATE body temperature

Did you know??????

• Blondes have more hair per square inch than redheads and brunettes.
• If three inches of hair was cut off during your last haircut, it will take about 6 months for it to grow back. Human hair grows at a rate of six inches a year.
"It’s a Guy Thing"

- If the average man never shaved or trimmed his beard, it would grow about 30 ft in his lifetime!!!

"Your Nails"

- Allow you to have a keen sense of “TOUCH”
- They are small, soft extensions of your bones!!!!
A few more things to think about!!!!

• Your toe nails grow about a half to three times more slowly than your fingernails.

• Your fingernails and hair grow faster in **summer** than they do in the winter!!!

And finally!!!!

• Your thinnest layer of skin is on your eyelids……

• Your thickest layer of skin is on the sole of your feet……

• You blink your eyes an average of 4.2 million times a year!!! WOW!!!