Science 6 - Quarter 2 - Module 1
Human Body Systems: Skeletal, Integumentary, and Digestive Systems

Skeletal System

Skeleton
- framework of the body
- consists of 206 bones (adult) that are connected by ligaments

Major functions of skeletal system:
- body support
- facilitation of movement
- protection of internal organs
- storage of minerals and fats
- blood cell formation

Two divisions of the skeletal system:
- axial skeleton - includes skull, vertebral column, ribs, and sternum
- appendicular skeleton - includes the bones of the shoulder, arms, hands, hips, legs, and feet

Classification of bones:
- long bones - limbs like arms and legs
- short bones - wrist and ankles
- flat bones - shoulder blades and skull
- irregular bones - face and vertebrae

Selected bones:
- skull - consists of:
    - cranium - protects the brain
    - facial bones
- spinal column / vertebrae
    - protects the spinal cord
    - 33 in child, 26 in adult
- rib cage
    - protects the lungs and heart
    - 12 pairs
        - upper 7 pairs - true ribs, connected to the breastbone
        - 8th to 10th pairs - connected to the 7th rib by cartilage
        - last 2 pairs - floating ribs, not connected to sternum or other rib
- scapula - bone at the back of shoulder

- humerus - long bone in the upper arm
- radius - the thicker of the two bones in the forearm
- ulna - the longer of the two bones in the forearm
- wrist or carpals - 8 bones that connect the hand to the forearm
- palm or metacarpals - 5 bones

Bone marrow
- found inside bones
- manufacture red blood cells
- two types:
    - red bone marrow - found in the humerus, femur, pelvis and vertebrae
    - yellow bone marrow - found in many other bones

Integumentary System

Integumentary system consists of:
- skin
- hair - helps keep you warm
- nails - give structure to the ends of the fingers
- glands - release oils for moisture and protection
- nerves - send and receive messages to/from the brain

Functions of the integumentary system:
- barrier to protect the body from the outside environment
- one of the first lines of defense of the body against pathogens
- helps retain body fluids, protect against dehydration
- helps eliminate waste products
- helps regulate body temperature
- acts as a receptor for touch, pressure, pain, heat, and cold
- stores water and fat

Parts of the skin:
- epidermis
    - outer layer of the skin
    - outer epidermal cells secrete a protein called keratin
- dermis
    - layer directly below the epidermis
    - connective tissues prevent the skin from tearing and enable it to return to normal after stretching
- hypodermis
    - layer below the dermis

    - stores fats and helps the body retain heat
- sweat glands
    - small tubular structures that produce sweat
    - also known as sudoriferous or sudoriparous glands
- hair
    - hair root - part of the hair below the surface of the skin
    - hair shaft - visible part of the hair that protrudes through the skin
- melanocytes
    - produce melanin, the pigment responsible for skin color
    - located in the epidermis

Digestive System

Digestive system is composed of:
- mouth
- esophagus
- stomach
- small intestine
- large intestine

Mouth
- where digestion begins
- teeth - cut and grind food
- saliva - moistens the food
- ptyalin - enzyme in saliva that helps digest starch

Esophagus
- peristalsis - rhythmic, wave-like muscle movements that push the food down

Stomach
- food broken down into smaller pieces
- gastric juices split proteins and fats

Small intestine
- 7 meters long
- where final digestion takes place and food is absorbed

Large intestine
- where undigested food goes
- also temporarily stores water
- feces - waste products of digestion

- rectum - lower part of the large intestine that stores feces until elimination through the anus

Science 6 - Quarter 2 - Module 2
Human Body Systems: Respiratory, Circulatory, and Nervous Systems

Respiratory System

Respiration
- the exchange of gases with the environment
- includes:
    - intake of oxygen
    - delivery of oxygen to the different parts of the body
    - release of carbon dioxide

Nasal cavity
- nostrils - opening into the nasal passages
- lined with hair and glands that produce mucus that traps impurities in the air

Pharynx
- the throat
- common passageway for food, water, and air

Larynx
- contains vocal cords that vibrate when air passes by

Trachea
- the windpipe
- also filters the air we inhale

Bronchi
- the two tubes that carry air into the lungs

Bronchioles
- smaller tubes after the bronchi
- branch off into alveoli

Alveoli
- grape-like structures at the end of each bronchiole
- surrounded by capillaries
- the exchange of oxygen and carbon dioxide happens between the alveoli and capillaries

Lungs
- main organ of the respiratory system
- where gas exchange occurs

Diaphragm
- dome-shaped muscle that controls breathing
- located at the bottom of the lungs

Circulatory System

Circulatory system consists of:
- heart
- blood
- blood vessels

Blood
- constantly flows throughout the body
- plasma - liquid part of blood
    - main component of blood
    - consists mostly of water
- red blood cells
    - also known as erythrocytes
    - transport gases to and from the cells
    - hemoglobin - what makes the blood red, carries oxygen
- white blood cells
    - also known as leukocytes
    - play a vital role in the immune system
- platelets
    - also known as thrombocytes
    - smallest of the formed components of blood
    - help in blood clotting to stop or prevent bleeding

Blood vessels
- vast networks of small tubes that carry blood throughout the body
- arteries - carry oxygen-rich blood away from the heart

- veins - carry deoxygenated blood back to the heart
- capillaries - smallest blood vessels; serve as connection between arteries and veins

Two parts of the circulation:
- pulmonary circulation - movement of deoxygenated blood from the heart and into the lungs
- systemic circulation - movement of oxygenated blood from the heart to the different parts of the body

Heart
- pumping organ of the body
- average heartbeat - 60-100 beats per minute
- atria (singular: atrium)
    - upper chambers of the heart
    - receive blood from parts of the body
- ventricles
    - lower chambers of the heart
    - known as the pumping chambers
    - when they contract, blood is forced away from the heart
- valves - overlapping tissue between atria and ventricles that allow blood to flow in only one direction

Nervous System

Nervous system
- the body system that controls other parts of the body
- receives signals from stimuli inside and outside of the body
- main function: integrate and coordinate bodily activities
- two main parts:
    - central nervous system (CNS) - brain and spinal cord
    - peripheral nervous system (PNS)

Brain
- primary organ of the nervous system
- cerebrum
    - largest part of the brain
    - receives sensory messages
    - center of emotions, consciousness, learning and voluntary movement
- cerebellum
    - smaller, located beneath the cerebrum
    - coordinates involuntary and muscle action
    - responsible for ability to learn habits and develop skills

    - helps maintain sense of balance
- brain stem
    - at the base of the brain
    - contains vital centers for autonomic functions

Spinal cord
- cordlike material in the backbone

Peripheral nervous system
- made up of nerves that branch off from the spinal cord and extend to all parts of the body
- collects information from sense organs and transmits it to the CNS
- deliver instructions from the CNS to the body parts that will act on them

Neuron
- the nerve cell
- the functional unit of the nervous system
- three parts: dendrites, cell body, axon
- cell body
    - main component of the neuron
    - maintains the health of the neuron
- dendrites
    - short fibers around the cell body
    - carry messages into the nerve cell
- axon
    - long fiber of the neuron

Three types of neurons:
- sensory neuron
    - typically has long dendrites and axons
    - carries messages from the receptor organs (skins, eyes, nose, ears, and tongue) to the nerve center
- motor neuron
    - typically has short dendrites and long axons
    - receives information from the nerve centers and transmits it to the effector organs (muscles or glands)
- interneurons
    - connect sensory neurons to motor neurons
    - found only in the central nervous system

Autonomic nervous system
- controls or regulates the body's internal environment, including the vital signs
- vital signs

    - body temperature, pulse and respiration rate, and blood pressure
    - reflect the condition of your internal organs
- two divisions:
    - sympathetic
    - parasympathetic
- sympathetic and parasympathetic
    - produce opposing effects
    - both are directly involved in maintaining the normal functions of cells

Science 6 - Quarter 2 - Module 3/4
Animals: Characteristics of Vertebrates

Vertebrates
- animals with backbone
- can be:
    - viviparous - born live
    - oviparous - hatched from an egg
- vertebrate groups:
    - mammals
    - fish
    - birds
    - amphibians
    - reptiles

Mammals
- warm-blooded
- viviparous (born alive)
- body covering: hair or fur
- have mammary glands to feed their young with milk

Fish
- cold-blooded
- oviparous (hatched from eggs)
- body covering: scales
- breathe through gills
- have tails and fins to help them swim

Birds
- warm-blooded
- oviparous (hatched from eggs)
- body covering: feathers
- have a pair of:
    - limbs for hopping
    - wings for flying (some have wings but can't fly)
- use their beak or bill to get food and protect themselves

Amphibians
- cold-blooded
- oviparous (hatched from eggs)
- body covering: moist, scaleless skin
- spend part of their lives in water and part on land
- examples: salamander, newt, toad, caecilian

Reptiles
- cold-blooded
- oviparous (hatched from eggs)
- body covering: dry, scaly skin
- some have shells
- examples: turtles, chameleon, snake, lizard, and gecko

Science 6 - Quarter 2 - Module 5
Animals: Characteristics of Invertebrates

Invertebrates
- animals without backbones
- 8 main groups:
    - arthropods
    - mollusks
    - echinoderms
    - poriferans
    - cnidarians
    - platyhelminthes
    - nematodes
    - annelids

Arthropods
- segmented bodies with jointed legs
- hardened outer skeleton (exoskeleton)
- largest group in the animal kingdom
- further classified based on how many pairs of legs
    - insects (class Insecta) - 3 pairs of legs
    - arachnids (class Arachnida) - 4 pairs of legs, ex. scorpions, spiders
    - crustaceans (class Crustacea) - 5 or more pairs of legs, ex. crabs, barnacles
    - class Chilopoda - 1 pair of legs *per segment*, ex. centipedes
    - class Diplopoda - 2 pairs of legs *per segment*, ex. millipedes

Mollusks
- soft-bodied animals
- usually have a hard shell (exceptions: squid, octopus)
- examples: snails, clams, squids, octopus

Echinoderms
- marine animals
- spiny endoskeleton
- radial symmetry
- tube feet
- water vascular system
- examples: sea stars, brittle stars, sea urchins, sea cucumber

Poriferans
- sponges
- pore-bearing animals
- attach themselves to rocks or the sea floor

Cnidarians
- hollow-intestined animals (have a digestive cavity)
- have just one body opening
- have stinging cells called nematocysts
- examples: jellyfish, corals, anemones, hydra

Platyhelminthes (flatworms)
- flattened, elongated worm-like animals
- examples: flatworms, flukes, tapeworms

Nematodes (roundworms)
- elongated, unsegmented
- worm-like or thread-like

- can be free-living but mostly parasitic
- examples: ascaris, vinegar eels, hookworms, pinworms

Annelids (segmented worms)
- elongated, segmented with ringed appearance
- have body segments that allow for specialization of tissues and for efficient movement
- examples: earthworms, leeches, lugworms

(mnemonic: CAMP PANE)

Science 6 - Quarter 2 - Module 6
Ecosystem: Tropical Rainforests, Coral Reefs, and Mangrove Swamps

Tropical Rainforests

Living things and non-living things interact with each other in an ecosystem.

In the forest ecosystem:
- living things - ex. plants, animals
- non-living things - ex. soil, air, humidity, water, sunlight

Layers of a rainforest:
- emergent - trees that are 130 to 180 feet tall
- canopy - trees that are 60 to 129 feet tall
- understory
    - 59 feet and below
    - consists of trunks of canopy, shrubs, trees, and small plants
- forest floor
    - plant life is thin because little sunlight gets through the thick canopy and understory and reaches the forest floor
    - home to animals like jaguars, tigers, and cassowaries
    - also contains fungi, insects, worms, and litter from taller trees

Producers and consumers
- producers
    - provide food for the consumers
    - include trees, shrubs and other plant life

- consumers - include:
    - herbivores - plant-eating animals
    - carnivores - flesh-eating animals

Feeding relationships
- food chain - a series of feeding relationships that includes:
    - producer
    - series of consumers (primary, secondary, tertiary)
    - decomposers
- food web - results from interconnected food chains

Interactions between organisms in a tropical rainforest ecosystem:
- commensalism
    - the organisms live together without harming one another
    - example: orchids attached to the trunk of a tree - the orchids benefit, the tree is not harmed
- mutualism
    - both organisms benefit in the relationship
    - example: insect sucks nectar, flower reproduces
- competition
    - the organisms compete for survival
    - example: the grass, shrubs, flowers, and trees that grow together in one area compete for food, sunlight, soil, nutrients, and other needs
- predation
    - one organism (predator) kills another organism (prey) for food
    - example: snake eats a rat for food

Coral Reefs

Coral reef
- a marine biome that serves as a breeding ground for marine life
- ecosystem composed of:
    - non-living things - ex. water, sand
    - living things - ex. fish, seagrass, corals, sponges and other marine animals

Organisms that interact with each other in a coral reef ecosystem:
- producers - ex. seagrass
- consumers - ex. sea turtles, crabs, manatees (dugong), fishes, other marine animals

Factors that contribute to coral reef formation:
- temperature

- light penetration
- stable salinity
- water movement

Categories of coral reefs:
- fringing reefs - reefs that hug the shore of continents or islands
- barrier reefs - reefs that stand between the open sea and a lagoon
- coral atolls - reefs that enclose a lagoon

Interactions between organisms in a coral reef ecosystem:
- commensalism
    - the organisms live together without harming one another
    - example: barnacles attached to the skin of turtles - the barnacles benefit, the turtle is not harmed
- mutualism
    - both organisms benefit in the relationship
    - example: corals receive oxygen from the algae, the algae get protection from the corals
- competition
    - the organisms compete for survival
    - example: fishes compete for source of food and space in the coral reef
- predation
    - one organism (predator) kills another organism (prey) for food
    - example: a big fish eats a small fish - the big fish benefits, the small fish is harmed
- parasitism
    - one organism (parasite) depends on another for food, protection, and reproduction
    - one organism benefits while the other is harmed (but not killed for food, unlike in predation)
    - example: worms in fish

Mangrove Swamps

The mangrove swamp ecosystem consists of:
- non-living things - water, sand, mud, rocks, and sunlight
- living things - a variety of marine and terrestrial life
    - mangrove plants - main organism that dominates the ecosystem
    - in the mangrove canopy - white heron (*tagak*) and other birds
    - attached to the trunk and lower branches of the mangroves - oysters, mussels
    - under the mangrove roots - fishes and crustaceans
    - migratory birds such as pelicans, spoon bills, and bald eagles
    - other animals such as saltwater crocodiles, monitor lizards, mudskippers, and crustaceans such as shrimps and crabs

Interactions between organisms in a mangrove ecosystem:

- commensalism
    - barnacles and oysters attach themselves to the roots of mangroves
    - fish stay in the mangroves to grow and develop into mature fish
- mutualism
    - crabs and mollusks that benefit from the mangroves also help break down plant litter in the ecosystem through grazing
- predation
    - a white heron eating a fish

Importance of the mangrove ecosystem:

- serve as breeding and nesting grounds of animal species
    - fish breed and nurse here before heading to the open ocean
- important habitat of organisms
- many animal species find protection and abundant food in this environment
- natural barrier and flood defense - defend coastlines from flooding and erosion
- important source of livelihood for people living in coastal areas