Name:_____Date:_____Block:_____

The Big Picture: Human Body

Levels of organization

- Cell
- Tissue – group of cells that together perform similar functions
- Organ – made up of different types of tissue
- Organ System

All body systems function to maintain homeostasis (maintaining constant internal environment)

The digestive system

Function: ingests food and breaks it down, releases indigestible material

- **Mouth**: mechanical and chemical digestion begins here; grinding breaks down food particles; digestive enzyme amylase starts breaking down starch
- **Pharynx**: opening of both esophagus and trachea (windpipe)
- **Esophagus**: food travels from mouth to stomach; esophageal sphincter prevents food from moving down when trachea is open
- **Epiglottis:** a flap of skin that prevents food from moving down trachea (towards lungs) when esophagus is open
- **Stomach**: gastric juice (mucus, HCl, and enzymes) secreted by special cells; acidic environment activates enzymes to begin digestion of proteins
- **Pancreas:** produces many digestive enzymes released into the small intestine when needed as well as a basic solution that neutralizes stomach acid entering small intestine
- **Liver:** produces bile, which makes fats more available for enzymes to digest
- **Gall bladder:** stores bile until needed
- **Small intestine:** location where digestion of lipids begins and digestion of all nutrients ends; site of absorption of nutrients into blood
- **Villi:** finger-like projections that increase surface area of cells lining small intestine, increasing surface area for absorption of nutrients
- **Large intestine:** water reabsorbed, undigested wastes consolidated; friendly microflora feed on fiber (cellulose from plant materials) produce some required vitamins

Peristalsis: circular muscles contract and push food through food digestive system

The excretory system

Function: releases nitrogen-containing wastes and toxins, also maintains water/salt balance

- **Skin**: releases water, salts
- **Lungs**: releases water
- **Liver**: produces urea
- **Kidney**: processes urea (nitrogen-rich waste)
- **Nephron**: functional unit of the kidney (millions of nephrons in each kidney)
  - filtration – materials from blood enter nephron
  - reabsorption - important nutrients/water returned to blood
  - secretion – additional wastes put into nephron
  - excretion – wastes leave kidney through ureter, urinary bladder and urethra

Name:_____Date:_____Block:_____

The circulatory system

Function: transports gases, nutrients, and wastes throughout body

- **Heart:** pumps blood, through right atrium, out right ventricle to…
- **Pulmonary arteries**: carry blood to lungs and then…
- **Pulmonary veins**: bring oxygenated blood back to heart, enters at left atrium
- **Aorta:** blood leaves left ventricle through this
- **Arteries**: large arteries carry blood to head, arms, abdominal organs and legs
- **Capillaries**: the smallest branches of the arteries
- **Veins:** bring blood back towards heart
- **Superior and inferior vena cava:** bring blood from upper and lower body into the heart's right atrium

Components of blood

- **Plasma:** 55% volume of blood, contains water, salts, nutrients, wastes, etc.
- **Red blood cells:** nearly all of remaining 45% volume of blood, transport O2/CO2
- **White blood cells:** defense and immunity
- **Platelets:** help blood clotting
- All blood cells begin development in bone marrow

Pacemaker: special region of cardiac muscle sets rate of heart beat
Blood pressure: force that blood exerts against walls of blood vessels; systolic = pressure when heart contracted and diastolic = pressure when heart relased

The respiratory system

Function: exchanges gases with the environment

- **Nasal cavity:** warms, humidifies air
- **Pharynx:** opening to trachea (and esophagus)
- **Larynx:** voice box can produce sounds
- **Trachea:** windpipe; rings of cartilage maintain shape; leads to lungs
- **Bronchi**: one leads to each lunchs
- **Bronchioles:** within lung, Bronchi branch repeatedly into finer tubes
- **Alveoli:** grape-like clusters of air sacs. Inner surface lined with thin layer of epithelial cells that form the respiratory surface where gases are exchanged; surrounded by capillaries
- **Diaphragm muscle**: muscle below lungs; contracts during inhalation (expanding chest cavity and created negative pressure so air rushes in) and relaxes during exhalation (decreased chest cavity volume forces air out)

Rate of breathing controlled by region of brain that responds to level of CO2 in blood – high CO2 signals to inhale

Name:_____Date:_____Block:_____

Parts of the skeletal and muscular systems

Function: movement, support, protection

- skeleton – protects, supports, assists muscles with movement
- bone – living cells held within rigid connective tissue, hardened by calcium salts
- bone marrow – site of blood cell formation
- cartilage – firm, also flexible connective tissue; not as hard or brittle as bone
- ligaments – connect bone to bone
- tendons – connect bone to muscle
- muscles contract to cause movement; opposite action of two muscles (ex. bicep and tricep) allows bending/straightening and other opposite movements; interactions between filaments of the proteins actin and myosin cause contraction
- smooth muscle – involuntary, lines many organs
- cardiac muscle – heart muscle
- skeletal muscle – voluntary muscle that is involved with movement

Parts of the nervous system

Function: along with endocrine system coordinates body activities

- Central nervous system (CNS) – brain and spinal cord, integrates information and controls rest of nervous system
- Peripheral nervous system (PNS) – nerves throughout body, carry signals in/out of CNS (sensory input/motor output)
- neuron – nerve cell
- motor neuron – signals muscle movement (some voluntary, some involuntary)
- sensory neuron – receives information about internal/external environment
- structure of neuron – dendrite receives chemical information from other neurons and transmits action potential to cell body
- cell body – center of neuron
- axon – long slender projection that transmits action potential from cell body; at end of axon, action potential triggers chemical signal to next neuron
- synapse – gap between two neurons where neurotransmitters pass signal between neurons
- action potential – electrical signal that travels along nerve cell

Parts of the endocrine (hormonal) system

Function: secretes hormones that regulate body systems

- hormone – regulatory chemical that travels in blood from production site to other sites; targets action in cells with particular receptors
- protein hormones act by binding receptor in plasma membrane
- steroid hormones enter cell, bind receptor and, together, act as transcription factor
- some key hormonal organs
    - thyroid – regulates development and metabolism
    - pancreas – produces insulin/glucagons hormones to regulate blood sugar
    - adrenal glands – regulate response to stress
    - testes – produce testosterone controlling male reproductive development
    - ovaries – produce progesterone estrogen controlling female reproductive development

Name:_____Date:_____Block:_____

Parts of the reproductive system

Function: produces gametes (sperm and eggs)

- sperm – male gamete, transfers DNA only to egg during fertilization
- egg – female gamete, DNA + cellular material contributed to offspring
- meiosis produces eggs and sperm
- embryo – developing stage of a multicellular organism, in humans from 1st division of zygote (fertilized egg) to 9th week when body structures start to appear; after that embryo is called a fetus

Parts of the immune system

Function: protects body from pathogens and cancer cells

- **non-specific defense** – skin (barrier) and some white blood cells (attack any pathogen)
- **specific defense -**
  T cells (white blood cells) attack specific pathogens with certain antigens
  B cells (white blood cells) produce antibodies, proteins that stick to antigens
- antibody – molecule made by body, binds to antigens
- antigen – molecule on surface of pathogen, help body to recognize as foreign

Parts of the lymphatic system

Function: pick up fluid that leaks out of circulatory system; also stores white blood cells

- **lymph:** similar to interstitial fluid (fluid outside of cells)
- **lymph nodes:** many white blood cells present here so can attack pathogens brought by lymph from other parts of body