Human Body Systems

The human body consists of 11 major systems.
Systems

- Skeletal
- Muscular
- Cardiovascular or Circulatory
- Digestive
- Respiratory
- Urinary
- Endocrine
- Nervous
- Integumentary
- Lymphatic or the Immune
- Reproductive
Skeletal

- Gives the body shape.
- Provides for an attachment for muscles.
- Protects vital organs
- Major area where blood is produced.
  Epiphysis of bones the ends mainly of large bones like big bone in leg (femur) and large bone in arm (humerus). Diaphysis?
- Flat bones such as the pelvis and sternum (breast bone)
Muscular

- Gives the body form
- Responsible for body movement.
- Muscles are attached to bones by tendons thus cause the body to move.
Three major types of muscles

- **Skeletal**- sometimes referred to as striated. Voluntary attached to bones.
- **Cardiac**- Found only in the heart. Involuntary also has striations.
- **Visceral**- also known as smooth. Involuntary and lacks striations. Found in internal organs known as viscera.
Cardiovascular or Circulatory

- Consists of the heart and blood vessels mainly.
- Heart, arteries, arterioles, capillaries, venules, veins and back to the heart.
- Provide oxygen and nutrients for the cells and removes carbon dioxide and nitrogenous waste from the cells.
Blood vessels

- Arteries carry blood away from the heart.
- Veins carry blood back to the heart.
- Although most arteries carry oxygenated blood, the pulmonary arteries carry deoxygenated blood or blood rich in carbon dioxide.
Blood vessels (cont)

- Veins mainly carry deoxygenated blood (laden with carbon dioxide) but the pulmonary veins carry oxygenated blood.

- Thus best definition for artery is one that carries blood away from the heart and veins carry blood back to the heart.
Capillaries

- The smallest of the blood vessels.
- The capillaries connect arterioles (very small arteries with venules very small veins)
- Materials that enter or leave the blood do so through the capillaries.
Arteries and Veins

- Arteries and veins are very thick and have three layers to them.
- Tunica externa (tunica adventitia)
- Tunica media
- Tunica interna (tunica intima)
- Capillaries being only one layer thick allows substances to enter or leave the blood.
Cardiovascular

- The left side of the heart contains oxygenated blood.
- The right side of the heart contains blood heavily concentrated with carbon dioxide.
- The two sides are separated by a septum that prevents blood from mixing from one side with the other.
Digestive

- Breaks the food down into a usable form by the cells.
- Absorption then takes place which is the transfer of the usable nutrients from the digestive tract (the stomach and intestines) into the blood.
- Known as digestive tract, Gastrointestinal tract (G-I tract or Alimentary canal)
- Continuous tube from mouth to anus
Trace food through the digestive tract.

- Oral cavity
- Oropharynx
- Laryngopharynx
- Esophagus (food tube)
- Lower esophageal sphincter valve
- Stomach (fundus, body, pylorus)
Larynx (voice box) area

- Epiglottis
- Larynx
- Trachea
- Oropharynx
- Laryngopharynx
- Esophagus
Muscles of the stomach

- Longitudinal
- Circular
- Oblique
Small intestine (small bowel)

- Duodenum
- Jejunum
- Ileum

All of the above are part of the small intestine which is about 23 feet long but only 1 inch in diameter)

Ileocelecal sphincter valve connects the small and large intestine
duodenum
jejunum
ileum
Ileocecal valve
Ileocecal valve
ileum
cecum
appendix
The large intestine has pouches not the small intestine.
FIGURE 3.18 Posterior wall of the peritoneal cavity. Anterior view.
The Large Intestine

adapted from Thibodeau
Large intestine or Colon

- Ascending colon
- Hepatic flexure
- Transverse Colon
- Splenic flexure
- Descending Colon
- Sigmoid Colon
- Rectum
- Anus
Respiratory

- Supplies oxygen to the body and removes the carbon dioxide.
- Mouth or nose to the pharynx, to the trachea (windpipe) bronchi, bronchioles (little bronchi) to the alveoli (air sacs)
- Oxygen leaves the alveoli and enters the blood and carbon dioxide leaves the blood and enters the alveoli.
The Human Respiratory System

- Nasal passage
- Oral cavity
- Pharynx
- Larynx
- Trachea
- Bronchi
- Lung
- Heart
- Ribs
Larynx (voice box) area

- Epiglottis
- Larynx
- Trachea
- Oropharynx
- Laryngopharynx
- Esophagus
Respiratory Tract

- Mouth or Nose
- Pharynx (nasopharynx, oropharynx, laryngopharynx)
- Epiglottis (flap of larynx)
- Remainder of larynx (voice box)
- Trachea (windpipe)
- Bronchi
- Bronchioles
- Alveoli
Urinary

- Consists of the kidneys and the transferring structures.
- Ureter carries nitrogenous waste from the kidney to the urinary bladder.
- Urethra carries the nitrogenous waste from the urinary bladder to the outside of the body.
Urinary System

Components of the Urinary System

- Kidney
- Ureter
- Bladder
- Urethra
Blood flow through the kidneys.

- Renal artery carries blood into the kidneys.
- The nephrons (functioning unit of the kidneys) will filter out the nitrogenous waste and add this waste product to the ureter. There are 1 million nephrons in each kidney.
- The renal vein will carry blood out of the kidney.
Male Reproductive Tract

Bladder
Prostate
Urethra
Penis
Vas Deferens
Testis
Scrotum
Epididymis
Tunica Vaginalis

Oviduct
Ovary
Fimbriae
Uterus
Urinary bladder
Pubic bone
Urethra
Clitoris
Labium minora
Labium majora
Anus

Vert colu

Female reproductive
Nervous

- Controls body activities and maintains homeostasis or balance on a fast acting basis.
- Brain and spinal cord—central nervous system (CNS)
- All the other nerves are part of the peripheral nervous system (PNS)
Cerebrum - intellectual center and emotional center.

Cerebellum - has to do with physical coordination.

Brain stem.

Medulla oblongata - controls heart rate and breathing rate.
Spinal Cord

- 31 Vertebrae
- Nerves run between each vertebrae
- Control various parts of the body
- When the vertebrae are in their proper positions, the nerves pass through without a problem. Impulses race along the nerve fibers to and from the brain relaying information and instructions without interference. When a vertebrae is jarred out of its proper alignment, however, the messages are distorted. The body can no longer function at 100% of its capacity.
- The term for a misplaced vertebrae is subluxation.
Endocrine

- Coordinates the body is a slower fashion than the nervous system.
- Consists of endocrine glands, pituitary, adrenal, thymus, thyroid, parathyroids etc.
- Works through hormones which are chemicals produced in one part of the body that have an effect elsewhere in the body.
Endocrine

- The endocrine system is controlled by the hypothalamus.
- It is located very close to the hypophysis (pituitary)
Adenohypophysis

Neurohypophysis

Brain space

Hypothalamus

Stalk

Portal vessels

Anterior Pituitary

Posterior Pituitary

Third ventricle

Hypothalamus and hypothalamic neurons

Hypophyseal artery

Hypothalamic-hypophyseal portal veins

Anterior pituitary

Hypophyseal vein

Nose
Integumentary

- Skin which protects the body from invasion for the most part.
Lymphatic or Immune

- A separate set of vessels that transports a clear fluid through the body. (protects the body)
- Begins all over the body when interstitial fluid enters lymph capillaries and then is transferred to the lymph vessels and eventually the subclavian vein.
Lymphatic System

- The lymphatic system consists of a unique set of vessels separate from the circulatory system that includes a clear lymph.

- These vessels lack a pump such as a heart and must depend on other means to transport the fluid.
http://video.google.com/videosearch?gbv=2&hl=en&q=lymph%20capillaries&ndsp=18&ie=UTF-8&sa=N&tab=iv&start=0
Lymph is a watery, slightly yellow liquid found in the lymphatic vessels of one’s body. These vessels act as a drainage system for the body. Just as blood circulates throughout one’s body so does the lymph. Lymphatic vessels range in size from very large to microscopic and are found in every organ and tissue of the body. These lymphatic vessels flow alongside one’s blood vessels. However, unlike blood, lymph does not flow because of a heart “pump”. Lymph is slowly coaxed by the movement of the body’s muscles until it empties back into the blood vessels just above the heart.

The actual lymph fluid is formed when liquid plasma and protein from the blood ooze out of their capillaries and are then picked up by the, almost transparent, lymph capillaries (vessels). However, is not only excess fluid from the blood that is picked up; but also, nutrients, hormones, waste products of the cells, bacteria, cancer cells, and cellular debris. Also present within the lymph are lymphocytes, which disable harmful foreign invaders. During circulation lymph passes through countless lymph nodes stationed throughout its pathways. Each lymph node acts as a filter helping destroy microorganisms and cellular debris. Besides helping to maintain the body’s fluid balance and defend the body against disease, the lymph absorbs digested fats from the intestines and
Lymph capillary working

1-way valve
Lymph capillary working
**Lymphokinetic Motion and Pressure Gradient**

Blood capillaries → Interstitial Fluid → Lymph capillaries → Lymph veins → Lymph ducts → Large circ. Veins

*Highest pressure* → Lower pressure inside → Back pressure closes minivalves → Higher pressure outside → Filaments anchored to connective tissue

*Lowest pressure*
Lymph nodes scattered

**Lymph nodes**

- Several hundred lymph nodes are scattered throughout the lymphatic system, especially in the:
  - groin
  - armpits
  - abdomen and
  - neck.
Lymph vessels go here

- All of the lymph vessels dump into one of two subclavian veins.
- All the lymph collected from the entire left side of the body,
- the digestive tract and
- the right side of the lower part of the body flows into a single major vessel, the **thoracic duct** (also known as left lymphatic duct)
One Fourth of the lymph goes here

- The right upper quadrant dumps into the right lymphatic duct.
- Thus all the lymph is returned to the blood.
- The lymph originated from the blood and returned to the blood.
Regional lymph nodes:

- Cervical nodes
- Axillary nodes
- Inguinal nodes

Entrance of right lymphatic duct into right subclavian vein

Internal jugular vein

Entrance of thoracic duct into left subclavian vein

Thoracic duct
Aorta
Cisterna chyli
Lymphatic collecting vessels

Collections of lymph nodes along the lymph veins at the constriction points in the drainage
Lymph Node

Lymph nodes are small, bean-shaped structures that are laced throughout the body along the lymphatic routes.

Lymph nodes contain specialized compartments where immune cells congregate, and where they can encounter antigens.
Reproductive

- Provides for the continuation of the species in this case the *Homo sapien*
- Male gonad (testes) where the sperm is formed
- Female gonad (ovaries) where the ova are formed.
Younger female reproductive system:

- Uterus
- Ovum
- Cervix
- Vagina
Tissues

- Muscle - skeletal, cardiac and visceral
- Epithelium - covers and lines surfaces makes up the glands
- Nervous - controls actions and coordinates body activities
- Connective - bone, cartilage, ligaments, tendons, areolar (loose connective tissue)
Cells

- Nucleus, cytoplasm, ribosomes, endoplasmic reticulum, lysosomes, mitochondria, nucleolus.
- All of the above structures are known as organelles
What makes up the organelles

- Chemical compounds or molecules
- Sodium chloride (Na Cl)
- Sugar (C_{12}H_{22}O_{11})
- The smallest form of a compound that is still that compound is a molecule.
What makes up a molecule

- Atoms makes up a molecule.
- Or you could say elements make up compounds.
- Water which is a compound is made up of hydrogen and oxygen atoms.
What makes up atoms

- Subatomic particles which would be protons, neutrons, and electrons primarily.
Let's look at some basic genetic structures.

- Put into the proper sequence.
- Cell
- Nucleus
- Chromosomes
- DNA
- Genes
Genes are a portion of a DNA molecule

- Only a section of a DNA molecule is a gene.
- On one DNA molecule you could have genes for your brain, muscle in your foot, skin.
- DNA stands for deoxyribonucleic acid
Nucleic acids

- DNA and RNA
- DNA is the director, RNA assists the DNA in doing its job.
- There are some exceptions AIDS is caused by human immunodeficiency virus (HIV) is actually an retrovirus or RNA component.
HIV

- When this nucleic acid gets in the body it takes over the activity of the cells by directing the action.
- The original DNA does not function but rather the retrovirus (HIV) does the directing thus it cannot produce some simple actions to produce substances which protect the body.