HOMEOSTASIS

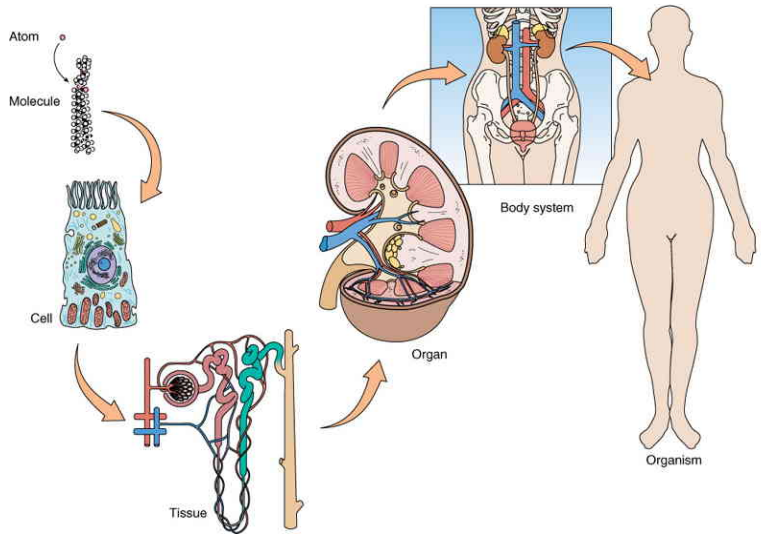
Investigating Human Physiology

HOMEOSTASIS: The property of living organisms to maintain a stable, internal environment despite changes in the external environment (Ex: Regulating internal body temperature).

PHYSIOLOGY: The study of the mechanical, physical, and biochemical functions of living organisms.

LEVELS OF ORGANIZATION…

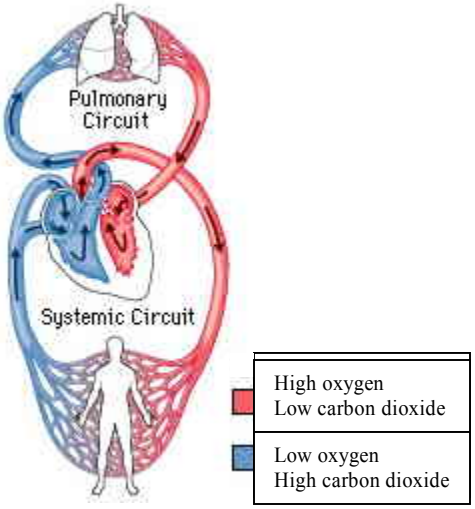
Atoms
Make up
Molecules
which make up
Cells
which make up
Tissues
which make up
Organs
which make up
Systems
which make up
Organisms



AN OVERVIEW OF THE HUMAN BODY SYSTEMS…

System	Major structures	Functions
Circulatory	Heart, blood vessels, blood (cardiovascular) lymph nodes and vessels, lymph (lymphatic)	Transports nutrients, wastes, hormones, and gases
Digestive	Mouth, throat, esophagus, stomach, liver, pancreas, small and large intestines	Extracts and absorbs nutrients from food; removes wastes; maintains water and chemical balances
Endocrine	Hypothalamus, pituitary, pancreas and many other endocrine glands	Regulates body temperature, metabolism, development, and reproduction; maintains homeostasis; regulates other organ systems
Excretory	Kidneys, urinary bladder, ureters, urethra, skin, lungs	Removes wastes from blood; regulates concentration of body fluids
Immune	White blood cells, lymph nodes and vessels, skin	Defends against pathogens and disease
Integumentary	Skin, nails, hair	Protects against injury, infection, and fluid loss; helps regulate body temperature
Muscular	Skeletal, smooth, and cardiac muscle tissues	Moves limbs and trunk; moves substances through body; provides structure and support
Nervous	Brain, spinal cord, nerves, sense organs	Regulates behavior; maintains homeostasis; regulates other organ systems; controls sensory and motor functions
Reproductive	Testes, penis (in males); ovaries, uterus, breasts (in females)	Produces gametes and offspring
Respiratory	Lungs, nose, mouth, trachea	Moves air into and out of lungs; controls gas exchange between blood and lungs
Skeletal	Bones and joints	Protects and supports the body and organs; interacts with skeletal muscles, produces red blood cells, white blood cells, and platelets

CIRCULATION & RESPIRATION…



THE NERVOUS SYSTEM…

The nervous system is composed of the central nervous system and the peripheral nervous system. The central nervous system, which includes the brain and spinal cord, processes and coordinates all incoming sensory information and outgoing motor commands, and it is also the seat of complex brain functions such as memory, intelligence, learning, and emotion. Interneurons conduct impulses within the central nervous system. The peripheral nervous system includes all neural tissue outside of the central nervous system. It is responsible for providing sensory information to the central nervous system and carrying motor commands out to the body's tissues. Voluntary motor commands, such as moving muscles to walk or talk, are controlled by the *somatic* nervous system, while involuntary motor commands, such as digestion and heartbeat, are controlled by the *autonomic* nervous system. The autonomic nervous system is further divided into two systems. The sympathetic nervous system, sometimes called the "fight or flight" system, increases alertness, stimulates tissue, and prepares the body for quick responses to unusual situations. In contrast, the parasympathetic nervous system, sometimes called the "rest and repose" system, conserves energy and controls sedentary activities, such as digestion. Nerve impulses are electrical signal sent along nerve cell to other neurons, muscles, or body to signal information.

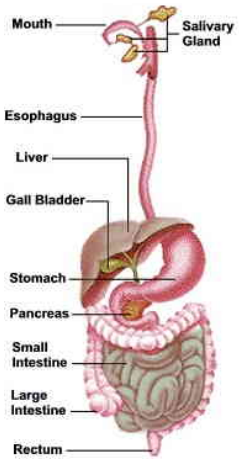
THE ENDOCRINE SYSTEM…

This is a group of specialized organs and tissues that produce, store, and secrete chemical substances known as hormones. Among their many jobs, hormones regulate growth and development, control the function of various tissues, support reproductive functions, and regulate metabolism (the chemical processes of the body).

When a change occurs in the body, there are two general ways that the body can respond. In negative feedback, the body responds in such a way as to reverse the direction of change. Because this tends to keep things constant, it allows us to maintain homeostasis. On the other hand, positive feedback is also possible. This means that if a change occurs, the response is to change that variable even more in the same direction. This has a de-stabilizing effect, so it does not result in homeostasis. Positive feedback is used in certain situations where rapid change is desirable.

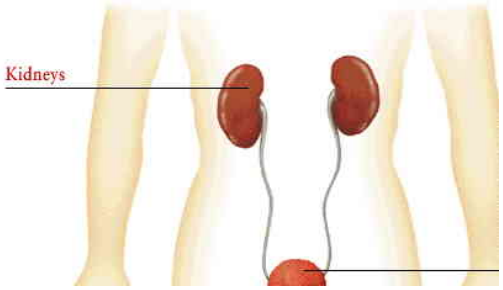
DIGESTION & EXCRETION…

When food moves through the digestive system, it is broken down to extract nutrients and energy that the body needs for growth, repair and maintenance. The remaining material is eliminated as solid waste.



One of the largest organs in the human body is part of the digestive system… the liver. The liver produces a digestive fluid called 'bile' and carries out about 500 other functions. This is the body's main chemical factory and main chemical storage facility.

The excretory system is needed to remove nitrogenous waste (urine) and regulate bodily fluids. Kidneys take care of this by filtering the blood vessels to remove waste materials, which are then eliminated as urine. The kidneys also help control the amount of salts, water, minerals and vitamins in the blood, as well as regulating the pH and volume of blood in the body.



HOMEOSTASIS

Investigation Questions… RESTATE the questions in your answers.

1. Describe 'homeostasis'. Give 2 examples of homeostatic activities within the body.
2. Explain how organs and systems work together in the body.
3. Write the name of each human body system on your paper, followed by a BRIEF description of each system's function.
4. Circulation and respiration… How does oxygen get to the cells of the body? How is carbon dioxide waste removed from the cells?
5. Read the section on the nervous system…
    a. What is the central nervous system? What is the peripheral nervous system?
    b. What are interneurons, motor neurons, and sensory neurons?
    c. How is the somatic system different from the autonomic system?
    d. How is the sympathetic system different from the parasympathetic system?
    e. Create a CONCEPT MAP of the human nervous system that includes the following:
        - CNS / PNS, somatic & autonomic, sympathetic & parasympathetic
        - Interneurons, motor neurons, and sensory neurons
6. For the endocrine system… What are hormones? What are positive and negative feedback?
7. How does the liver help the body to maintain homeostasis? What about the kidneys?