आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

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INTRODUCTION TO THE HUMAN BODY

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AN INTRODUCTION TO THE HUMAN BODY

- **The number of humans in the world now is 7.53 billion (7, 530,000,000) !!**

- **More than 250 babies are born every minute, while 150,000 people die daily, with the population increasing by almost three humans per second.**

- **Each of us lives, thinks, worries, and daydreams with, and within, that most complex and marvelous of possessions – a human body !!**

- The body is a series of 11 integrated systems. Each system carries out one major role or task.

- The systems are, in turn, composed of main parts known as organs, the organs consist of tissues, and tissues are made up of cells.

ANATOMY AND PHYSIOLOGY

A) Anatomy deals with the structure of the body and its parts; in other words, the names of the parts.

Pictures of the inside of the body are often shown in isolation, using techniques such as cutaways, cross-sections, and "exploded" views, which provide clarity and understanding.

But in reality, the inside of the body is a crowded place. Tissues and organs push and press against one another. There is no free space, and no stillness either. Body parts shift continually in relation to each other, as we move about, breathe, sleep, and eat.

B) Physiology studies the functions of these parts or asks the question, "how do they work?"

The two disciplines are closely interrelated because the functional role of a part depends on how it is made.

LEVELS OF ORGANIZATION OF THE BODY

The human body is the sum of its parts and these parts can be studied at a variety of levels of organization.

1. Chemicals:

    a. Atoms are the simplest level.

    b. Two or more atoms comprise a molecule.

    c. Macromolecules are large, biologically important molecules inside cells.

2. Organelles are groups of macro-molecules used to carry out a specific function in the cell.

LEVELS OF ORGANIZATION OF THE BODY

3. **Cells** are the basic units of structure and function for living things.

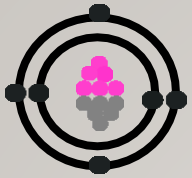
4. **Tissues** are groups of cells functioning together.

5. Groups of tissues form **organs** that have specialized functions.

6. Groups of organs function together as an **organ system**.

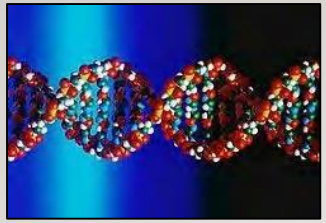
7. The 11 Body (Organ) systems functioning together, to make up an **organism**.

LEVELS OF ORGANIZATION OF THE BODY

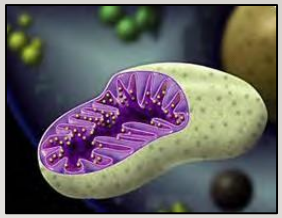


Carbon atom

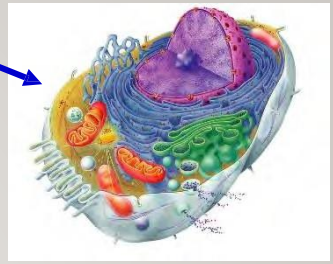
Chemical



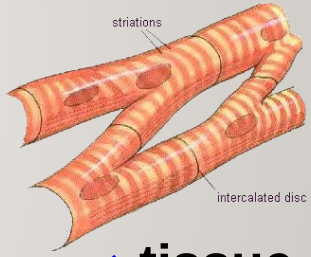
DNA molecule



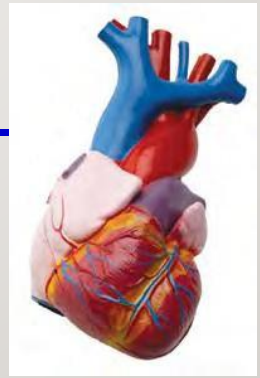
organelle



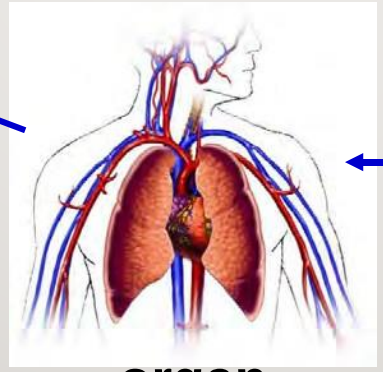
cell



tissue



organ



organ system

organism

CHARACTERISTICS OF LIFE

Fundamental characteristics of life are traits shared by all organisms.

1. **Movement** – change in position of the body or a body part; motion of an internal organ

2. **Responsiveness** – reaction to internal or external change

3. **Growth** – increase in size without change in shape

4. **Reproduction** – new organisms or new cells

5. **Respiration** – use of oxygen; removal of Carbon Dioxide

6. **Digestion** – breakdown of food into simpler forms

7. **Absorption** – movement of substances through membranes and into fluids

8. **Circulation** – movement within body fluids

9. **Assimilation** – changing nutrients into chemically different forms

10. **Excretion** – removal of metabolic wastes

Taken together, these 10 characteristics constitute our metabolism – the physical and chemical events that obtain, release, and use energy.

WHAT ARE THE MAIN CHARACTERISTICS OF ORGANISMS?

1. **Made of CELLS**
2. **Require ENERGY (food)**
3. **REPRODUCE (species)**
4. **Maintain HOMEOSTASIS** (keeping the body systems in balance)
5. **ORGANIZED**
6. **RESPOND to environment**
7. **GROW and DEVELOP**
8. **EXCHANGE materials with their surroundings (water, wastes, gases)**

MAINTENANCE OF LIFE

Life depends on the availability of the following:

A) WATER

1) The most abundant chemical in the body

2) Required for many metabolic processes

3) Transportation of cells and body materials

4) Regulates body temperature

5) Makes up intracellular and extracellular fluid compartments

What Does Water do for You?

Needed by the brain to manufacture hormones and neurotransmitters

Forms saliva (digestion)

Keeps mucousal membranes moist

Regulates body temperature (sweating and respiration)

Allows body's cells to grow, reproduce and survive

Acts as a shock absorber for brain and spinal cord

Flushes body waste, mainly in urine

Converts food to components needed for survival - digestion

Lubricates joints

Water is the major component of most body parts

Helps deliver oxygen all over the body

I. MAINTENANCE OF LIFE - (CONTINUED)

B) FOOD

1) Provides the body with needed nutrients

2) Needed for energy, raw building materials for growth and repair, and to regulate chemical reactions

b. Oxygen – releases energy from food

c. Heat – product of metabolic reactions and muscle movement that controls and maintains the body temperature

1. MAINTENANCE OF LIFE - (CONTINUED)

C) PRESSURE

1) Force applied to something

2) Atmospheric pressure is needed for breathing

3) Hydrostatic (water) pressure is needed to move blood through blood vessels – our blood pressure

2. Both the quality and quantity of these factors are important

HOMEOSTASIS

- All organisms must maintain a constant internal
  - environment to function properly

    - Temperature
    - pH (acidic or basic)
    - Salinity (salt level)
    - Fluid levels

HOMEOSTASIS

1. Maintenance of a stable internal environment of the body is called **homeostasis.**

2. Homeostasis is regulated through control systems which have **receptors (sensors),** a set point, and **effectors** in common.

   a. **Receptors** are of many types whose job is to monitor for changes

   b. The **set point** is the normal value or range of values

   c. **Effectors** are muscles or glands that respond to the changes to return to stability

3. Examples include:

   a. Homeostatic mechanisms regulate body temperature in a manner similar to the functioning of a home heating/cooling thermostat.

   b. Another homeostatic mechanism employs pressure-sensitive receptors to regulate blood pressure

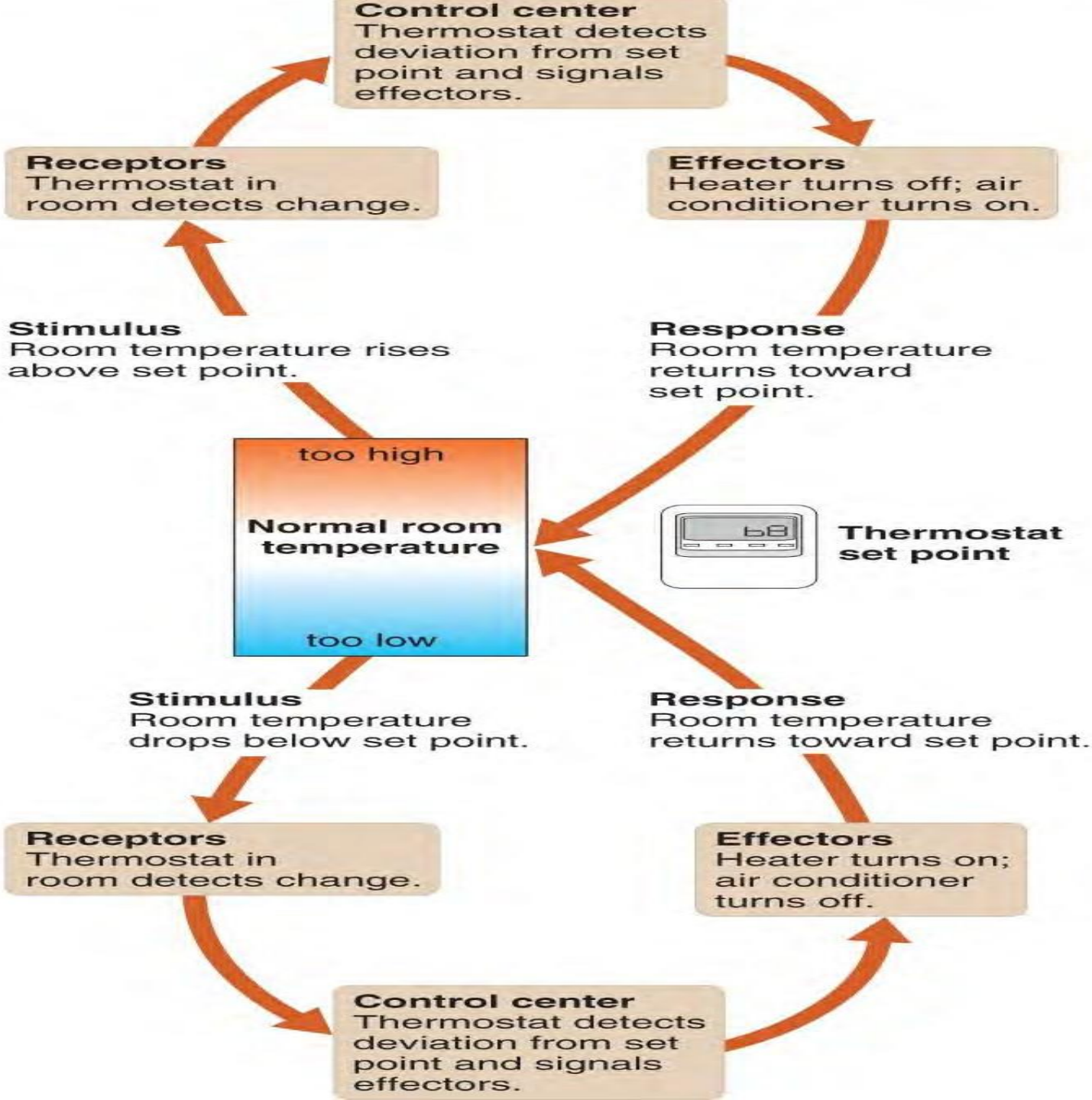
4. Each individual uses homeostatic mechanisms to keep body levels within a normal range; normal ranges can vary from one individual to the next.

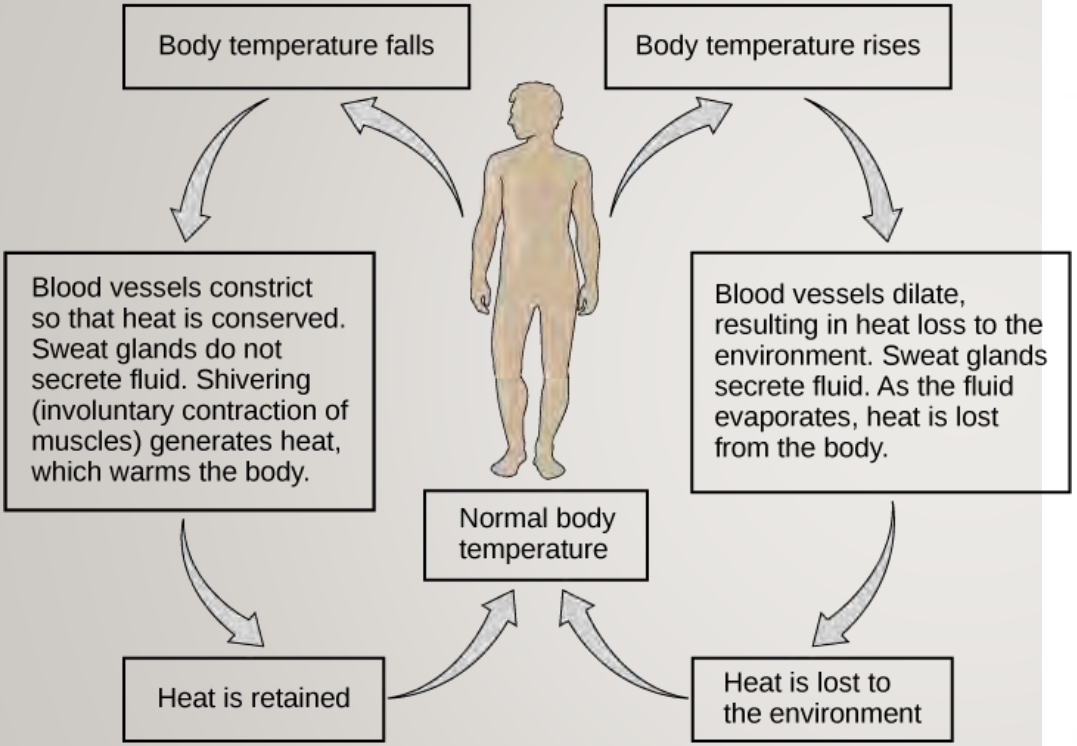
5. Many of the body's homeostatic controls are **negative feedback** mechanisms.

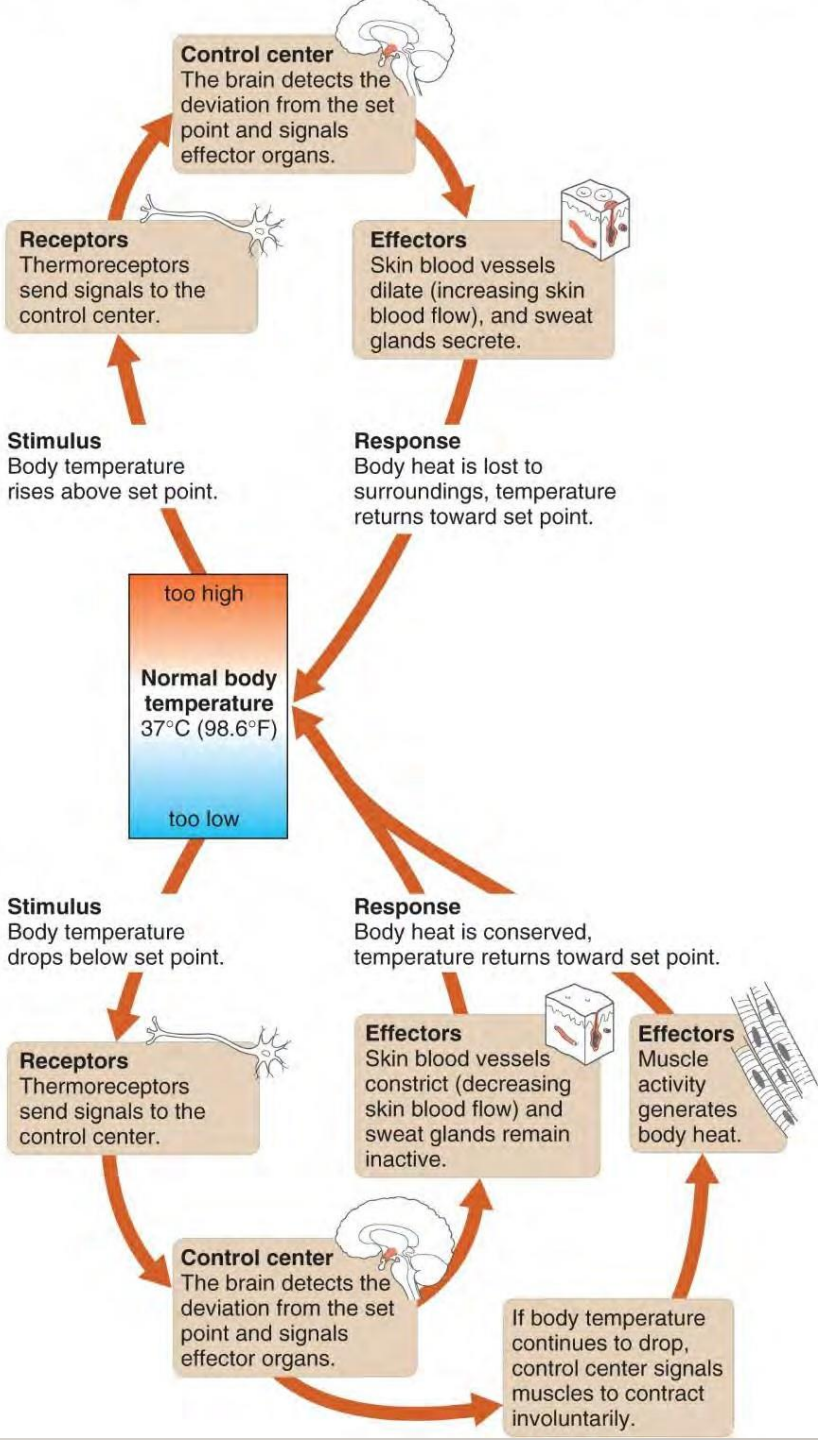
   a. Responses move in the opposite direction from the change

   b. Reduces the amount of change from the set point

   c. Includes most control mechanisms in the body


Control center
Thermostat detects deviation from set point and signals effectors.
Receptors
Thermostat in room detects change.
Effectors
Heater turns off; air conditioner turns on.
Stimulus
Room temperature rises above set point.
Response
Room temperature returns toward set point.
too high
Normal room temperature
too low
Thermostat set point
Stimulus
Room temperature drops below set point.
Response
Room temperature returns toward set point.
Receptors
Thermostat in room detects change.
Effectors
Heater turns on; air conditioner turns off.
Control center
Thermostat detects deviation from set point and signals effectors.


Body temperature falls
Body temperature rises
Blood vessels constrict so that heat is conserved. Sweat glands do not secrete fluid. Shivering (involuntary contraction of muscles) generates heat, which warms the body.
Blood vessels dilate, resulting in heat loss to the environment. Sweat glands secrete fluid. As the fluid evaporates, heat is lost from the body.
Normal body temperature
Heat is retained
Heat is lost to the environment


Control center
The brain detects the deviation from the set point and signals effector organs.
Receptors
Thermoreceptors send signals to the control center.
Effectors
Skin blood vessels dilate (increasing skin blood flow), and sweat glands secrete.
Stimulus
Body temperature rises above set point.
Response
Body heat is lost to surroundings, temperature returns toward set point.
too high
Normal body temperature
37°C (98.6°F)
too low
Stimulus
Body temperature drops below set point.
Response
Body heat is conserved, temperature returns toward set point.
Receptors
Thermoreceptors send signals to the control center.
Effectors
Skin blood vessels constrict (decreasing skin blood flow) and sweat glands remain inactive.
Effectors
Muscle activity generates body heat.
Control center
The brain detects the deviation from the set point and signals effector organs.
If body temperature continues to drop, control center signals muscles to contract involuntarily.

6. **Positive feedback** mechanisms

a. Response moves further from the set point

b. Change from set point gets larger

c. Many positive feedback mechanisms produce unstable conditions in the body which eventually go back to normal.

d. Examples associated with normal health

1) Blood clotting

2) Birth

ORGANIZATION OF THE BODY – BODY CAVITIES

1. Body Cavities - A body cavity is a space created in an organism which houses organs.

2. It is lined with a layer of cells and is filled with fluid, to protect the organs from damage as the organism moves around.

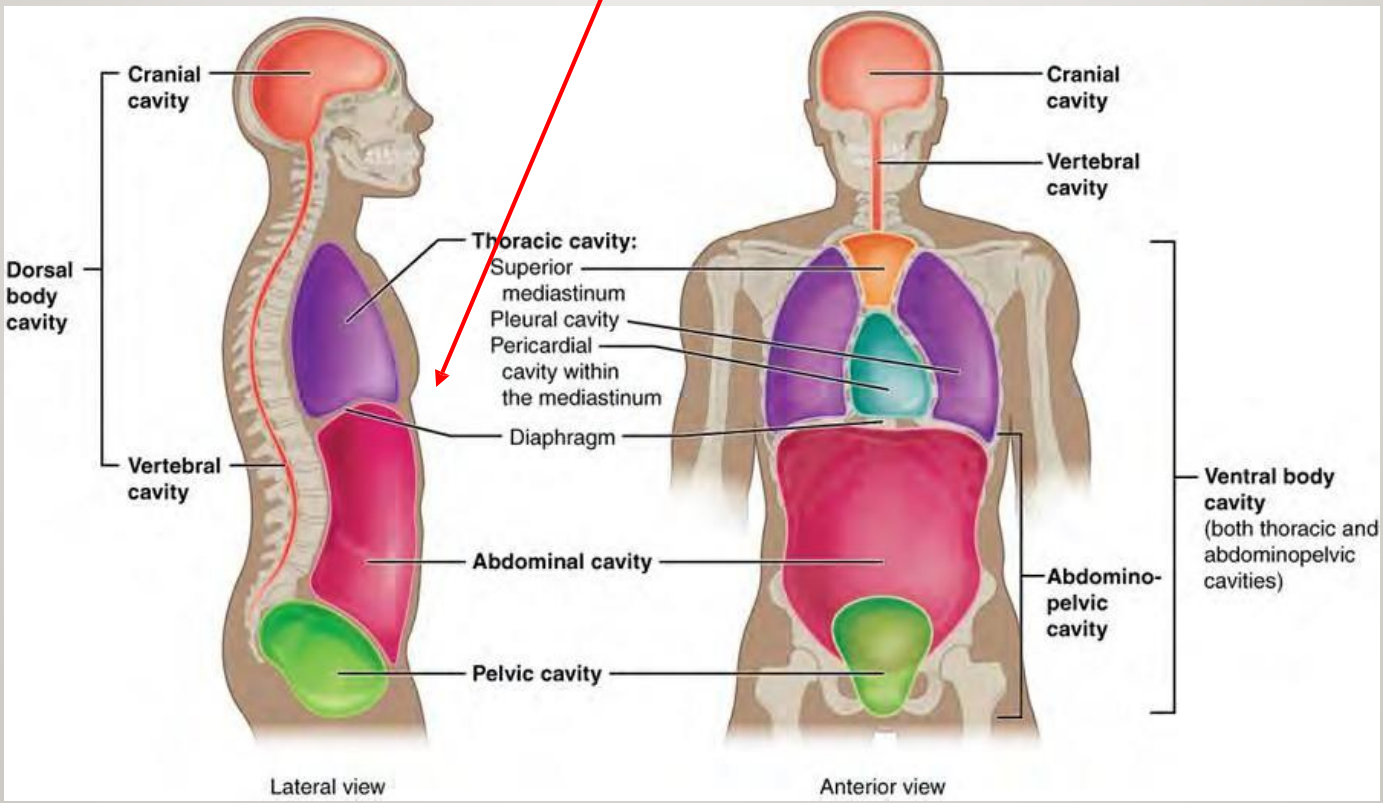
3. Body cavities form during development, as solid masses of tissue fold inward on themselves, creating pockets in which the organs develop.

4. An example of a body cavity in humans would be the cranial cavity, which houses the brain.

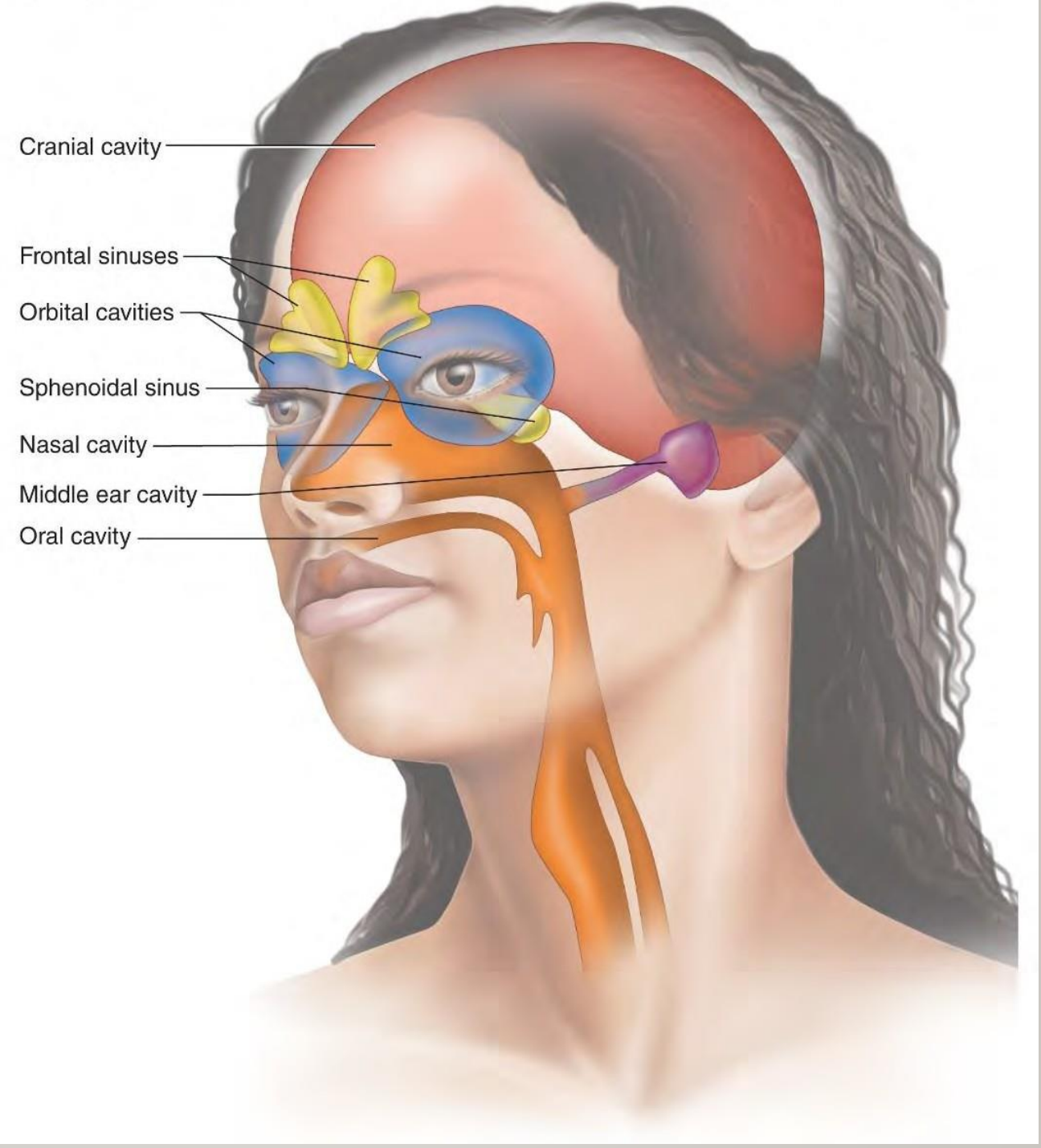
THE HUMAN BODY HAS TWO MAIN BODY CAVITIES

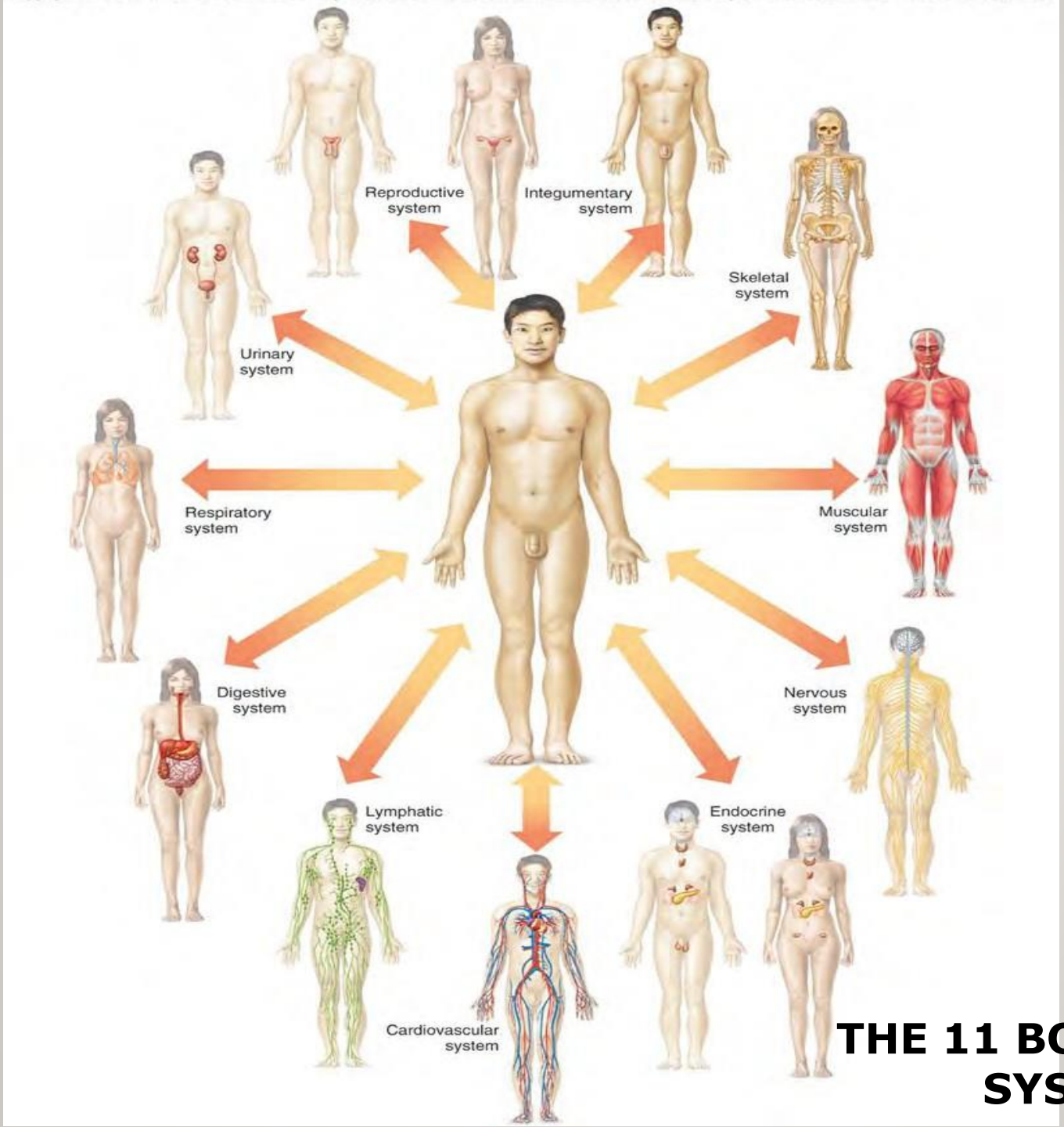
The first, the *ventral cavity*, is a large cavity which sits ventrally to the spine and includes all the organs from your pelvis to your throat.

The first subdivision is the *diaphragm* muscle, which divides the *abdomino-pelvic cavity* from the *thoracic cavity*. This can be seen in the image below.



Smaller cavities within the head include the oral cavity, nasal cavity, orbital cavities (eye sockets) , and middle ear cavities





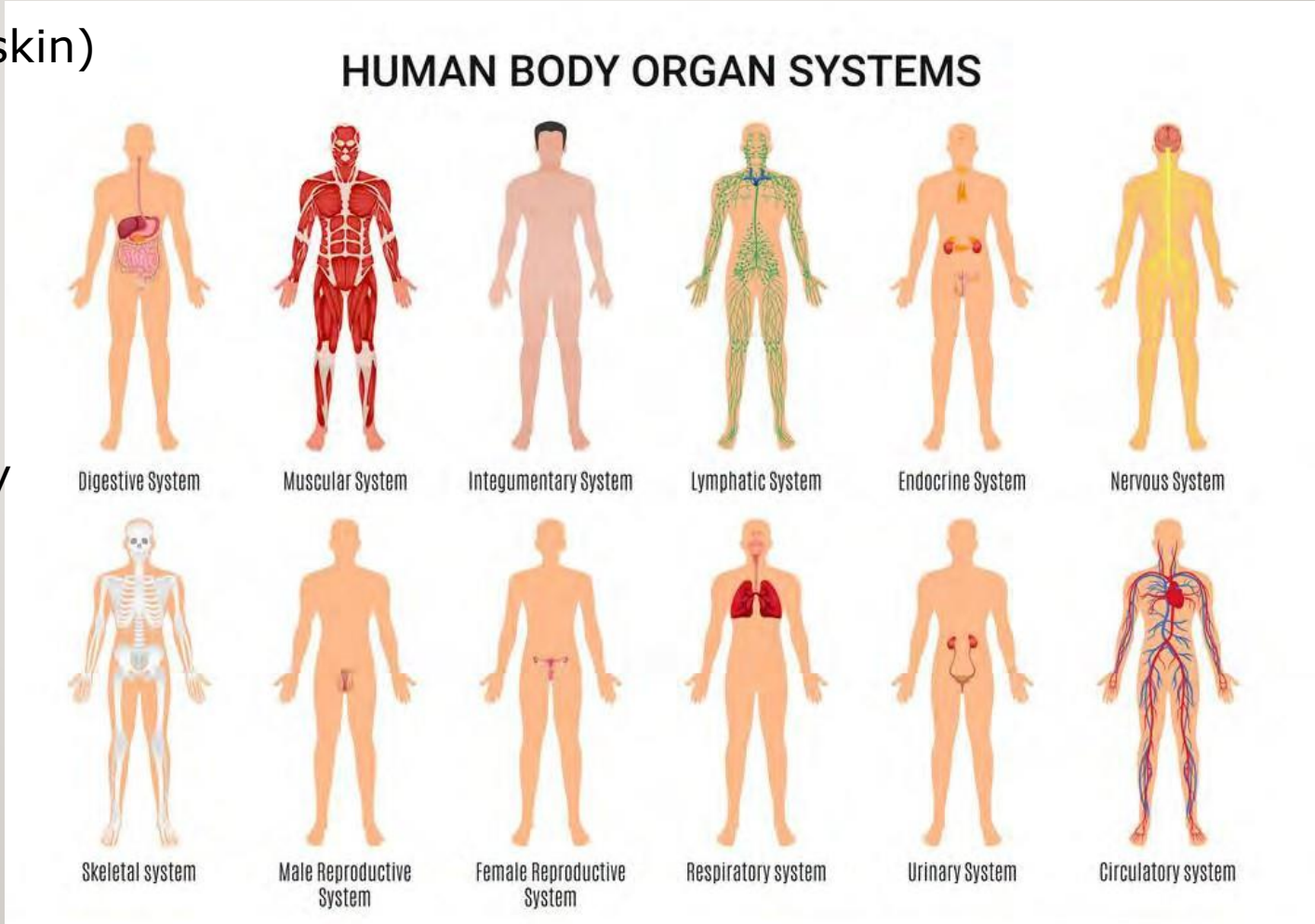
THE 11 BODY (ORGAN) SYSTEMS

When groups of tissues work together, they are called organs. Some examples of organs are the heart, lungs, skin, and stomach.

When organs work together, they are called systems and each one depends, directly or indirectly, on all of the others..

The 11 organ systems of the **body** are:

- Integumentary (skin)
- Muscular
- Skeletal
- Nervous
- Circulatory
- Lymphatic,
- Respiratory
- Endocrine
- Urinary/Excretory
- Reproductive
- Digestive.



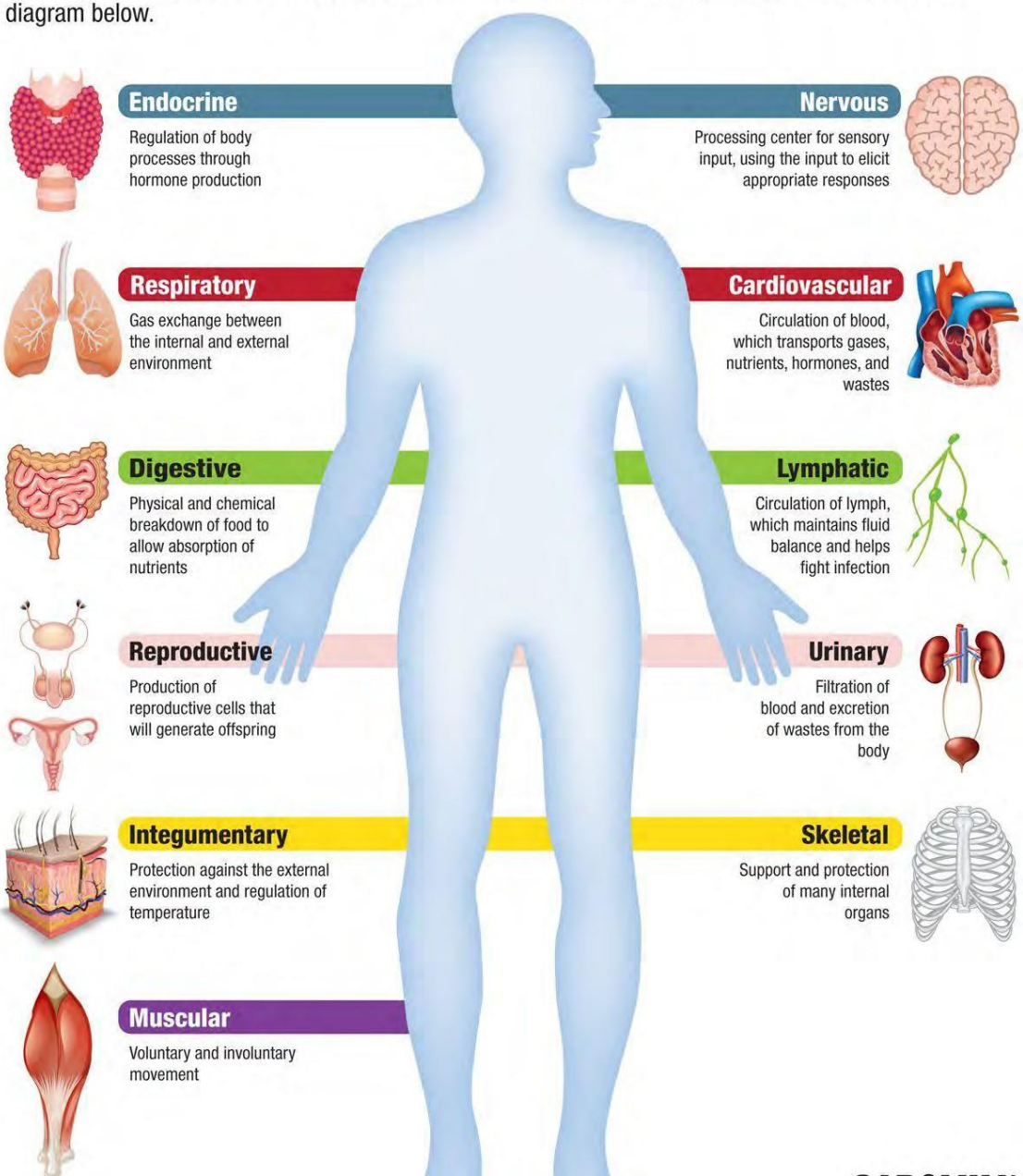
ALL OF YOUR BODY SYSTEMS HAVE TO WORK TOGETHER TO KEEP YOU HEALTHY. IF ANY SYSTEM IN YOUR BODY ISN'T WORKING PROPERLY, OTHER SYSTEMS ARE AFFECTED

- Your **bones and muscles** work together to support and move your body.
- Your **respiratory system** takes in oxygen from the air and gets rid of carbon dioxide.
- Your **digestive system** absorbs water and nutrients from the food you eat.
- Your **circulatory system** carries oxygen, water, and nutrients to cells throughout your body.
- **Wastes from the cells** are eliminated by your respiratory system, excretory system, and skin.
- Your **nervous system** controls all these activities with electrical impulses..

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

Human Body Systems

There are 11 main systems that keep our bodies functioning. Learn the primary roles of each in the diagram below.



Endocrine

Regulation of body processes through hormone production

Nervous

Processing center for sensory input, using the input to elicit appropriate responses

Respiratory

Gas exchange between the internal and external environment

Cardiovascular

Circulation of blood, which transports gases, nutrients, hormones, and wastes

Digestive

Physical and chemical breakdown of food to allow absorption of nutrients

Lymphatic

Circulation of lymph, which maintains fluid balance and helps fight infection

Reproductive

Production of reproductive cells that will generate offspring

Urinary

Filtration of blood and excretion of wastes from the body

Integumentary

Protection against the external environment and regulation of temperature

Skeletal

Support and protection of many internal organs

Muscular

Voluntary and involuntary movement

1) **INTEGUMENTARY SYSTEM (SKIN)**

Forms the external body covering and protects deeper tissues from injury.

Synthesizes vitamin D, and contains cutaneous (pain, pressure, etc.) receptors and sweat and oil glands.

Major Organs
- Skin
- Hair
- Sweat glands
- Nails

Functions
- Protects against environmental hazards
- Helps regulate body temperature
- Provides sensory information

2. SUPPORT AND MOVEMENT

(2 PARTS)

A) The **skeletal system** is made up of bones and ligaments.

It supports, protects, provides frameworks, stores inorganic salts, and houses blood-forming tissues.

Major Organs
- Bones
- Cartilages
- Associated ligaments
- Bone marrow

Functions
- Provides support and protection for other tissues
- Stores calcium and other minerals
- Forms blood cells

B) The **muscular system** consists of the muscles that provide body movement, posture, and body heat.

Major Organs

- Skeletal muscles and associated tendons

Functions

- Provides movement
- Provides protection and support for other tissues
- Generates heat that maintains body temperature

3. INTEGRATION AND COORDINATION (2 PARTS)

A) The **<u>nervous system</u>** consists of the brain, spinal cord, nerves, and sense organs.

It integrates incoming information from receptors and sends impulses to muscles and glands.

Major Organs
- Brain
- Spinal cord
- Peripheral nerves
- Sense organs

Functions
- Directs immediate responses to stimuli
- Coordinates or moderates activities of other organ systems
- Provides and interprets sensory information about external conditions

B) The **endocrine system**, includes the hypothalamus, pituitary, thyroid, parathyroid, pineal, and thymus glands, pancreas, ovaries, and testes, along with other organs that secrete hormones.

It helps to integrate metabolic functions.

Major Organs
- Pituitary gland
- Thyroid gland
- Pancreas
- Adrenal glands
- Gonads
- Endocrine tissues in other systems

Functions
- Directs long-term changes in the activities of other organ systems
- Adjusts metabolic activity and energy use by the body
- Controls many structural and functional changes

4. TRANSPORT (2 PARTS)

A) The **cardiovascular system**, is made up of the heart and blood vessels.

It distributes oxygen, nutrients, and hormones throughout the body while removing wastes from the cells.

Major Organs
- Heart
- Blood
- Blood vessels

Functions
- Distributes blood cells, water and dissolved materials including nutrients, waste products, oxygen, and carbon dioxide
- Distributes heat and assists in control of body temperature

B) The **lymphatic system**, consists of lymphatic vessels, lymph nodes, thymus, and spleen.

It drains excess tissue fluid and includes cells of immunity.

Major Organs
- Spleen
- Thymus
- Lymphatic vessels
- Lymph nodes
- Tonsils

Functions
- Defends against infection and disease
- Returns tissue fluids to the bloodstream

5. ABSORPTION AND EXCRETION (3 PARTS)

A) The **digestive system** is made up of the mouth, esophagus, stomach, intestines, and accessory organs.

It receives, breaks down, and absorbs nutrients.

Major Organs
- Teeth
- Tongue
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Liver
- Gallbladder
- Pancreas

Functions
- Processes and digests food
- Absorbs and conserves water
- Absorbs nutrients
- Stores energy reserves

B) THE **RESPIRATORY SYSTEM** EXCHANGES OXYGEN AND CARBON DIOXIDE BETWEEN THE BLOOD AND AIR AND IS MADE UP OF THE LUNGS AND PASSAGEWAYS.

Major Organs
- Nasal cavities
- Sinuses
- Larynx
- Trachea
- Bronchi
- Lungs
- Alveoli

Functions
- Delivers air to alveoli (sites in lungs where gas exchange occurs)
- Provides oxygen to bloodstream
- Removes carbon dioxide from bloodstream
- Produces sounds for communication

C) The **Urinary system**, consists of the kidneys, ureters, bladder, and urethra.

It removes wastes from the blood and helps to maintain water and electrolyte balance.

Major Organs
- Kidneys
- Ureters
- Urinary bladder
- Urethra

Functions
- Excretes waste products from the blood
- Controls water balance by regulating volume of urine produced
- Stores urine prior to voluntary elimination
- Regulates blood ion concentrations and pH

6) THE **REPRODUCTIVE SYSTEM**

PRODUCES NEW ORGANISMS.

A)The male reproductive system consists of the testes, penis, accessory organs, and vessels that produce and conduct sperm to the female reproductive tract.

B)The female reproductive system consists of ovaries, uterine tubes, uterus, vagina, and external genitalia.

She produces egg cells and also houses the developing baby.

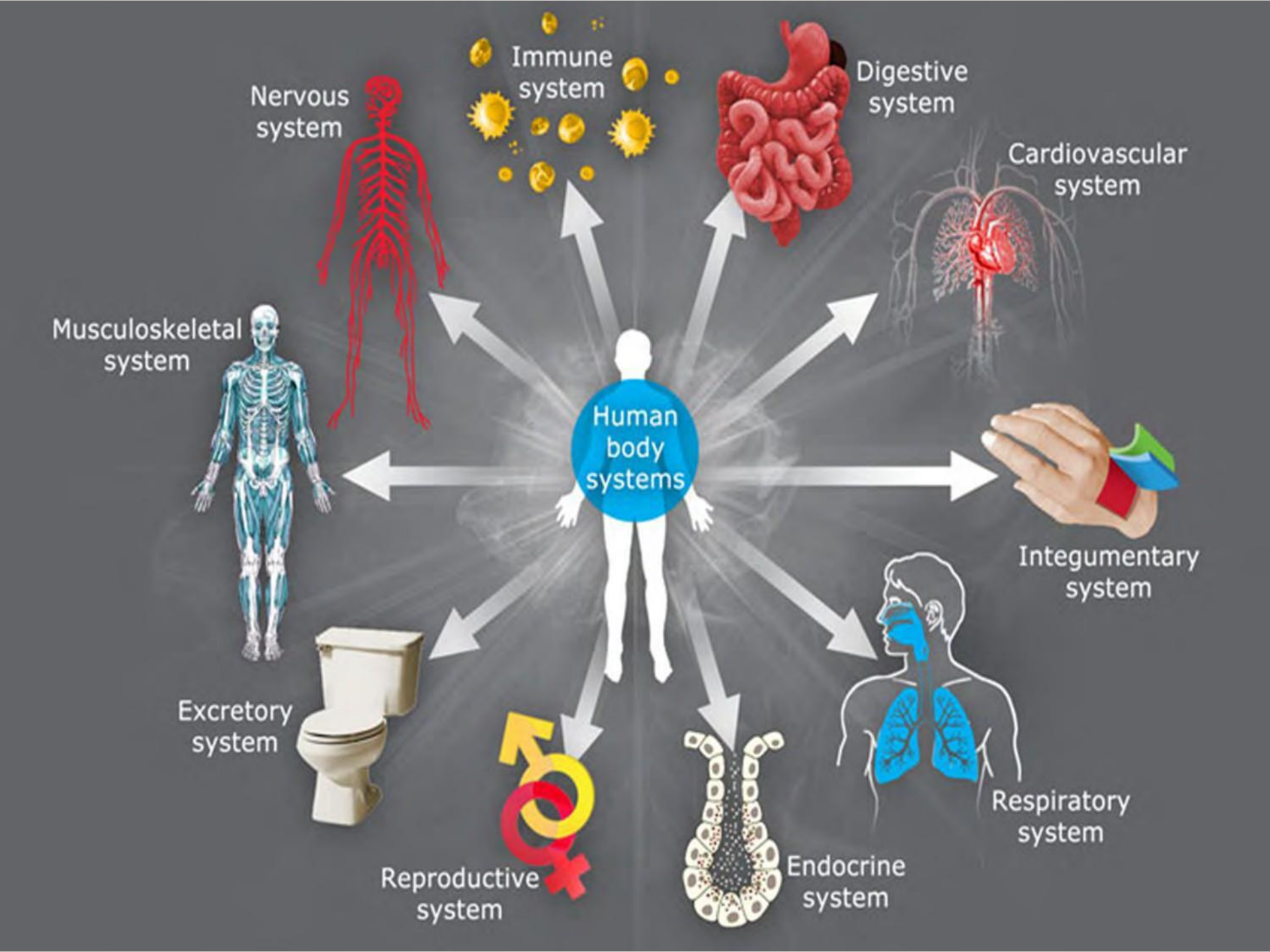
5 minute video
https://www.youtube.com/watch?v=Ae4MadKPJC0

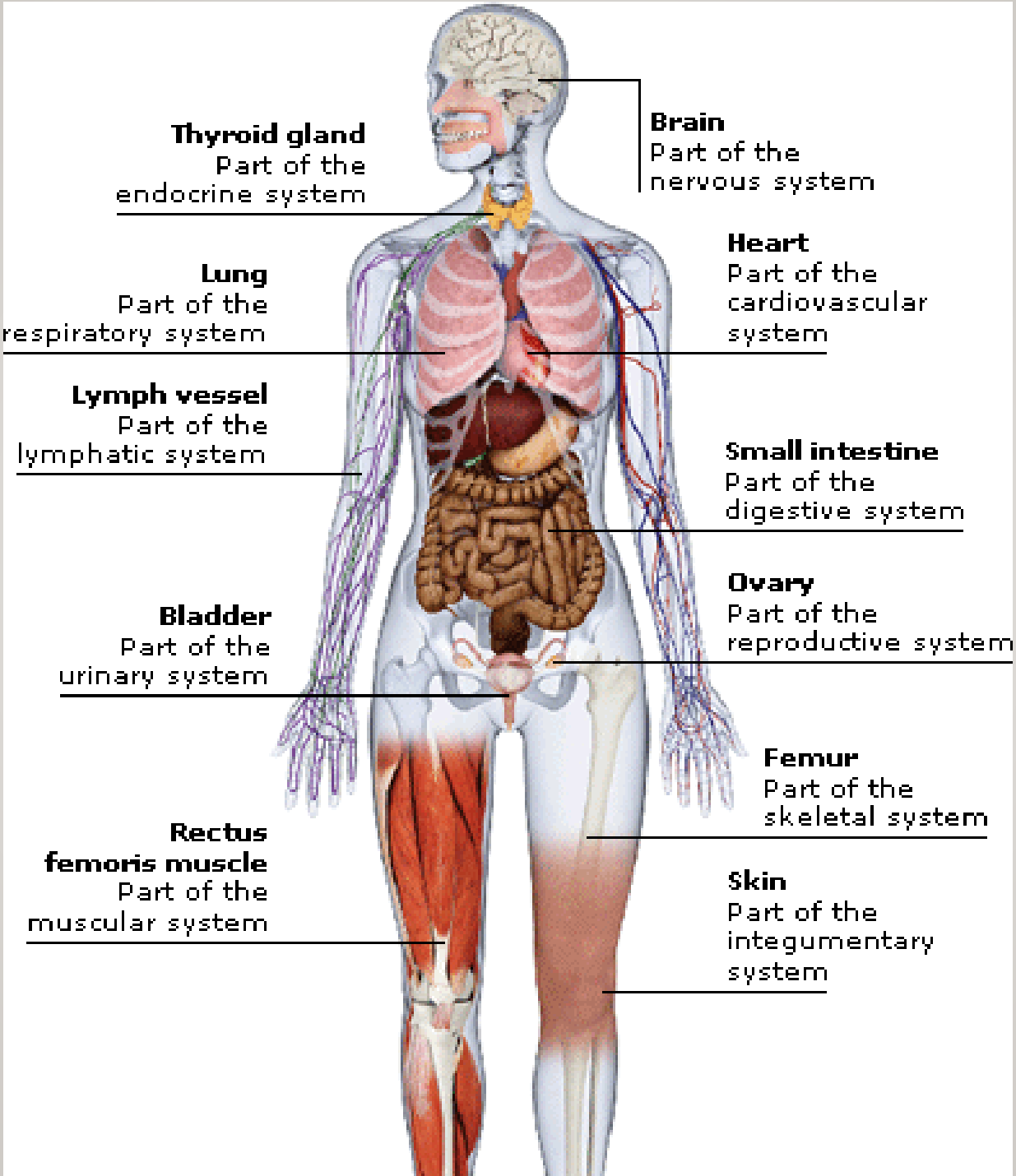
Major Organs
- Testes
- Epididymides
- Ductus deferentia
- Seminal vesicles
- Prostate gland
- Penis
- Scrotum

Functions
- Produces male sex cells (sperm), seminal fluids, and hormones
- Sexual intercourse

Major Organs
- Ovaries
- Uterine tubes
- Uterus
- Vagina
- Labia
- Clitoris
- Mammary glands

Functions
- Produces female sex cells (oocytes) and hormones
- Supports developing embryo from conception to delivery
- Provides milk to nourish newborn infant
- Sexual intercourse


Nervous system
Immune system
Digestive system
Cardiovascular system
Musculoskeletal system
Human body systems
Integumentary system
Excretory system
Reproductive system
Endocrine system
Respiratory system


Brain
Part of the nervous system
Thyroid gland
Part of the endocrine system
Heart
Part of the cardiovascular system
Lung
Part of the respiratory system
Small intestine
Part of the digestive system
Lymph vessel
Part of the lymphatic system
Ovary
Part of the reproductive system
Bladder
Part of the urinary system
Femur
Part of the skeletal system
Rectus femoris muscle
Part of the muscular system
Skin
Part of the integumentary system

THANK YOU