

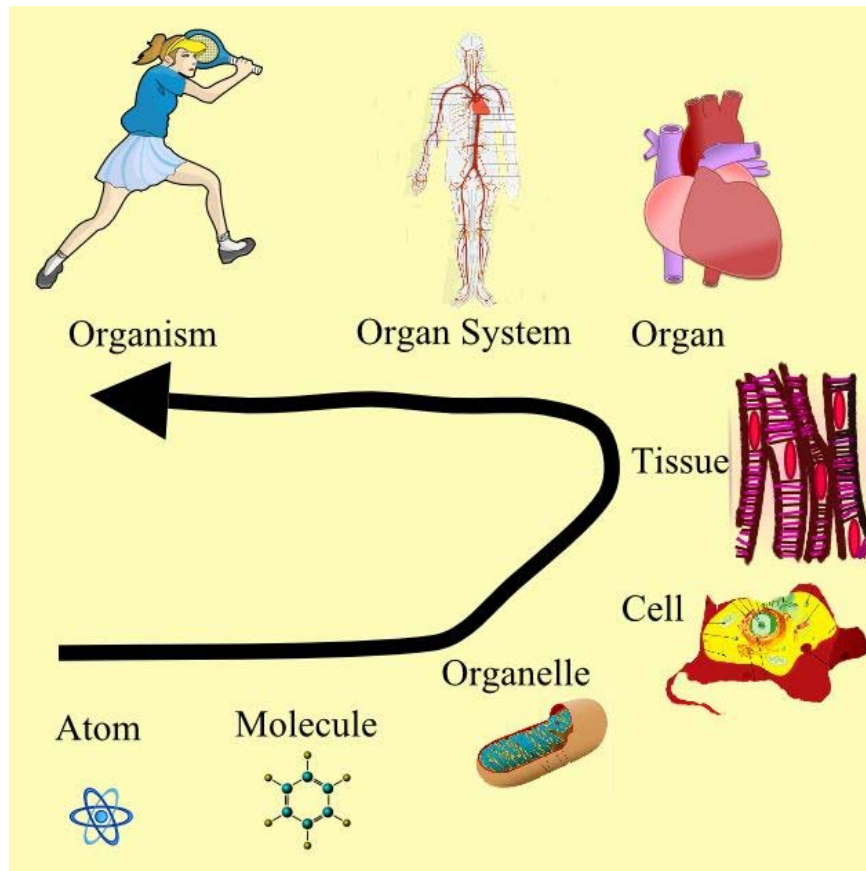
Levels of Organization in the Human Body



Science Prof Online

Online Education Resources

Levels of Organization in the Human Body



- **Multi-cellular**

- the cell is the basic functional unit of the human body and each human body have around 100 trillion cells

- **Specialization of cell form**

- a red blood cell is basically a donut-shaped bag of hemoglobin with no nucleus while a muscle cell is a very long, thin cell with more than one nucleus

- **Increases efficiency of overall function**

- a muscle cell doesn't need to waste energy roaming around the body looking for oxygen because a red blood cells delivers oxygen directly to its door.

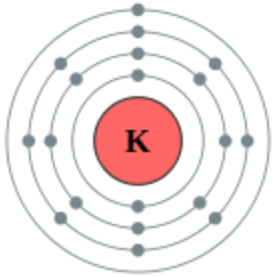


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How is the human body organized?

Chemical Level

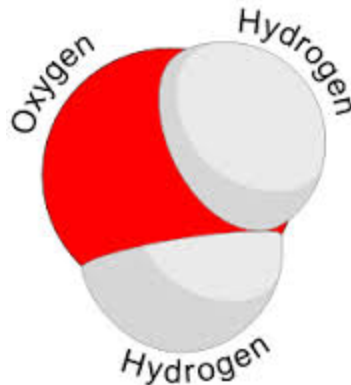
Inorganic



Potassium model. [Wikipedia](#)

- the body's organization starts at the atomic level
 - some important elemental ions include potassium, sodium, chloride, and calcium

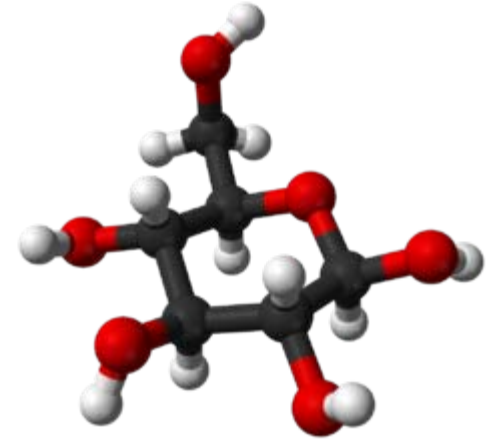
- Atoms bond to form molecules. There are two major types of molecules in the body.
 - inorganic molecules such as water are critical for life.



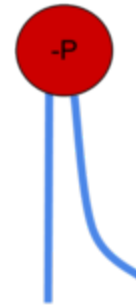
Water model.. [Wikimedia](#).

Organic

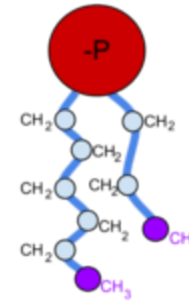
- Organic molecules make up the majority of chemicals found in the body.
 - all have carbon, hydrogen and oxygen



Glucose model. [Wikipedia](#).



A phospholipid with a hydrophilic head and a hydrophobic tail

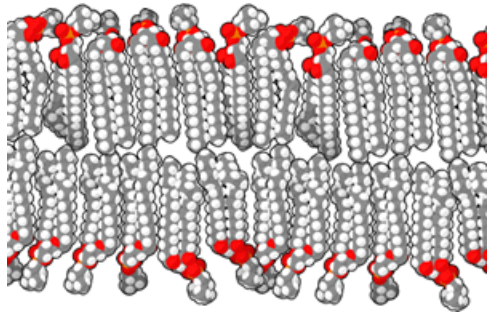


Chemical makeup of a

- Glucose, shown above is a simple sugar that is vital for energy use in cells.
- Phospholipids, left, are a major component of all cell membranes

Phospholipid models. [Wikipedia](#).

Organelle Level



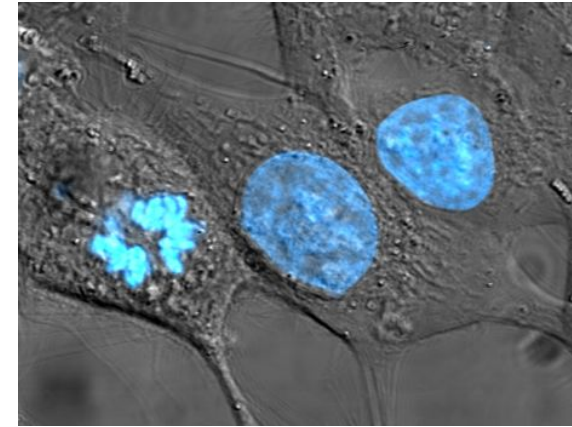
Cell membrane. [Wikipedia.](#)



- Organelles are special subunits of the cell that perform specific functions

- all human cells have a cell membrane but there are NO cell walls

- the majority of human cells also have at least one nucleus-shown to the right in blue



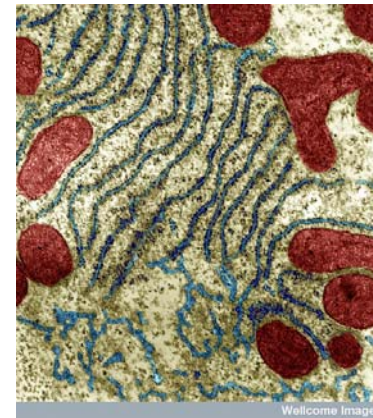
HeLa cells with nuclei stained. [Wikipedia.](#)

- The organelle responsible for producing cell energy is the mitochondria pictured here in blue.

- The surrounding gold colored substance is cytoplasm



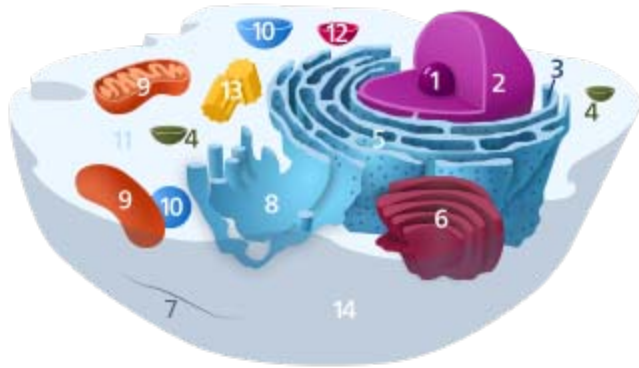
Mitochondria and cytoplasm. [Wellcome Library](#)



Rough E.R. and vacuoles. [Wellcome Library](#)

- Here you see long blue endoplasmic reticulum that has small knob-shaped ribosomes attached and dark red vacuoles.

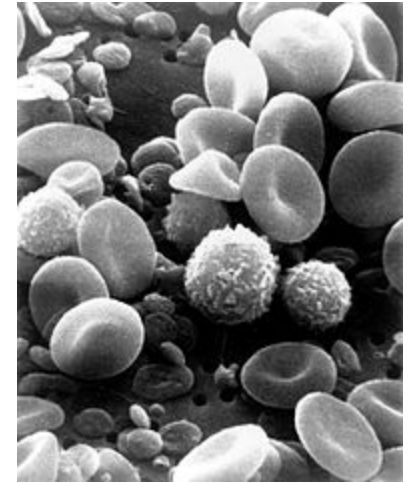
Cellular Level



Generalized animal cell. [Wikipedia.](#)

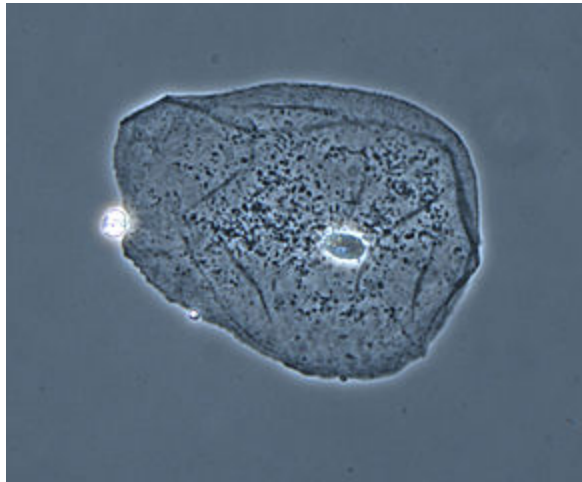
- A bundle of organelles all working together inside a membrane is called a cell.
 - the cell diagram to the left depicts a generalized animal cell. This cell has all of the organelles a cell could have and does not actually exist in the human body

- To the right is a micrograph of several different blood cell types.
 - Notice the different shapes. Each cell type has a different function



Blood cells. [Wikipedia.](#)

- This cell comes from the inside of the cheek. Notice the flat, thin shape. This cell protects the inside of the mouth



Cheek Squamous cell. [Wikipedia](#)



Newly fertilized human egg. [Wellcome Library.](#)

- Remember that all of the cells in the human body originate from this type of cell; the fertilized egg.

Tissue Level

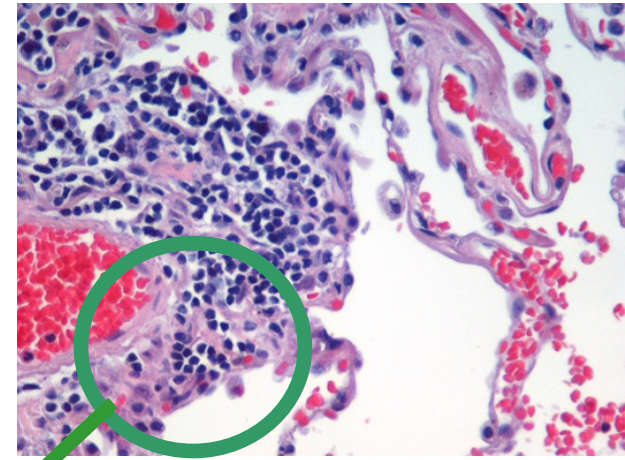


Striated Muscle. SPO.

•When cells are close in proximity, are similar, and help each other do a common task they are called tissue.

-There are four major tissue types in the human body:

- *muscular
- *epithelial
- *connective
- *nervous



Lung Tissue. [Wikipedia](#)

Muscular Tissue contracts

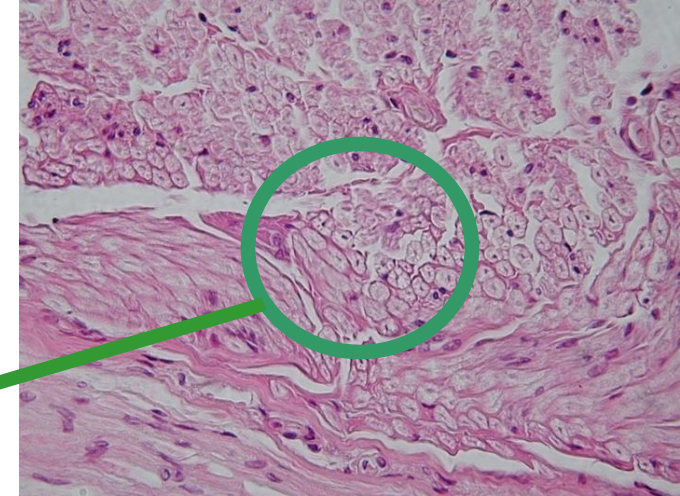
Epithelial Tissue lines and covers surfaces

Connective Tissue binds and supports

Nervous Tissue conducts signals



Human Hair follicle. [Wellcome Library](#)

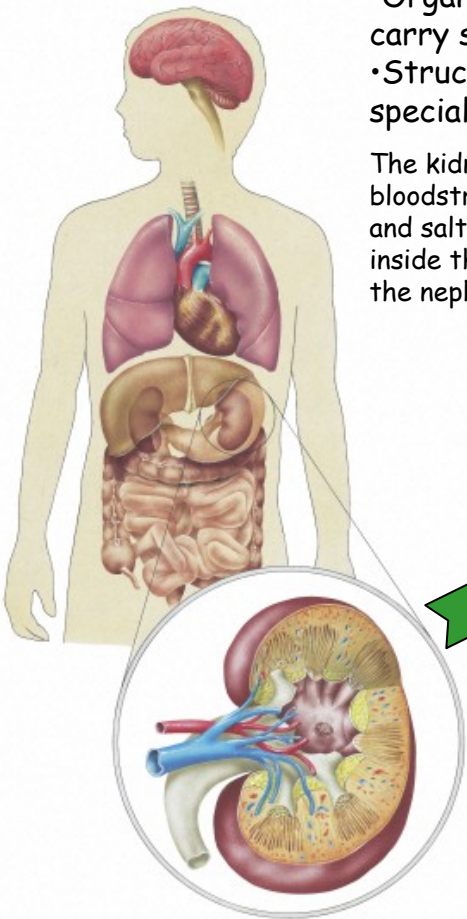


Peripheral nervous Tissue. [Wikipedia](#)

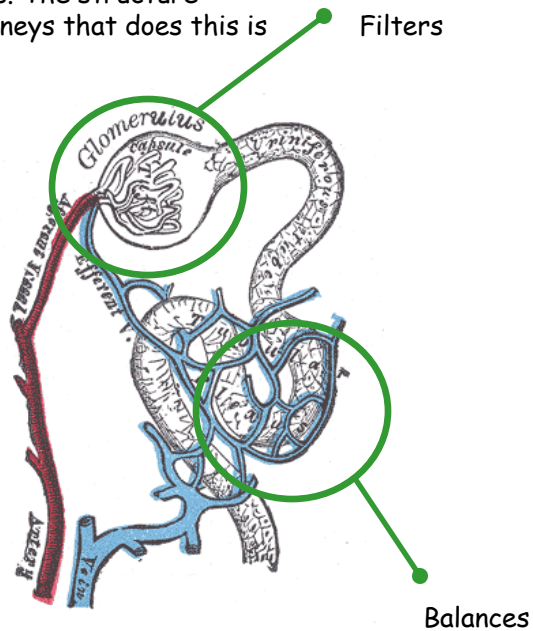
Organ Level

- Most organs in the human body are made up of all four tissue types.
- Organs have definite form and structure and carry specific complex functions
- Structures within an organ can be even more specialized in their function

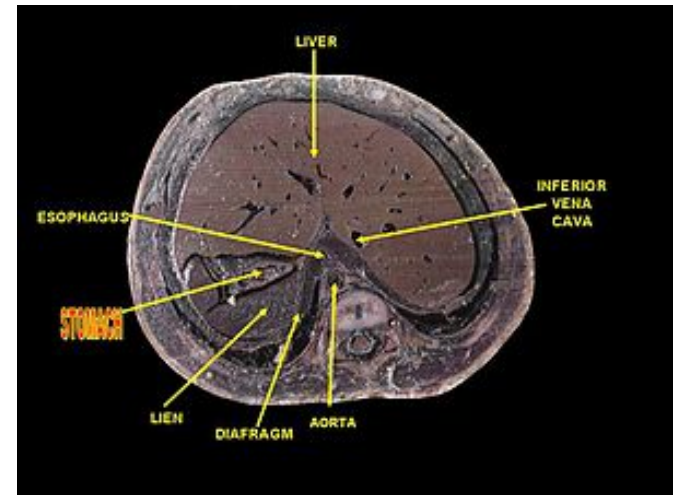
The kidney filters waste from the bloodstream and balances water and salt levels. The structure inside the kidneys that does this is the nephron



Wellcome Images

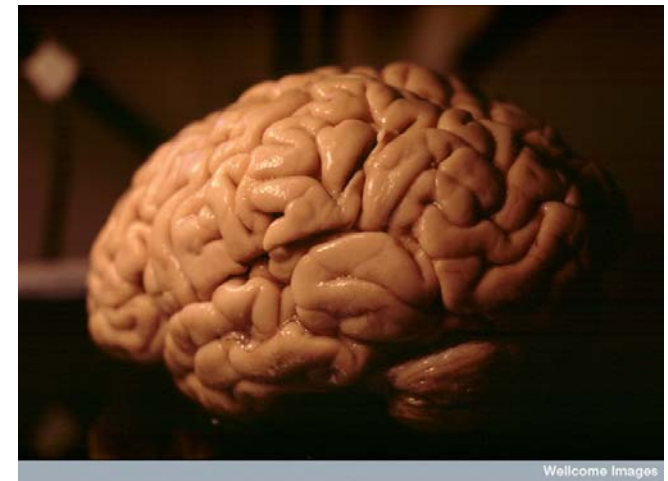


Nephron diagram. [Wikipedia.](#)



Liver, esophagus, inferior vena cava. [Wikipedia.](#)

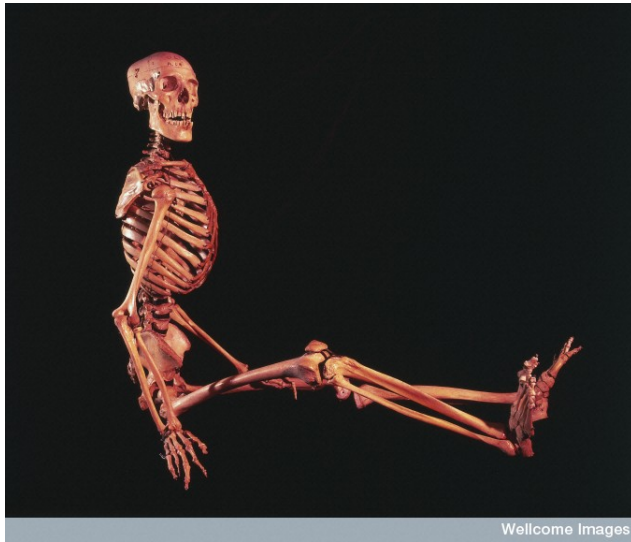
The liver regulates most chemical levels and excretes bile for the digestive system



Human brain. [Wellcome Library.](#)

The most complicated 3 pounds of organ in the human body

Organ System Level



Wellcome Images

Human skeletal system. [Wellcome Library](#).

- Organs that work closely together to accomplish a common purpose are collectively called an organ system.
- There are 11 to 13 different organ systems in the human body,. The number depends on which text or anatomist you are consulting



Wellcome Images

Human central nervous system. MRI. [Wellcome Library](#)

- Each bone of the skeletal system is considered a separate organ.

- Only a small portion of the miles of vessels contained in the cardiovascular system are shown here.



Cardiovascular system portion. [Wikipedia](#).

- Through MRI false-color imaging we can see the brain and a portion of the spinal cord belonging to the central nervous system

Organism

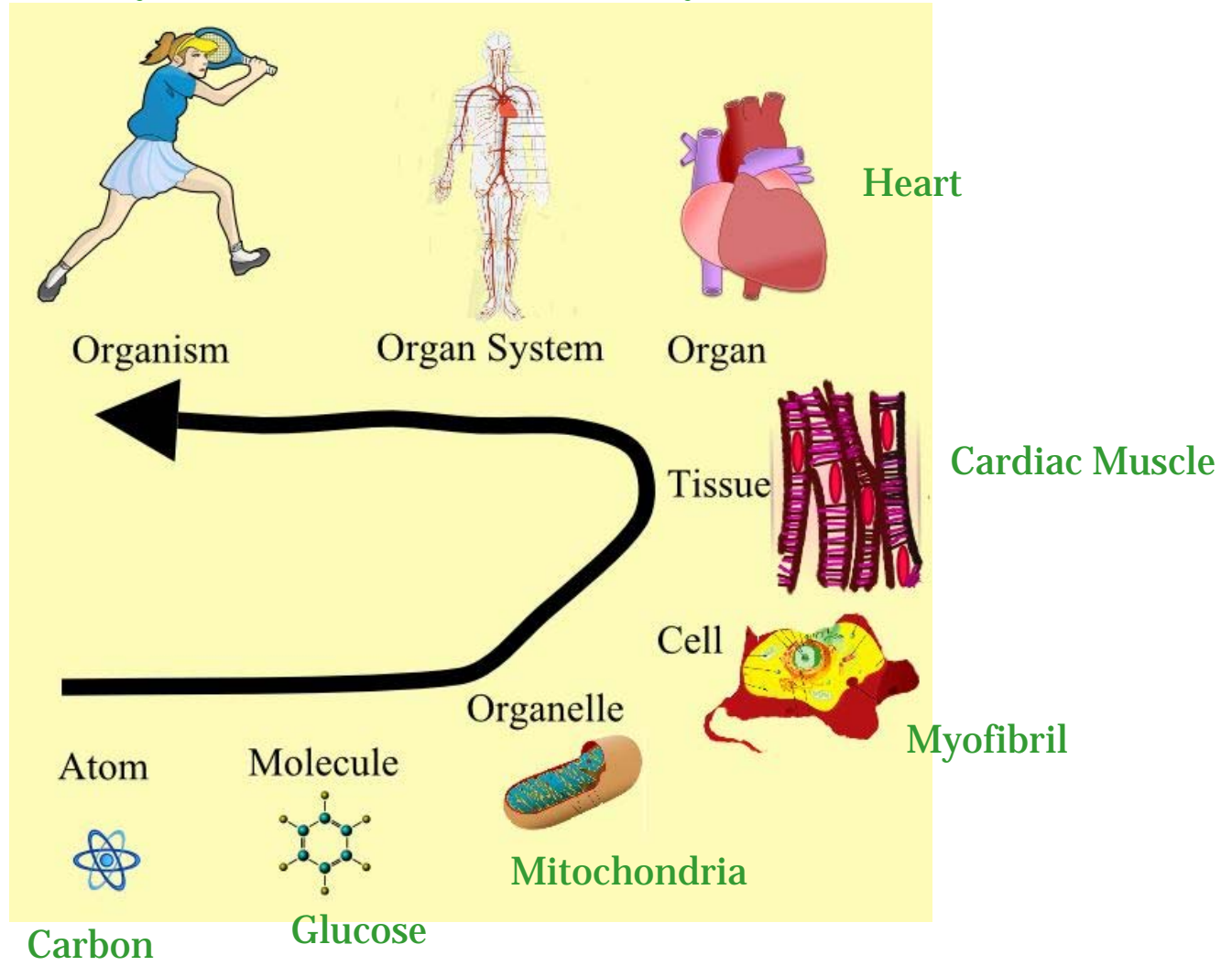


Humans. Serif Photo collection.

Example

Tennis Player

Cardiovascular System





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