

THE ORGANISATION OF THE HUMAN BODY

PEOPLE AND HEALTH

ORGANISATION OF LIVING MATTER

Subatomic level

- Protons, neutrons and electrons

Atomic level

- Bioelements

Molecular level

- Inorganic and organic biomolecules. **Virus**

Cellular level

- Capacity to perform vital functions

Organism level

- Tissues, organs, apparatus and systems

Population level

- Organisms from the same species sharing a particular area

Community level

- Different species populations inhabiting the same environment

Ecosystem level

- Including the relations between biotic and abiotic factors

Biosphere level

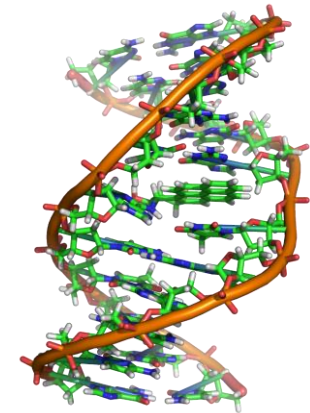
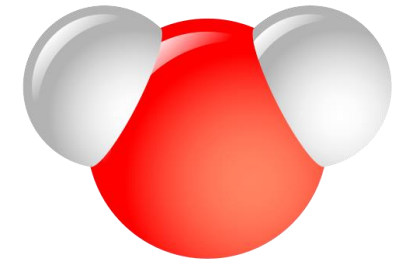
- All the living beings and all the places where they live

ATOMIC LEVEL

1 H Hydrogen 1.008																	2 He Helium 4.003	
3 Li Lithium 6.94	4 Be Beryllium 9.012																	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305																	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.922	34 Se Selenium 78.97	35 Br Bromine 79.904	36 Kr Krypton 83.798	
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium [97]	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	53 Te Tellurium 127.60	53 I Iodine 126.904	54 Xe Xenon 131.293	
55 Cs Cesium 132.905	56 Ba Barium 137.327	* 57 - 70	71 Lu Lutetium 174.967	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	78 Ir Iridium 192.217	79 Pt Platinum 195.084	80 Au Gold 196.997	81 Hg Mercury 200.592	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [209]	85 At Astatine [210]	86 Rn Radon [222]
87 Fr Francium [223]	88 Ra Radium [226]	** 89 - 102	103 Lr Lawrencium [262]	104 Rf Rutherfordium [267]	105 Db Dubnium [270]	106 Sg Seaborgium [269]	107 Bh Bohrium [270]	108 Hs Hassium [270]	109 Mt Meitnerium [278]	110 Ds Darmstadtium [281]	111 Rg Roentgenium [281]	112 Cn Copernicium [285]	113 Nh Nihonium [286]	114 Fl Flerovium [289]	115 Mc Moscovium [289]	116 Lv Livermorium [293]	117 Ts Tennessine [293]	118 Og Oganesson [294]

MOLECULAR LEVEL

- The combination of bioelements made up biomolecules
 - **Inorganic biomolecules:**
 - Water
 - Minerals
 - **Organic biomolecules:**
 - Carbohydrates
 - Lipids
 - Proteins
 - Nucleic acids



CELLULAR LEVEL

- **Cell theory**

- All living organisms are composed of one or more cells
- The cell is the most basic unit of life
- All cells arise only from pre-existing cells



CELLULAR LEVEL

- **Eukaryotic cell basic structures**

- Membrane:

- Layer that isolates cell from the environment and controls the entrance and release of substances

- Cytoplasm:

- A fluid where the most of the chemical reactions take place

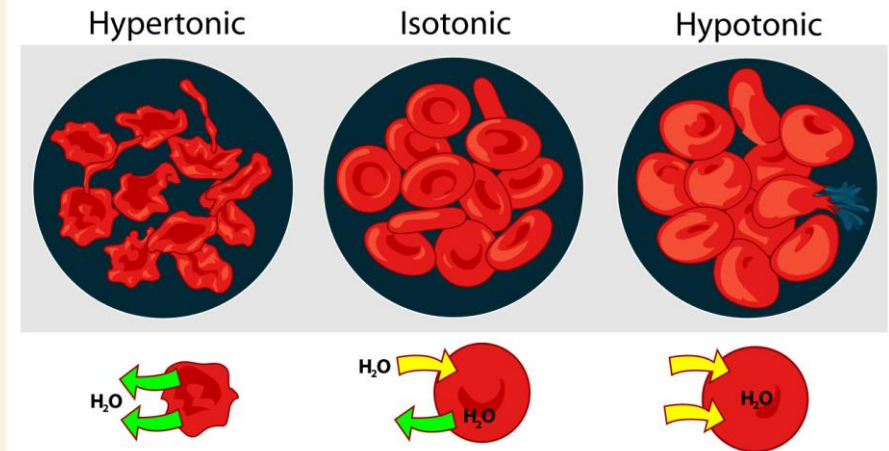
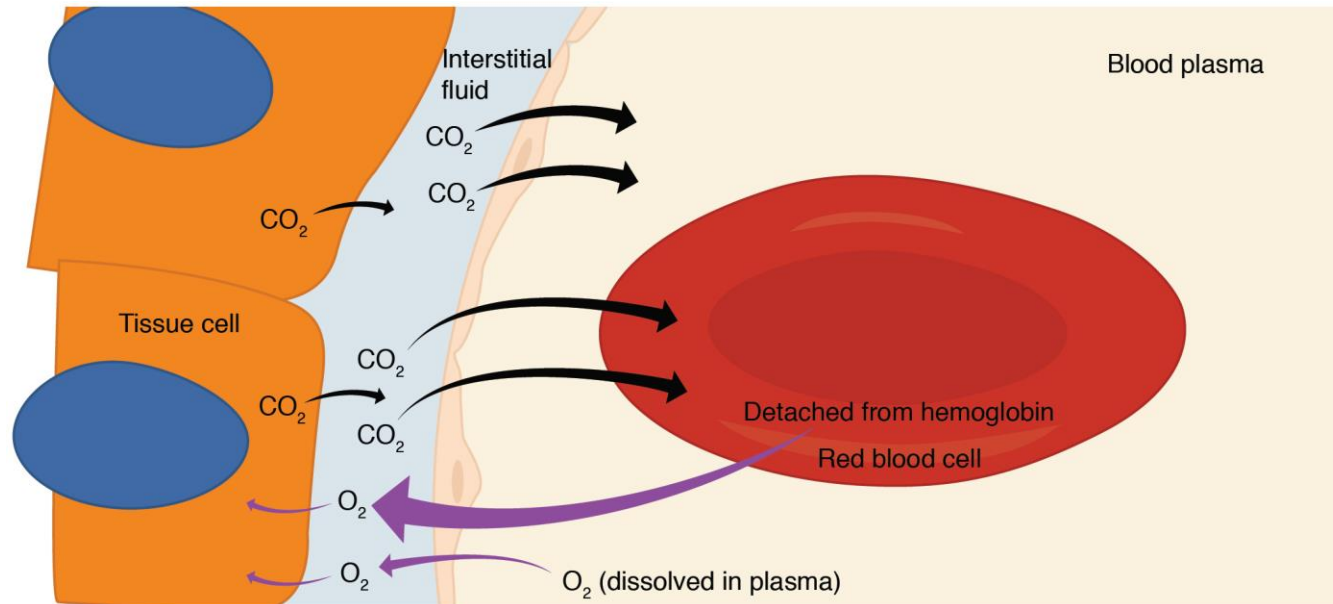
- Nucleus:

- The place where the genetic information is kept

TRANSPORTATION THROUGH THE MEMBRANE

- The cell membrane is semipermeable, only allowing the passage of some substances
 - **Diffusion:**
 - Small molecules passage (e.g. oxygen, carbon dioxide)
 - From the higher to the lower concentration place
 - **Osmosis:**
 - Water passage
 - Based on tonicity differences

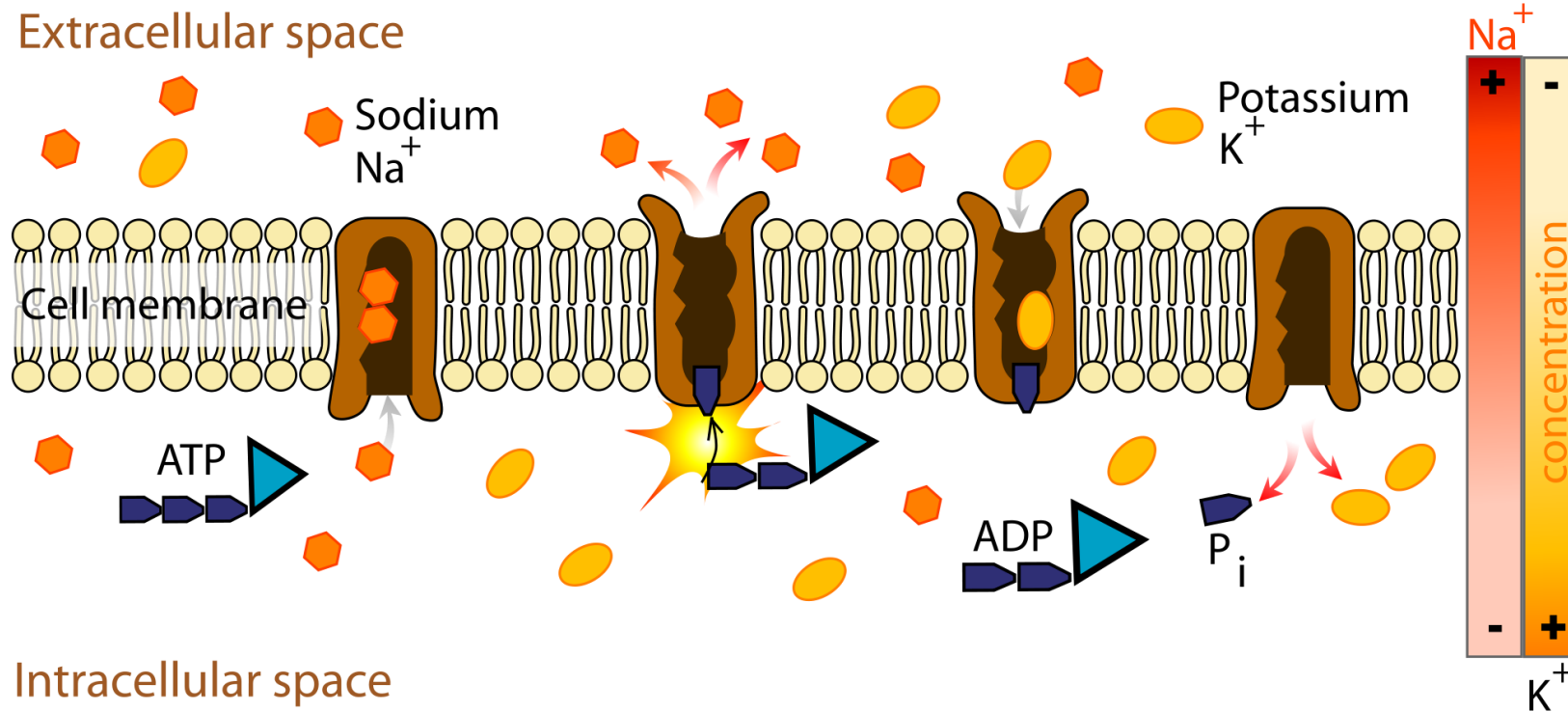
DIFFUSION & OSMOSIS



TRANSPORTATION THROUGH THE MEMBRANE

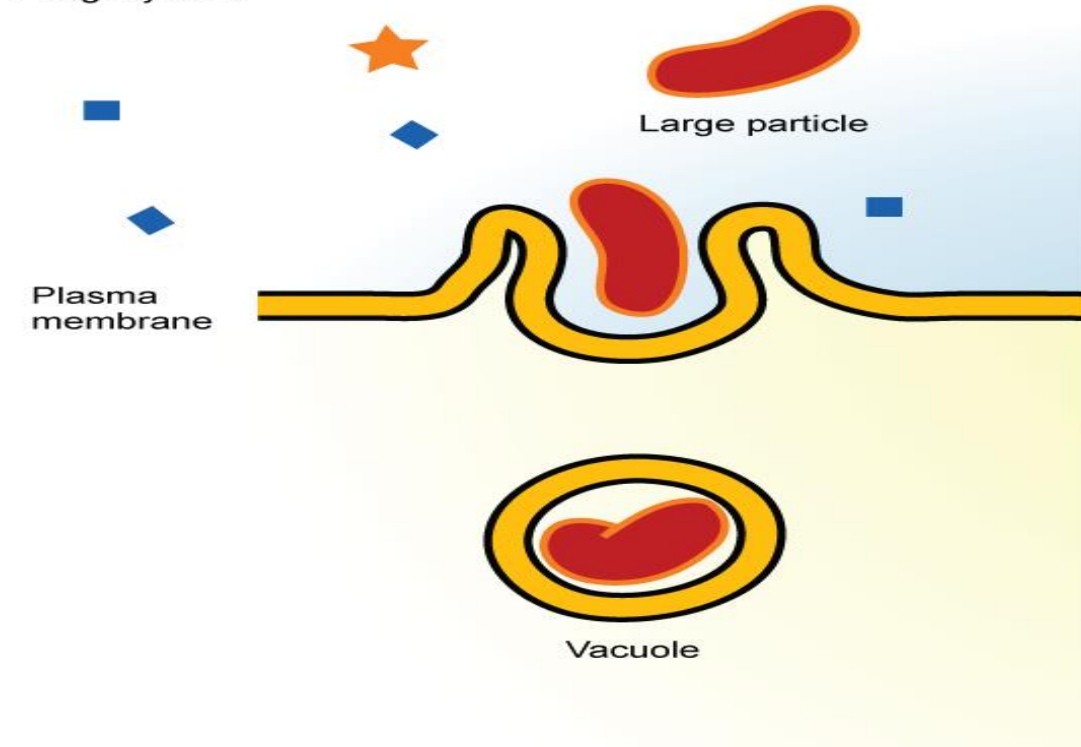
- **Active transport:**
 - Substances transportation using energy (ATP)
 - From the lower to the higher concentration place
- **Endocytosis / Exocytosis:**
 - Large particles incorporation or expulsion using vesicles

ACTIVE TRANSPORT

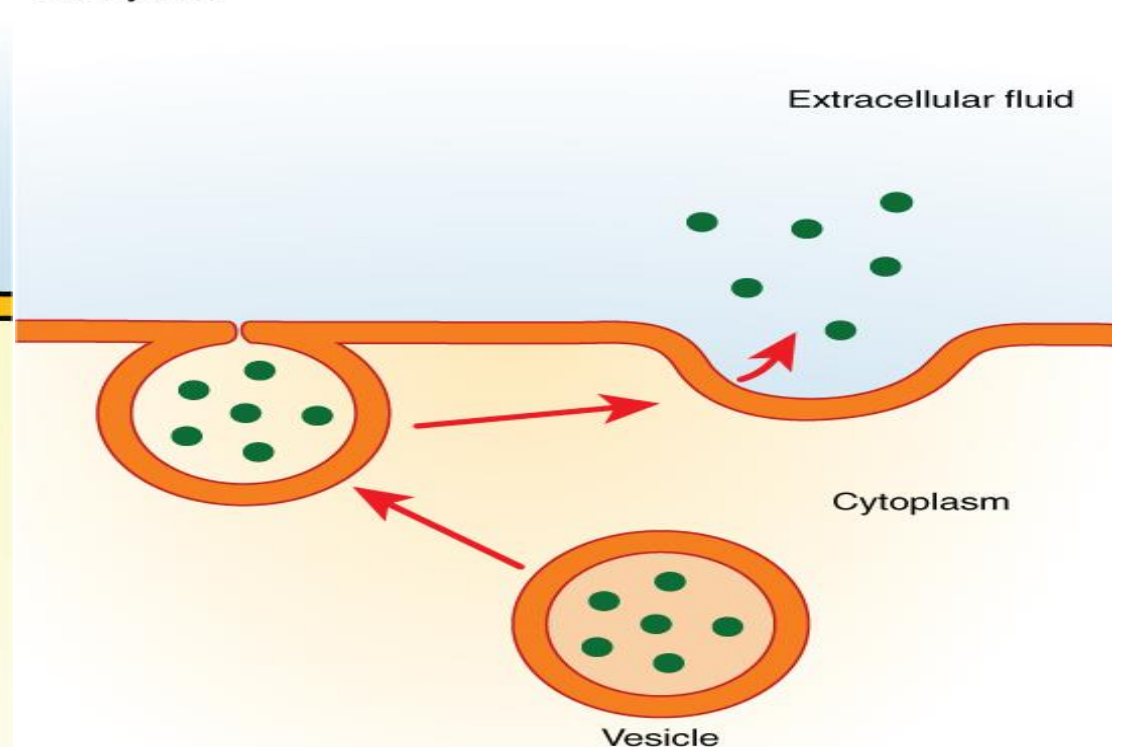


ENDOCYTOSIS & EXOCYTOSIS

Phagocytosis



Exocytosis



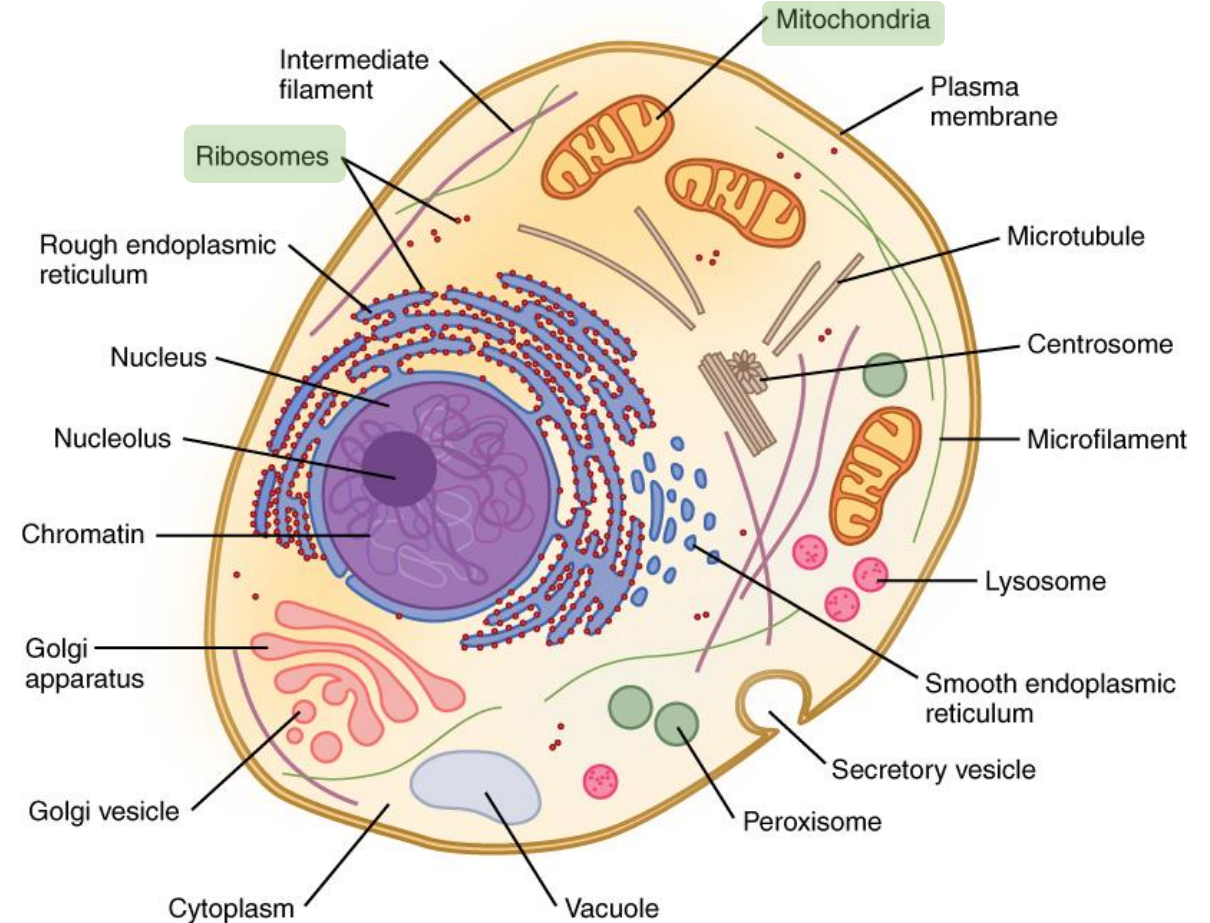
CYTOPLASMIC ORGANELLES

- **Mitochondrion:**

- Double membraned
- It obtains energy via cell respiration.

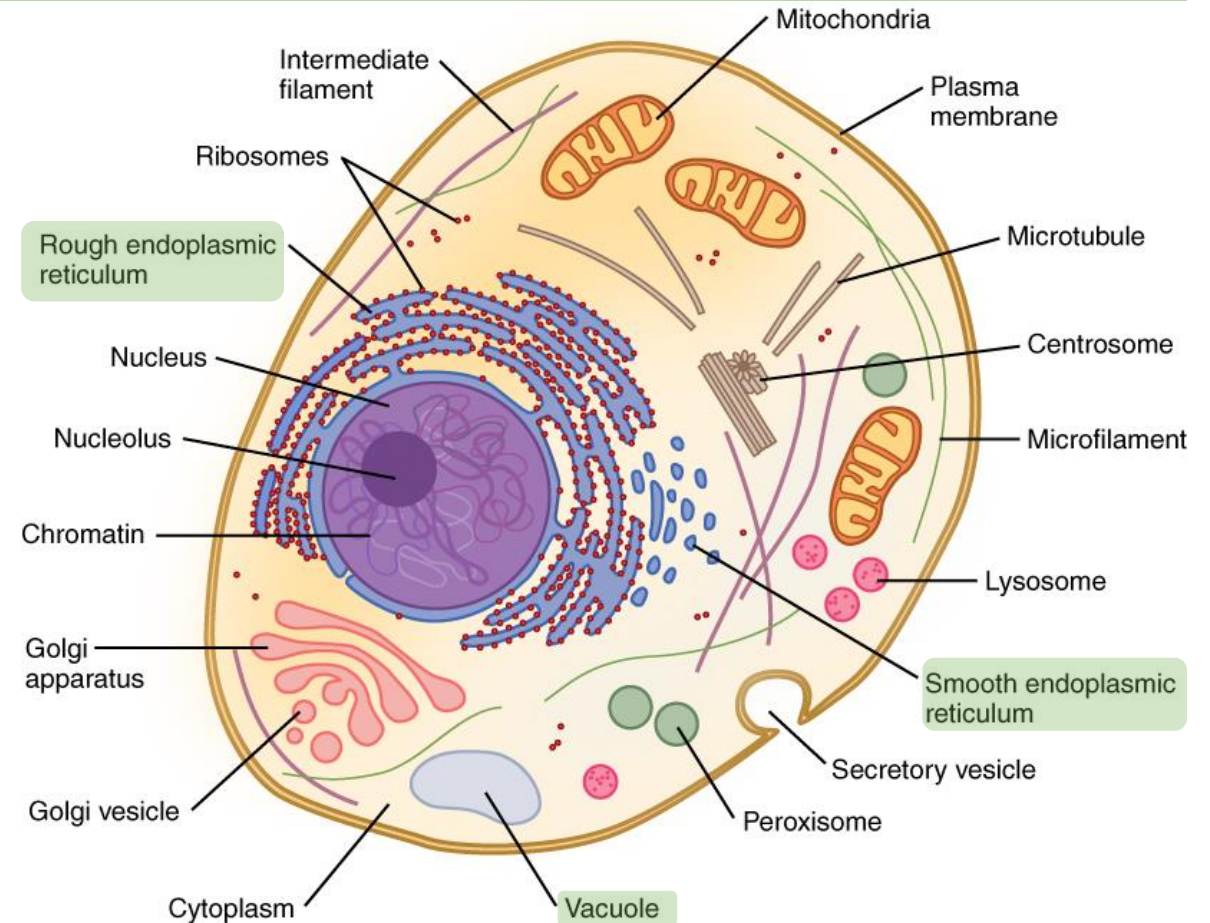
- **Ribosome:**

- Made of RNA and proteins
- Free in the cytoplasm or attach to the Endoplasmic Reticulum
- It synthesises proteins



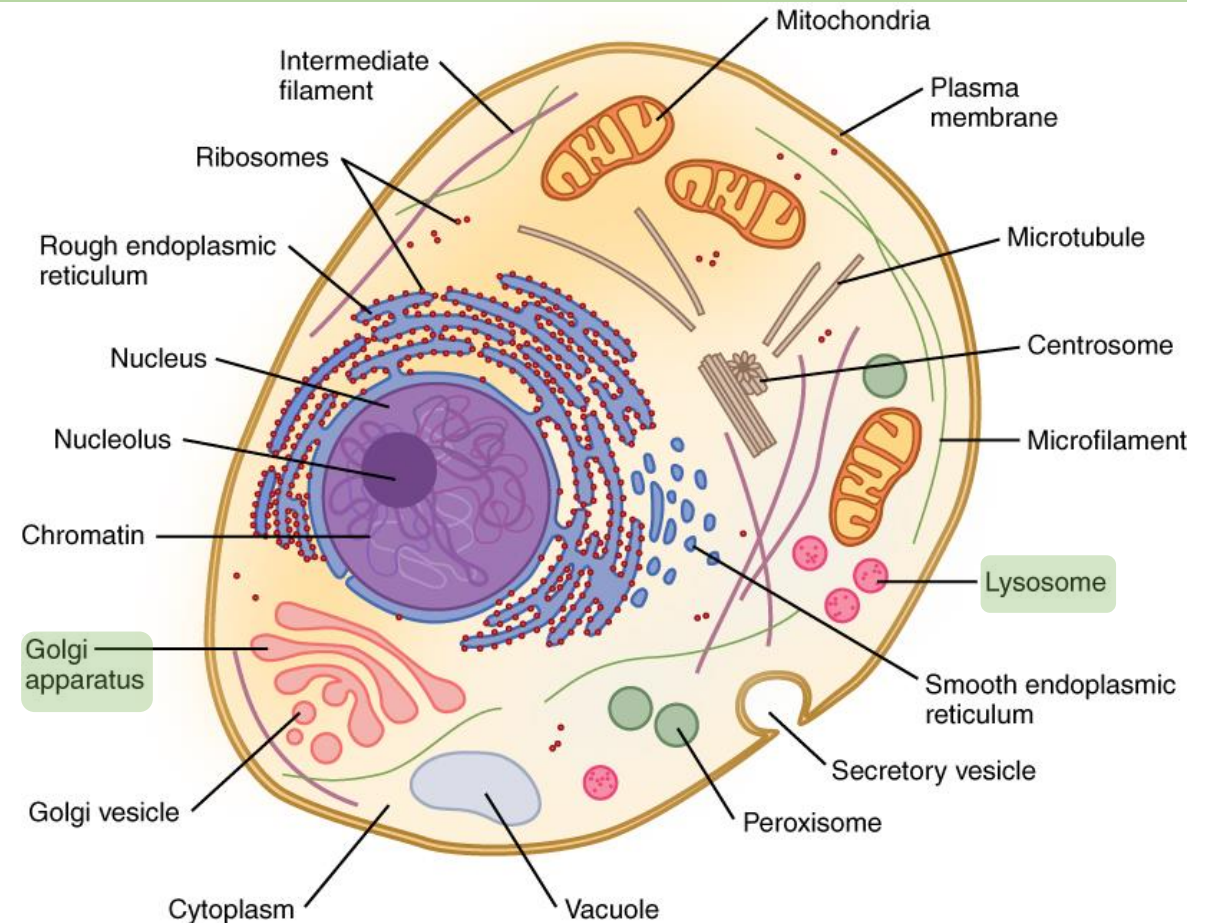
CYTOPLASMIC ORGANELLES

- **Vacuole:**
 - Vesicle that stores different types of substances
- **Endoplasmic reticulum:**
 - Smooth ER manufactures lipids and detoxifies the cell.
 - Rough ER manufactures and stores proteins.



CYTOPLASMIC ORGANELLES

- **Lysosome:**
 - It performs the digestion of large molecules.
- **Golgi apparatus:**
 - It processes proteins and creates membranes.



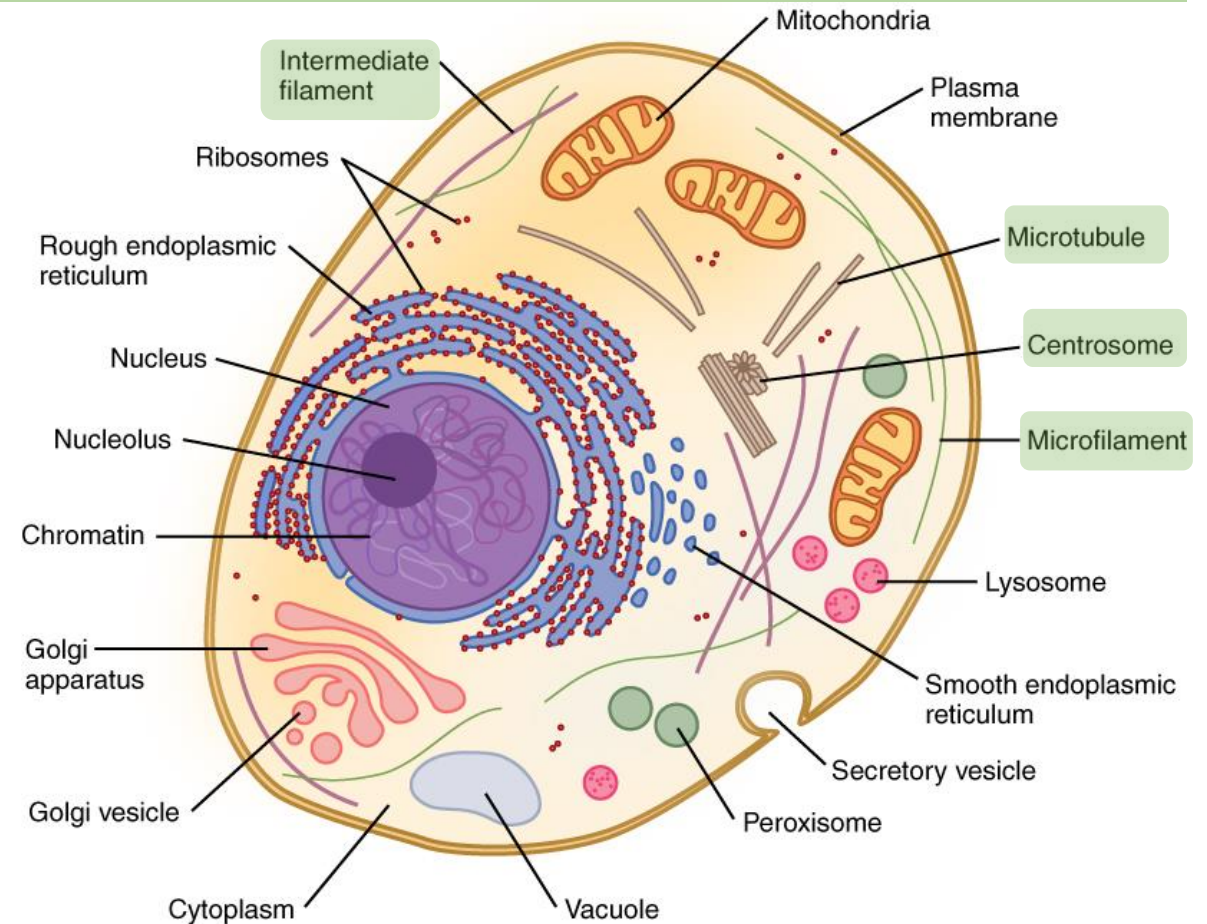
CYTOPLASMIC ORGANELLES

- **Centrosome:**

- It controls the movement and sharing of chromosomes.

- **Cytoskeleton:**

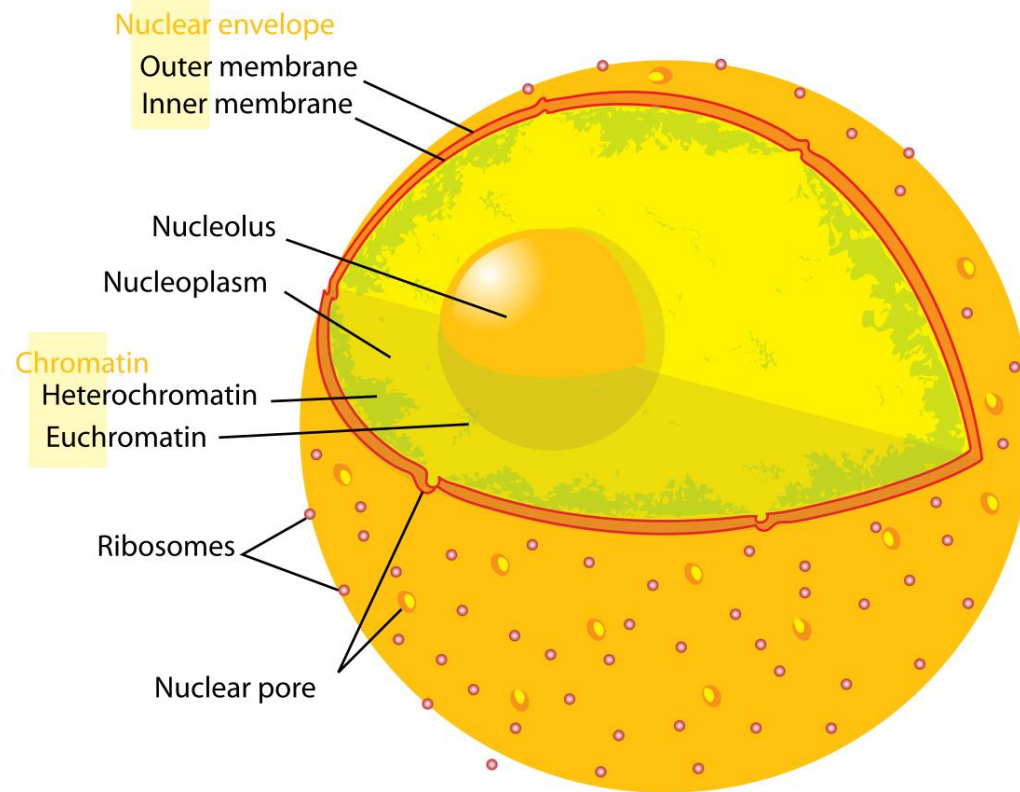
- It keeps the cell shape



THE CELL NUCLEUS

- **Nuclear envelope**
 - Double membrane connected by pores.
 - It controls the substances passage to or from the nucleoplasm.
- **Chromatin**
 - Made of DNA and proteins.
 - During cell division it forms the chromosomes.
- **Nucleolus**
 - It produces the ribosomes

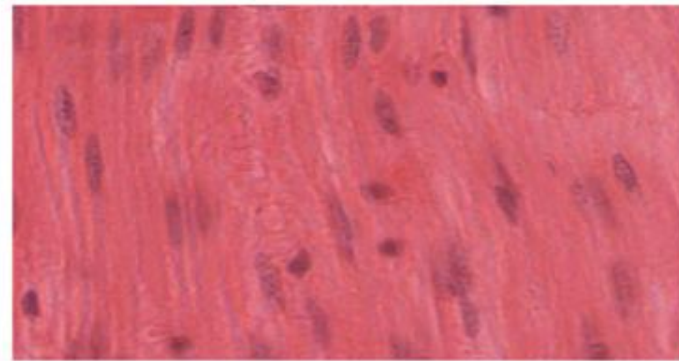
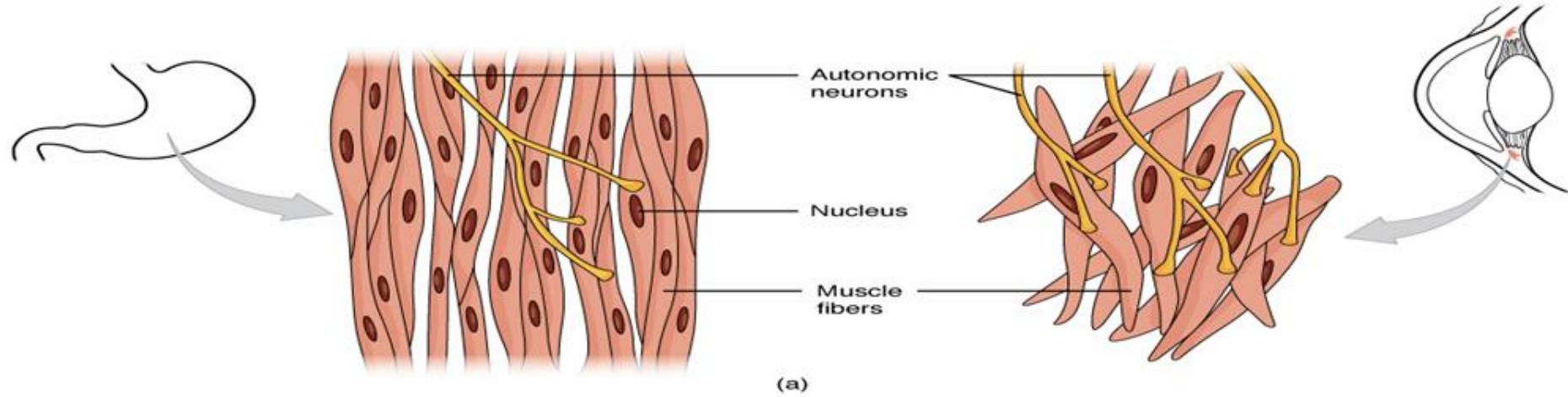
THE CELL NUCLEUS



TISSUES

- **Definition:** Cluster of cells with the same morphology and function.
- **Cell differentiation:**
 - Cell specialises performing different tasks
 - Because of this specialisation, different cells are created.
 - Differentiation levels:
 - Shape
 - Function
 - Activity of the cytoplasmic organelles

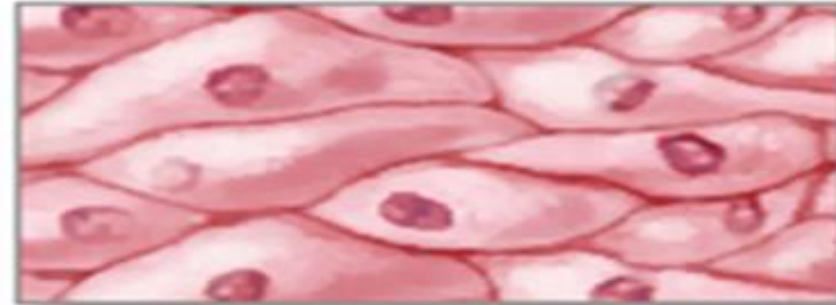
TISSUES



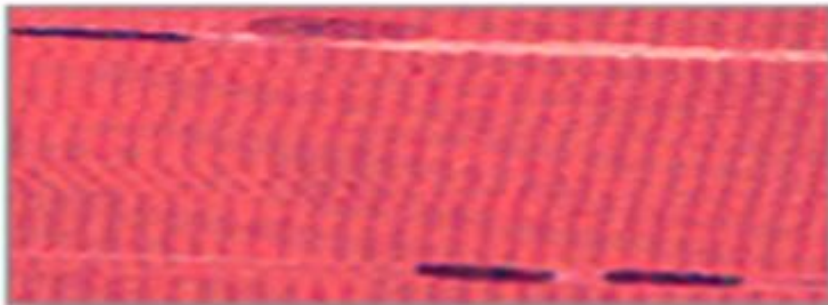
TYPES OF TISSUES



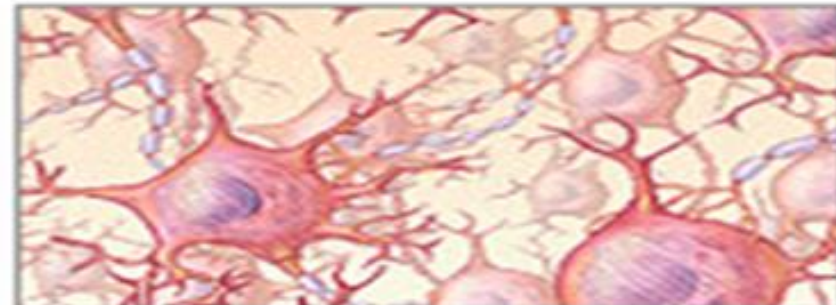
Connective tissue



Epithelial tissue



Muscle tissue





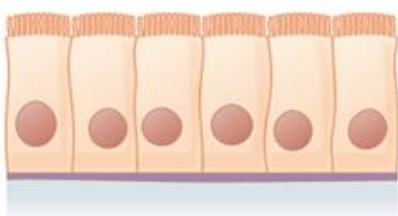

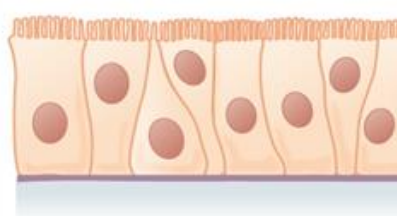


Nervous tissue

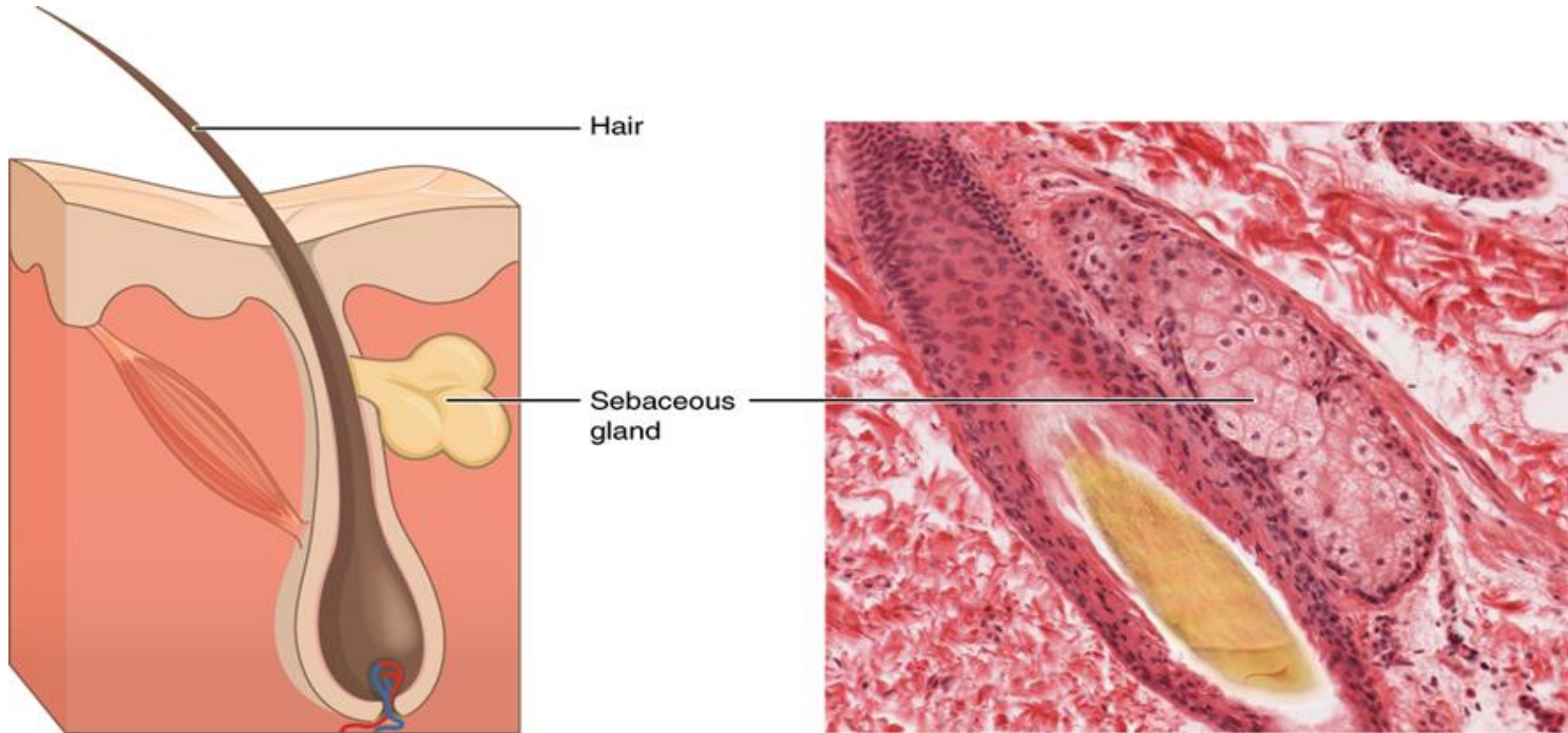
EPITHELIAL TISSUES

- Made of one or more layers where cells are arranged in tight junctions.
- **Epithelium tissue:**
 - It covers the surface of the body
 - Lining internal cavities
 - Enveloping organs
- **Glandular epithelium:**
 - They produce and release substances
 - Cells group forming glands

EPITHELIUM TISSUE

	Simple	Stratified	
Squamous	 <p>Simple squamous epithelium</p>	 <p>Stratified squamous epithelium</p>	
Cuboidal	 <p>Simple cuboidal epithelium</p>	 <p>Stratified cuboidal epithelium</p>	
Columnar	 <p>Simple columnar epithelium</p>	 <p>Stratified columnar epithelium</p>	Pseudostratified  <p>Pseudostratified columnar epithelium</p>

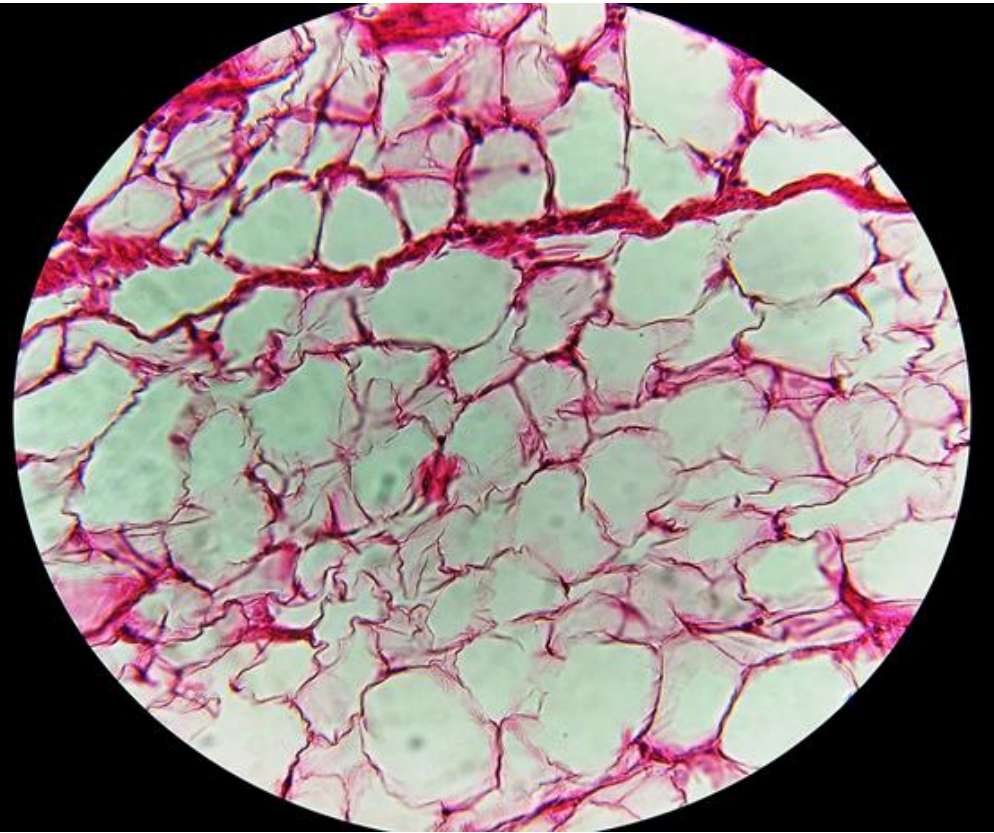
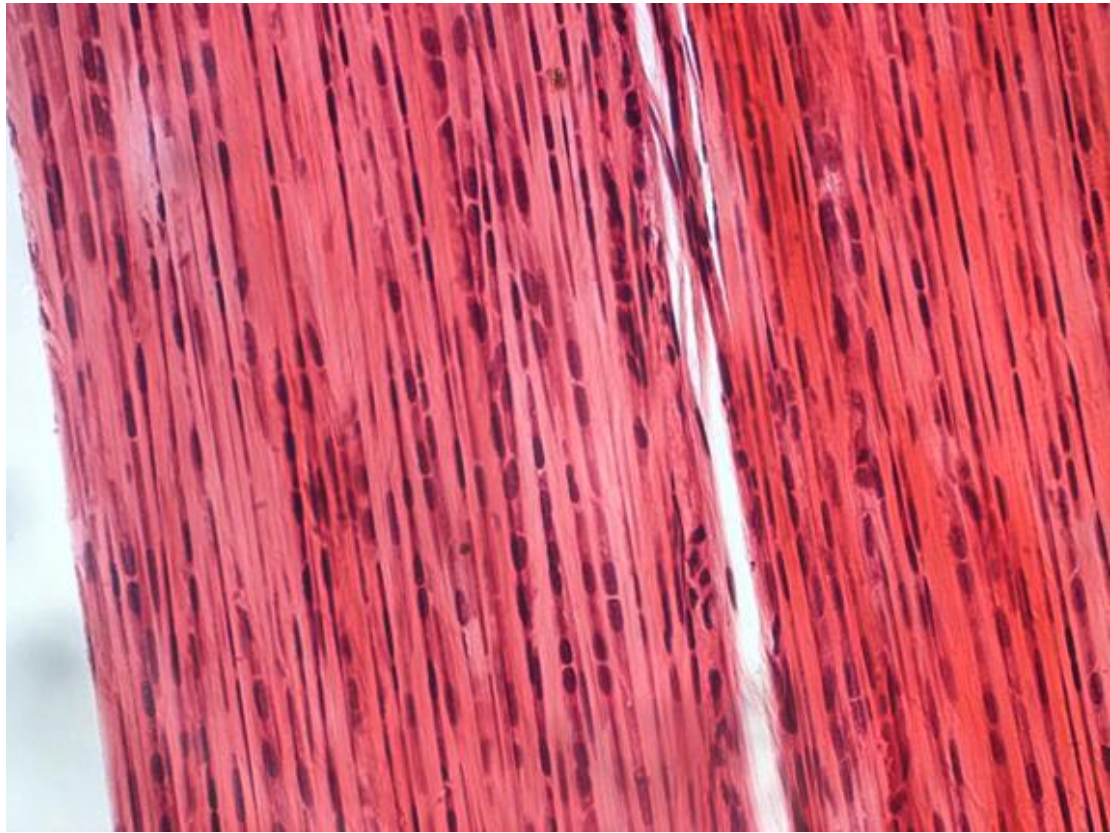
GLANDULAR EPITHELIUM



CONNECTIVE TISSUES

- The cells are separated by an extracellular matrix.
- Their function is to support, unify and connect systems in the organism.
- **Connective tissue:**
 - The extracellular matrix contains fibres (elastin, collagen).
 - It's found in the deep skin, tendons and ligaments.
- **Adipose tissue:**
 - The cells accumulate fat drops in the cytoplasm as an energy reserve and as cold insulation.

CONNECTIVE & ADIPOSE TISSUES



CONNECTIVE TISSUES

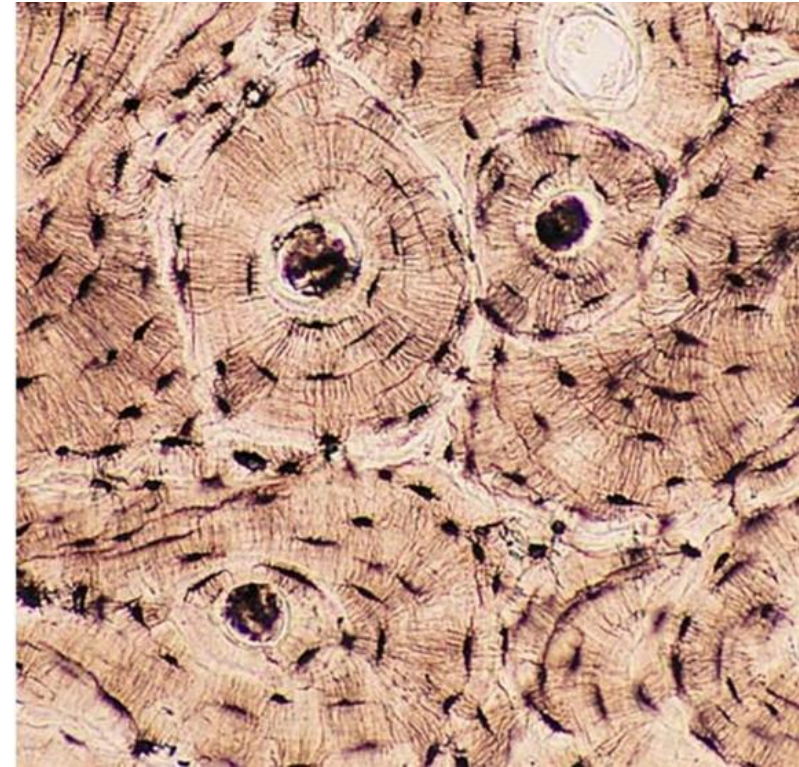
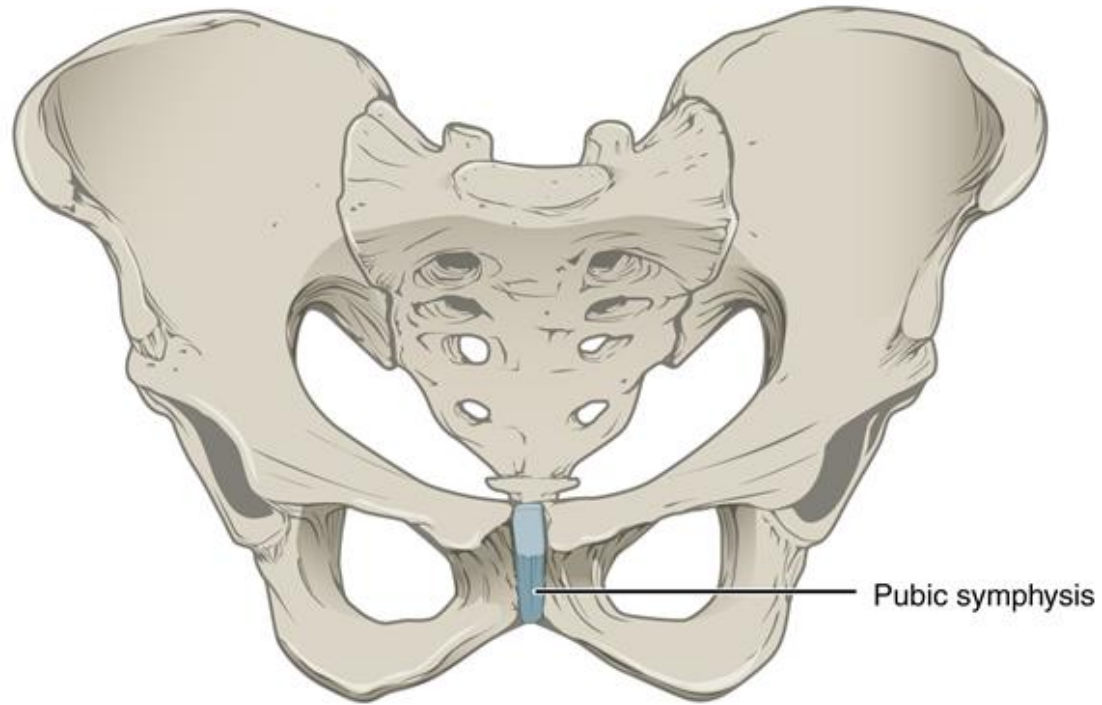
- **Cartilaginous tissue:**

- Firm, elastic and strong tissue that protects the joints and forms structures such as the pinna, the trachea, the intervertebral discs...

- **Bone tissue:**

- Rigid tissue because of the minerals deposition.
- It supports the organism and protects vital organs.

CARTILAGINOUS & BONE TISSUES

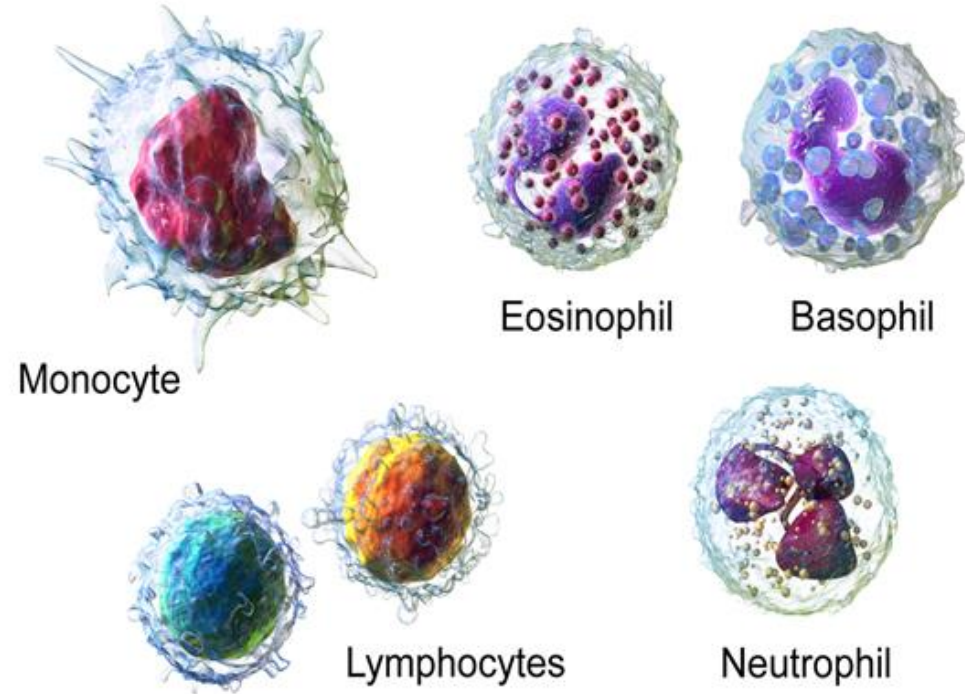
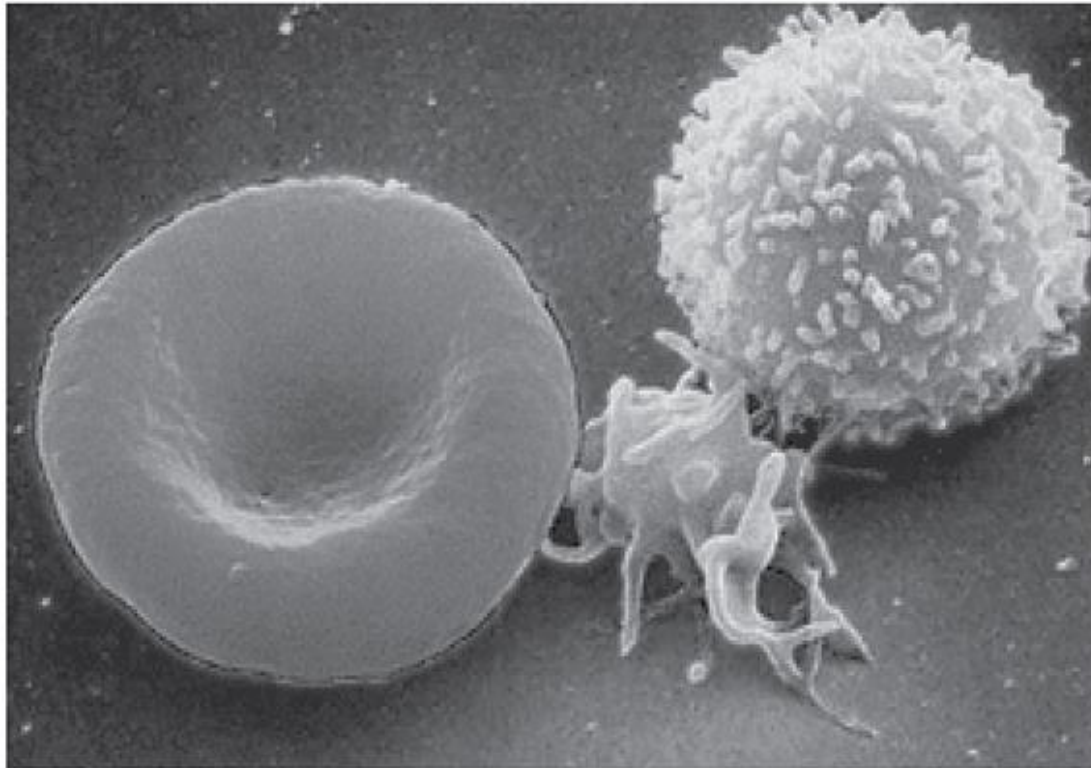


CONNECTIVE TISSUES

- **Blood tissue:**

- The most special characteristic is the existence of a liquid extracellular matrix called plasma.
- The cells suspended in there can carry out different functions, such as carrying gases (red blood cells), body defence (white blood cells) or haemostasis (a cell fragments called platelets).

BLOOD TISSUE



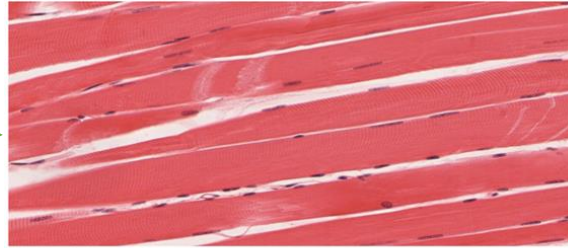
White Blood Cells

MUSCLE TISSUE

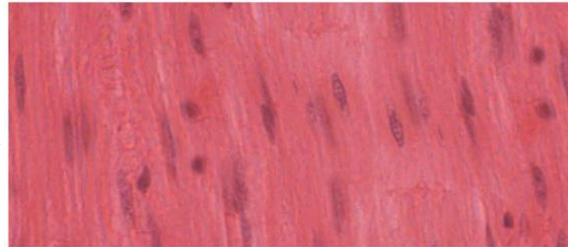
- It's made of elongated cells, called muscle fibres.
- These cells are able to contract in response to a stimulus.
- There are three different types of muscle tissues:
 - **Striated or skeletal muscle tissue:**
 - It moves the skeleton muscles.
 - **Smooth muscle tissue:**
 - It contracts involuntarily the muscles of the organs, such as the stomach, the uterus, the lungs...
 - **Cardiac muscle tissue or myocardium:**
 - It contracts involuntarily the heart.

TYPES OF MUSCLE TISSUES

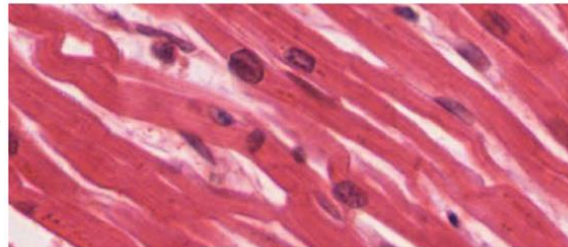
Skeletal muscle tissue



Smooth muscle tissue



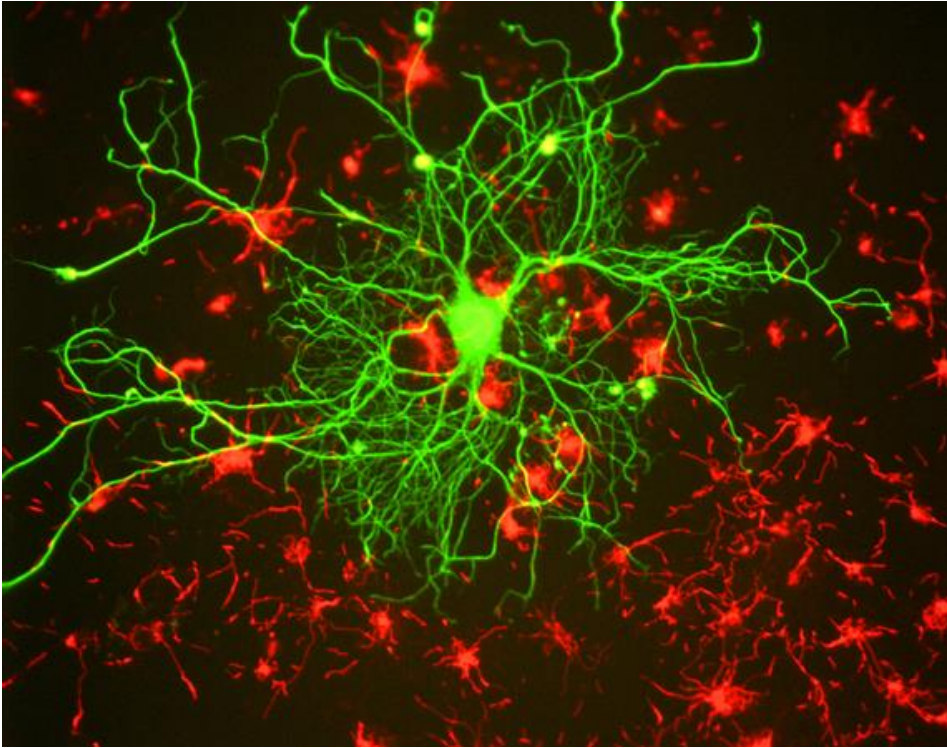
Cardiac muscle tissue



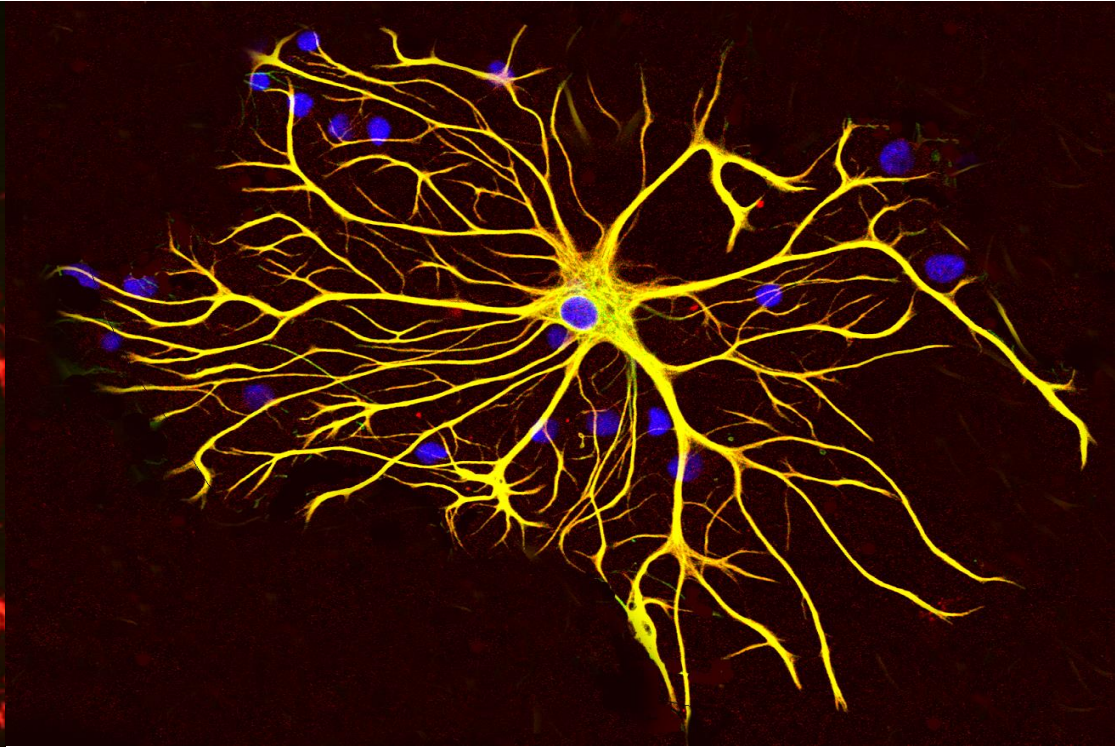
NERVOUS TISSUE

- It's made of two types of cells:
 - A very specialised cell called **neuron** that is able to create and transmit nerve impulses.
 - A cell found alongside the neurons called **glial cell**.
 - Its function is to protect and to supply the neuron with nutrients.
- The nervous tissue builds the nervous system up that coordinates the functioning of the organism.

NERVOUS TISSUE



Neuron



Glial cell (Astrocyte)

ORGANS & SYSTEMS

- **Organ:**

- A group of different tissues that performs a more complex function.

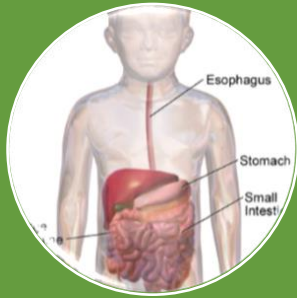


- **System:**

- A group of organs that perform a common function such as nutrition, interaction or reproduction.



SYSTEMS INVOLVED IN THE NUTRITION FUNCTION



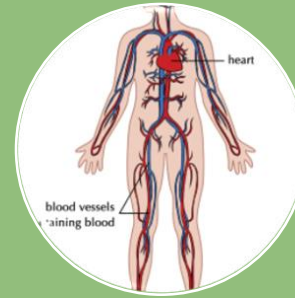
Digestive System

- It transforms food into nutrients
- It absorbs nutrients



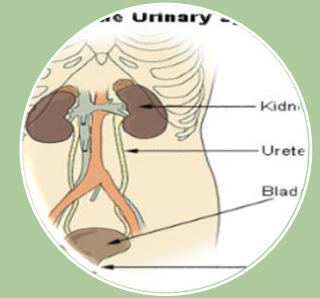
Respiratory System

- It exchanges carbon dioxide and oxygen



Circulatory System

- It provides oxygen and nutrients to the cells.
- It collects wastes and carbon dioxide.



Excretory System

- It takes wastes to the exterior
- It regulates the internal environment

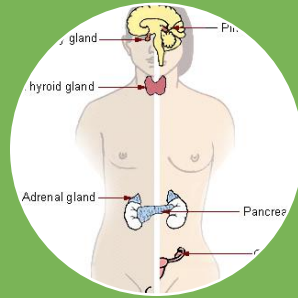


SYSTEMS INVOLVED IN THE INTERACTION FUNCTION



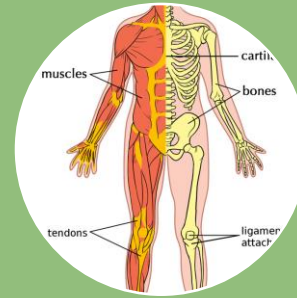
Nervous System

It receives information from the environment and makes the appropriate response.



Endocrine System

It secretes substances (hormones) that induce responses.



Muscular and Skeletal Systems

They are in charge of the movement

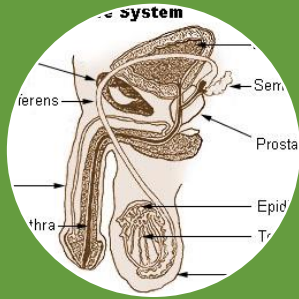


Sense Organs

They capture relevant information to the nervous system

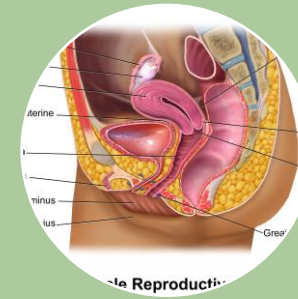


SYSTEMS INVOLVED IN THE REPRODUCTION FUNCTION



Male Reproductive System

It produces the male gametes (spermatozoids).



Female Reproductive System

It produces the female gametes (eggs) and protects the embryo during its development.

