

BIOL121 SUMMARY NOTES

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CELL: Cells are the structural unit of life and are made up of *atoms and molecules*. All living things are made of cells, which exhibit all functions of life (e.g. take in nutrients and oxygen, remove wastes, reproduction). Cells consist of a cell membrane, cytoplasm and nucleus.

CELL MEMBRANE: Boundary between intracellular (ICF) and extracellular (ECF) fluid. The structure of the cell membrane consists of the following:

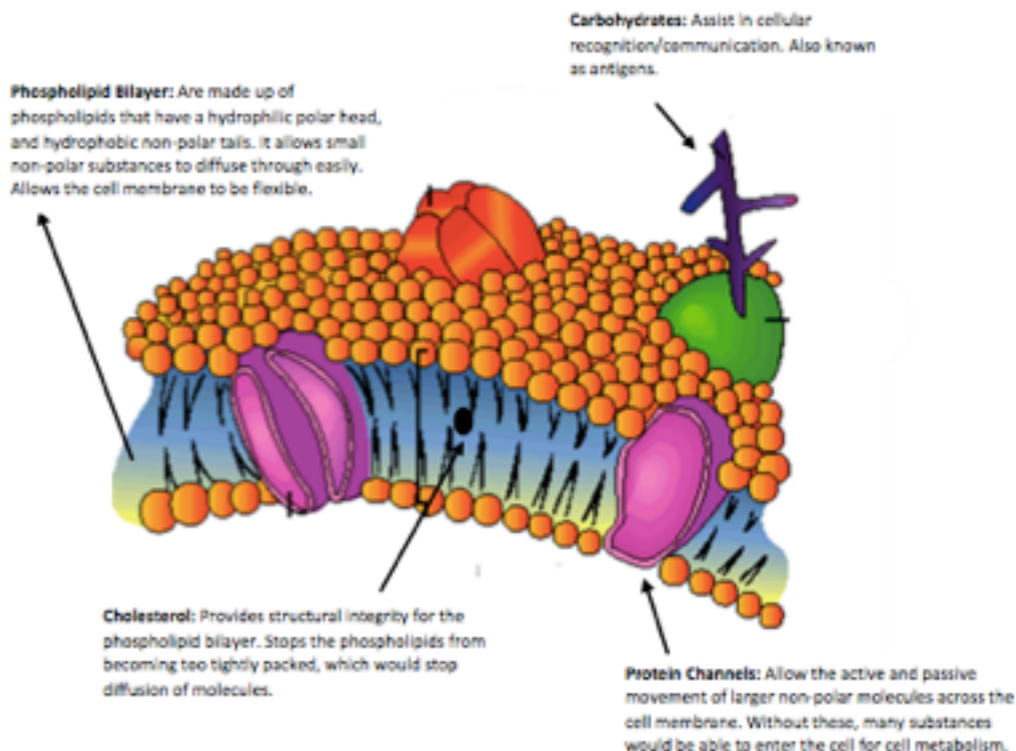
- *Phospholipid Bilayer:* Hydrophilic phosphate heads & hydrophobic lipid tails
- *Proteins:* These float in membrane, some receptors or enzymes, form channels/gates and pumps.
- *Cholesterol:* Provides the cell membrane with extra support.
- *Carbohydrates:* Only found on extracellular side, provides cushioning, protection and cell recognition.

Selective Permeability: The cell membrane is selectively permeable as it controls which substances can go in/out of the cell and stops others. This is due to the structure of the membrane.

- Lipid-soluble substances can cross the membrane by simple diffusion.
- Water-soluble ions and water pass through special protein channels/gates/pumps.
- Some molecules are too large to fit through protein channels (e.g. glucose) so a special carrier protein is used (facilitated diffusion). The structure of the cell membrane consists of the following:

Functions of Cell Membrane:

- Boundary between intracellular (ICF) and extracellular (ECF) fluid. Maintains composition of ICF & ECF.
- Controls movement of substances into and out of cells.
- Communicates with cells and organs (via receptors)
- Links adjacent cells.



CYTOSOL & CYTOPLASM: The intracellular fluid of inside a cell called the cytosol. It is separate from certain cell organelles such as the nucleus and the mitochondria. In eukaryotes, the cytoplasm is the content within a cell membrane minus the content in the cell nucleus. Cytoplasm composed of cytosol & organelles.

ORGANELLES: Organelles with a definite boundary created by a membrane are called membranous organelles, whereas those which don't are called non-membranous.

| ORGANELLE | MEMBRANOUS | FUNCTION |
|-----------------|------------|---|
| Rough ER | Yes | Modifies & transports proteins |
| Smooth ER | Yes | Synthesis of fats/steroids (detoxification) |
| Golgi Apparatus | Yes | Package material/secretions for transport in or outside the cell (via vesicles) |
| Lysosomes | Yes | Is the site of digestion in the cell (via digestive enzymes. Digests bugs/old cell parts, etc. |
| Peroxisomes | Yes | Breakdown of fats (detoxification) |
| Mitochondria | Yes | The powerhouse of the cell and the site of cellular respiration. Site of ATP (energy) production. |
| Ribosomes | No | Site of protein synthesis. |
| Cytoskeleton | No | Structural support to the cell |
| Microvilli | No | Increase surface area of the cell |

TISSUES: A tissue is a large mass of similar cells that make up a part of an organism and perform a specific function. There are 4 types of primary tissue in the body, these are:

EPITHELIAL TISSUE: Found at the skin, skin around organs, and high friction areas.

- *Shape* of epithelial tissue can be Squamous (flat), cuboidal, or columnar.
- *Number of Layers* are Simple (single), Stratified (many), or Pseudo-stratified (single but uneven).
- Protection/lining/covering
- Absorption
- Filtration
- Excretion & Secretion

CONNECTIVE TISSUE: Found at bones, tendons, ligaments, cartilage, lymph and blood. The matrix of connective tissues includes collagen and elastic fibres which provide strength and flexibility Functions are:

- Most abundant tissue in the body.
- Supports and binds other tissues.
- Insulation
- Protection

MUSCLE TISSUE: Is found at the muscles, can be smooth, skeletal or cardiac muscle tissue. Muscle cells are made of movable proteins which allows contractions to occur. Functions are:

- Allows movement
- Keeps joints stable
- Postural control
- Produces heat

NEURAL TISSUE: Is found at the nerves. Nerve cells have long axons for communication. Functions are:

- Communication with other nerve fibres.
- Neuroglia (support cells)

Anatomy: The bodily structure of an animal or of any of its parts.

Physiology: Deals with the normal functions of living organisms and their parts.

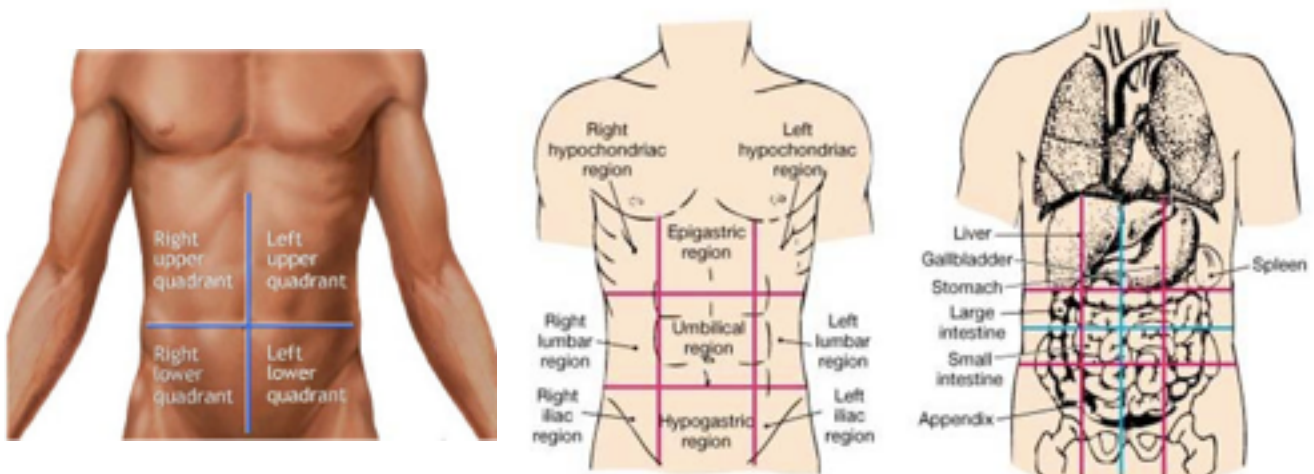
Histology: The study of the microscopic structure of tissues.

LEVELS OF BODY ORGANISATION:

Chemicals → Cellular → Tissue → Organs → Organ Systems → Human Body

ANATOMICAL POSITION: Is the erect position of the body with the face directed forwards, the arms at the side, and the palms of the hands facing forward. The anatomical position is used as a reference in describing the relation of body parts to one another.

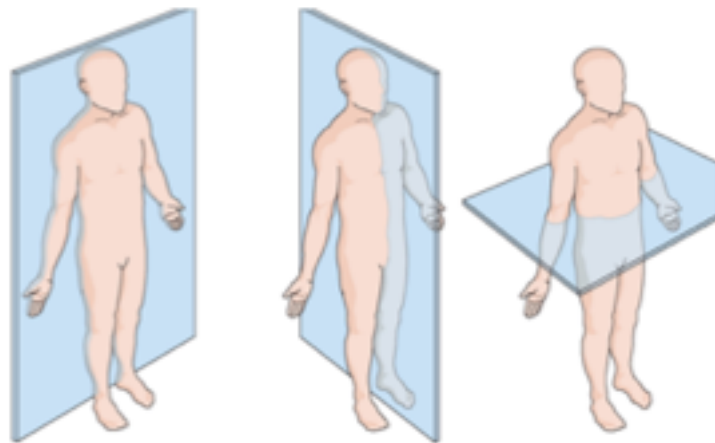
ABDOMINOPELVIC QUADRANTS AND REGIONS:



ANATOMICAL TERMS:

| TERM | DEFINITION |
|-------------|--|
| Anterior | Towards the front of the body |
| Posterior | Towards the back of the body |
| Lateral | Away from the bodies midline. |
| Medial | In the middle or closer to bodies midline. |
| Proximal | Toward the beginning of limb (e.g. shoulder) |
| Distal | Toward the end of limb (e.g. hand) |
| Superior | Closer to the head. Above. |
| Inferior | Closer to the feet. Below. |
| Deep | Away from the bodies surface (further into body) |
| Superficial | Closer to the bodies surface (skin) |

BODY PLANES: There are 3 body planes/sections, these are used to describe the location of body parts in relation to one another. The planes are frontal, sagittal, and transverse planes.

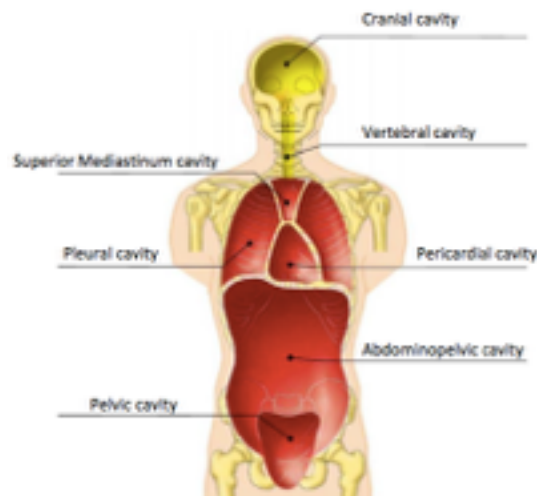


Frontal Plane: Is any vertical plane that divides the body into ventral and dorsal (belly and back).

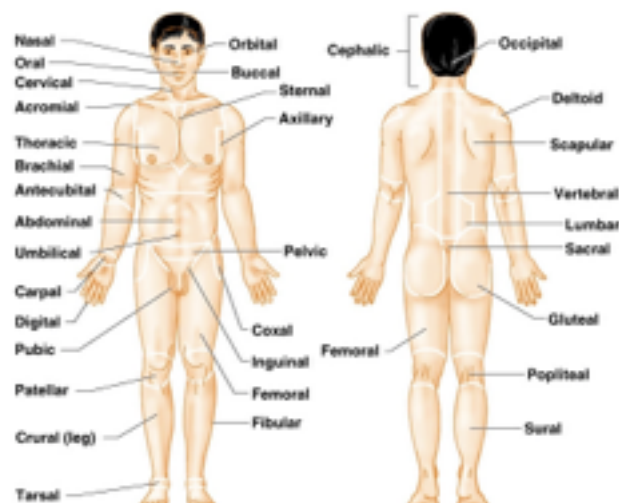
Sagittal Plane: A vertical plane which passes from anterior to posterior, dividing the body into right and left halves.

Transverse Plane: Is a horizontal plane which divides the body into superior & inferior parts.

BODY CAVITIES: Regions/cavities of the body are important as they pinpoint areas of pain when palpating.



BODY REGIONS: Anatomical areas of the body which are used for searching specific regions.



BODY SYSTEMS: Systems work together in unison to effectively function the human body.



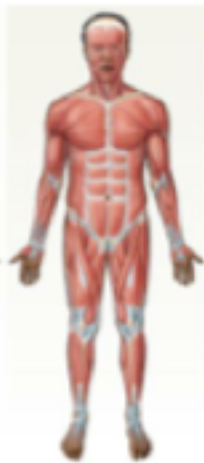
Integumentary:

Consists of skin, hair, nails, sweat glands. This system provides a barrier between the internal and external environment and regulates body temperature.



Skeletal:

Consists of bones, cartilage and bone marrow. This system provides body support and protection for internal organs and also stores minerals such as calcium. Site for blood cell formation.



Muscular:

Consists of muscles and tendons. The muscular system via contraction provides movement and also generates heat.



Nervous:

Consists of brain, spinal cord, nerves and sensory organs. Through electrical signals, this system detects changes and controls responses in the body.



Endocrine:

Consists of hypothalamus, pineal gland, pituitary gland, thyroid gland, adrenal, pancreas, ovaries & testicles. This system produces and secretes hormones for control of body processes.



Cardiovascular:

Consists of heart, and blood vessels. This system transports blood containing oxygen, carbon dioxide, nutrients, wastes, ions, hormones and other substances throughout the body.



Lymphatic:

Consists of lymph vessels, lymph nodes, lymph, tonsils, adenoids, spleen, and thymus. This system protects against foreign invaders. It is located within the blood but has a transport system of its own.



Respiratory:

Consists of oral cavity, nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles & alveoli. This system keeps the blood supplied with oxygen while eliminating carbon dioxide. It contributes to maintaining pH levels of the blood.



Digestive:

Consists of mouth, pharynx, oesophagus, stomach, small intestine, large intestine, colon, rectum, anus. This system acts to break down food into particles which can be absorbed into the blood for the delivery to the blood cells. Undigested food is removed as faeces.



Urinary:

Consists of kidneys, ureter, bladder and urethra. This system removes nitrogen containing wastes, which result from the breakdown of proteins and nucleic acids by the bodies cells. It maintains water, electrolyte, and pH balance of the blood.



Reproductive:

Male consists of penis, prestate gland, scrotum, and testicles. Females consist of vagina, uterus, ovaries, clitoris and breasts. This system provides sperm and egg for the continuation of the species. It also protects the developing foetus.

