BIOL125 CENTRAL EXAMINATION NOTES

WEEK 1: BODY ANATOMY AND CELLS

Directional Terminology:

- Anatomical position: refers to body placement, eyes forward and palms forwards
- ''Left'' and ''Right'' always refers to the subject not the observer
- Anatomical surface landmarks (outside of the body): descriptors ensure accuracy and clarity
- Abdominopelvic quadrants and regions (3D through the body) → Memorising the divided regions of the body e.g., Cranial, and the quadrants e.g., abdominopelvic region
- Planes/Axes to section off the body → Frontal (Coronal), transverse and sagittal planes
- Anatomical directional terms: e.g., Anterior, posterior, distal, proximal etc.

Body Cavities:

- Dorsal Cavity: Bones of cranium and vertebral column towards the posterior side of the body
- Ventral cavity: Anterior surface of the torso divided by diaphragm into upper thoracic cavity and abdominopelvic cavity → membrane lining prevents friction
- Thoracic Cavity: The chest; contains trachea, bronchi, lungs, oesophagus, heart, thymus etc.
- Abdominopelvic cavity: line that runs across hipbones and divides the body into the abdominal and pelvic cavities

CELLS:

Cell/Plasma Membrane:

- Phospholipid bilayer → fluid mosaic model: multiple types of proteins and cholesterol which is 6-10nm thick
- Contains phosphate, lipids, proteins and carbohydrates; phospholipid bilayer contains hydrophilic heads and hydrophobic tails
- Glycolipids and glycoproteins have a range of functions including acting as enzymes, receptors, self-recognition, lubrication and protection of membrane surface
- The cellular membrane is highly important as the internal and external have different compositions which must be kept separate

1. Physically isolates cell from external environment
   - As internal and external conditions are different, conditions must be maintained Inc. retention of enzymes and structural proteins to maintain homeostasis

2. Regulates exchange with external environment
   - Selectively permeable membrane controls ion entry and exit through channels
   - Absorbs nutrients and releases wastes in and out of the cell

3. Sensitivity to environment
    - Membrane receptors sensitive to specific molecules e.g., hormones
    - MHC proteins recognise cells as ''self'' rather than ''foreign''

4. Structural support
    - Holds tissues together via connections between cell membranes

Cytoplasm:

- Substances dissolved in cytosol include organelles, proteins, ions, dissolved, nutrients, waste products and gases
- Conditions: greater protein and K+ concentrations inside, less Na+ concentration inside, many enzymes to catalyse reactions energy molecules ad amino acids stored

Cell organelles:

- Membranous; nucleus, mitochondria, endoplasmic reticulum, Golgi, peroxisome, lysosome
- Non-membranous; cytoskeleton, microvilli, centrioles, cilia, ribosomes
- REMEMBER EACH DIAGRAM, STRUCTURE AND FUNCTION OF CELL ORGANELLES

Cell Specialisations:

- Microvilli: extension of membrane [folding past the membrane] to create large SA; support from internal cytoskeleton of microfilaments [Mostly actin]
- Cilia; array of microtubules that contract to create movement, mostly to sweep substances across cell surfaces e.g., ciliary escalator in the airways
- Keratin; epithelial cells, hair and nails contain the water-proofing protein keratin. Multiple layers of dead epithelial cells on the outer layer of skin used to protect against abrasion, water loss and microbe regulation

WEEK 2: CELLULAR TRANSPORTATION

CELLULAR TRANSPORTATION:

Membrane permeability:

- Lipid solubility; only small, uncharged molecules or larger lipid-soluble molecules can diffuse across the phospholipid bilayer
- Movement of molecules based on; lipid solubility, electrical charge, size, and molecular shape and occurs via active or passive transport
- To maintain optimal ion concentrations, Na+ ions must be pumped out, and K+ ions pumped in; ATP-driven transmembrane pump (channel protein activated by ATP) pumps ions against a concentration gradient to maintain internal homeostasis.

Benefits of selective permeability:

- Small uncharged molecules (oxygen and carbon dioxide) passively diffuse down concentration gradient [No energy expenditure needed]
- Proteins e.g., enzymes/ structural proteins stay in cell: too big to cross the bilayer