

CURRICULUM CONTENT

1. Characteristics of living organisms

- List and describe the characteristics of living organisms
- Define the terms:
 - *Nutrition* as taking in of nutrients which are organic substances and mineral ions, containing raw materials or energy for growth and tissue repair, absorbing and assimilating them
 - *Excretion* as removal from organisms of toxic materials, the waste products of metabolism (chemical reactions in cells including respiration) and substances in excess of requirements
 - *Respiration* as the chemical reactions that break down nutrient molecules in living cells to release energy
 - *Sensitivity* as the ability to detect or sense changes in the environment (stimuli) and to make responses
 - *Reproduction* as the processes that make more of the same kind of organism
 - *Growth* as a permanent increase in size and dry mass by an increase in cell number or cell size or both
 - *Movement* as an action by an organism or part of an organism causing a change of position or place

2. Classification and diversity of living organisms

- Define and describe the *binomial system* of naming species as a system in which the scientific name of an organism is made up of two parts showing the genus and species
- List the main features of the following vertebrates: bony fish, amphibians, reptiles, birds and mammals

3. Cell structure and organization

- State that living organisms are made of cells
- Identify and describe the structure of a plant cell (palisade cell) and an animal cell (liver cell), as seen under a light microscope
- Describe the differences in structure between typical animal and plant cells
- Relate the structure of the following to their functions:

- Ciliated cells – in respiratory tract
- root hair cells – absorption
- Xylem vessels – conduction and support
- Muscle cells – contraction
- Red blood cells – transport
- Define:
 - *Tissue* as a group of cells with similar structures, working together to perform a shared function
 - *Organ* as a structure made up of a group of Tissues, working together to perform specific functions
 - *organ system* as a group of organs with related functions, working together to perform body functions using examples covered in Sections II and III

4. Movement in and out of cells

a. Diffusion

- Define *diffusion* as the net movement of molecules from a region of their higher concentration to a region of their lower concentration down a concentration gradient, as a result of their random movement
- Describe the importance of diffusion of gases and solutes and of water as a solvent

b. Active Transport

- Define *active transport* as movement of ions in or out of a cell through the cell membrane, from a region of their lower concentration to a region of their higher concentration against a concentration gradient, using energy released during respiration
- Discuss the importance of active transport as an energy-consuming process by which substances are transported against a concentration gradient, e.g. ion uptake by root hairs and uptake of glucose by epithelial cells of villi

c. Osmosis

- Define *osmosis* as the diffusion of water molecules from a region of their higher concentration (dilute solution) to a region of their lower concentration (concentrated solution), through a partially permeable membrane
- Describe the importance of osmosis in the uptake of water by plants, and its effects on plant and animal tissues

d. Enzymes

- Define the term *catalyst* as a substance that speeds up a chemical reaction and is not changed by the reaction
 - Define *enzymes* as proteins that function as biological catalysts
 - Investigate and describe the effect of changes in temperature and pH on enzyme activity

5. Photosynthesis and plant Nutrition

- Define *nutrition* as taking in of nutrients which are organic substances and mineral ions, containing raw materials or energy for growth and tissue repair, absorbing and assimilating them
- List the chemical elements that make up: carbohydrates, fats, proteins
- Describe the synthesis of large molecules from smaller basic units, i.e. Simple sugars to starch and glycogen amino acids to proteins, fatty acids and glycerol to fats and oils
- Describe tests for: starch (iodine solution) reducing sugars (Benedict's solution) protein (biuret test)
- fats (ethanol)
- List the principal sources of, and describe the importance of:
 - carbohydrates
 - fats
 - proteins
 - vitamins (C and D only)
 - mineral salts (calcium and iron only)
 - fiber (roughage)
 - water
- Describe the deficiency symptoms for: vitamins (C and D only) mineral salts (calcium and iron only)
- Define *photosynthesis* as the fundamental process by which plants manufacture carbohydrates from raw materials using energy from light
- State the word equation for the production of simple sugars and oxygen
- Investigate the necessity for chlorophyll, light and carbon dioxide for photosynthesis, using appropriate controls
- Describe the intake of carbon dioxide and water by plants

- Explain that chlorophyll traps light energy and converts it into chemical energy for the formation of carbohydrates and their subsequent storage

6. Excretion in humans

- Define *excretion* as the removal from organisms of toxic materials, the waste products of metabolism (chemical reactions in cells including respiration) and substances in excess of requirements.
- Substances should include carbon dioxide, urea and salts
- Describe the function of the kidney in terms of the removal of urea and excess water and the reabsorption of glucose and some salts(details of kidney structure and nephron are **not** required)
- State the relative positions of ureters, bladder and urethra in the body
- State that urea is formed in the liver from excess amino acids
- State that alcohol, drugs and hormones are broken down in the liver

7. Hormones

- Define a *hormone* as a chemical substance, produced by a gland, carried by the blood, which alters the activity of one or more specific target organs and is then destroyed by the liver
- State the role of the hormone adrenaline in chemical control of metabolic activity, including increasing the blood glucose concentration and pulse rate
- Give examples of situations in which adrenaline secretion increases
- Compare nervous and hormonal control systems