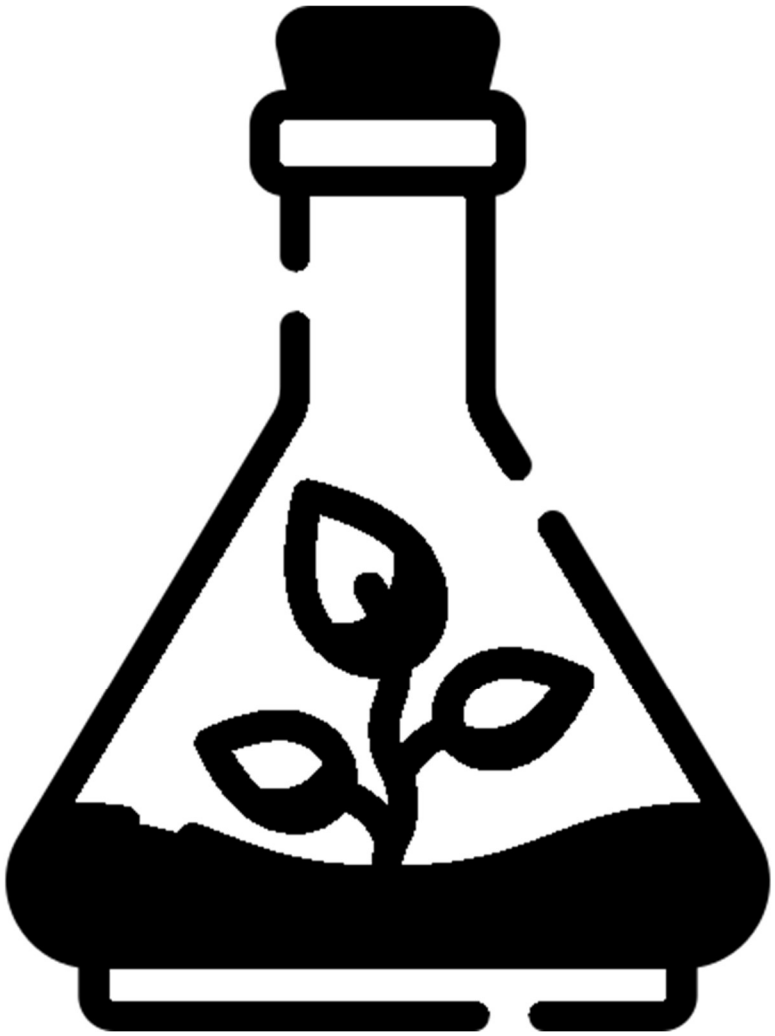
0610 IGCSE Biology
Biology Summary Sheet
Chapter 1, 2, 3, 4 and 5



Prepared by:
The ReviseRoom Educator Team

Chapter 1 – Characteristics of Living Organisms

7 Characteristics of Life – MRS GREN

Characteristic	Definition
Movement	ability to move parts or the whole organism (e.g., plants orienting leaves to sunlight, animals moving limbs).
Respiration	the chemical reactions in cells that break down nutrient molecules and release energy for metabolism
Sensitivity	the ability to detect and respond to changes in the internal or external environment
Growth	a permanent increase in size and dry mass
Reproduction	the processes that make more of the same kind of organism
Excretion	the removal of the waste products of metabolism and substances in excess of requirements
Nutrition	the taking in of materials for energy, growth and development

Classification Systems

- organisms can be classified into groups by the features that they share
- A **species** is a group of organisms that can reproduce to produce fertile offspring
- The **binomial system** of naming species is an internationally agreed system in which the scientific name of an organism is made up of two parts showing the genus and species (must be written in italic or underlined e.g. *Homo sapiens*)
- **Dichotomous keys** are constructed based on identifiable features
- **Classification systems** aim to reflect evolutionary relationships
- Classification systems are determined by **anatomy, morphology or DNA sequencing** (DNA sequencing is the **most effective**)
- Groups of organisms which share a more recent ancestor (are more **closely related**) have **base sequences in DNA that are more similar** than those that share only a distant ancestor and have **a shorter distance in genetic tree diagrams**

Classification of Vertebrates

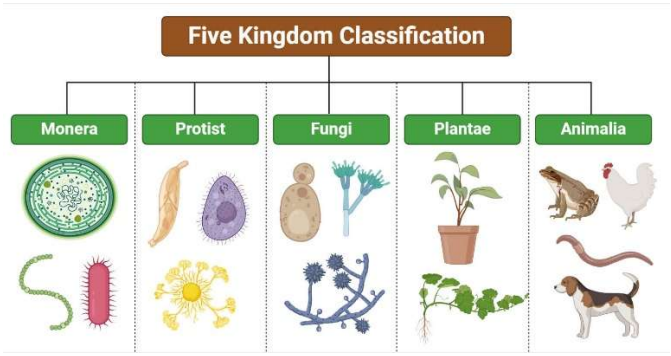
Vertebrate class	Body covering	Movement	Reproduction	Sense organs	Other details	Examples
Fish	Scales	Fins (also used for balance)	Usually produces jelly-covered eggs in water	Eyes but no ears, lateral line along body for detecting vibrations in water	Cold-blooded, gills for breathing	Herring, perch, shark
Amphibians	Moist skin	Four limbs, back feet often webbed to make swimming more efficient	Produces jelly-covered eggs in water	Eyes and ears	Cold-blooded, lungs and skin for breathing	Frog, toad, salamander
Reptiles	Dry, with scales	Four legs (apart from snakes)	Eggs with rubbery, waterproof shell – laid on land	Eyes and ears	Cold-blooded, lungs for breathing	Crocodile, python
Birds	Feathers, scales on legs	Wings, two legs	Eggs with hard shell	Eyes and ears	Warm-blooded, lungs for breathing, beak	Flamingo, pigeon
Mammals	Fur	Four limbs	Live young	Eyes, ears with pinna (external flap)	Warm-blooded, lungs for breathing, females have mammary glands to produce milk to feed young, four types of teeth	Elephant, mouse

Classification of Arthropods

	MAIN FEATURES	EXAMPLES
MYRIAPODS	– BODY CONSISTS OF **MANY SEGMENTS** – EACH SEGMENT CONTAINS AT LEAST **1 PAIR OF JOINTED LEGS** – 1 PAIR OF ANTENNAE	CENTIPEDE
INSECTS	– **3 PART BODY** – HEAD, THORAX AND ABDOMEN – **3 PAIRS** OF JOINTED **LEGS** – **2 PAIRS OF WINGS** (1 OR BOTH PAIRS MAY BE VESTIGIAL – MEANING NON–FUNCTIONAL AND UNDEVELOPED) – 1 PAIR OF ANTENNAE	BUTTERFLY
ARACHNIDS	– **2 PART BODY** – CEPHALOTHORAX AND ABDOMEN – **4 PAIRS** OF JOINTED **LEGS** – NO ANTENNAE	SPIDER
CRUSTACEANS	– **MORE THAN 4 PAIRS** OF JOINTED **LEGS** – **CHALKY EXOSKELETON** FORMED FROM CALCIUM – BREATHE THROUGH GILLS – **2 PAIRS OF ANTENNAE**	CRAB

The Five Kingdoms

	Cell Number	Cell wall	Nucleus	Chloroplasts
Bacteria	Unicellular	Present (peptidoglycan)	Absent (contains strands of DNA in cytoplasm and plasmids instead)	Absent
Protoctista	Either unicellular or multicellular	Present in some, absent in some	Present	Present in some, absent in some
Fungi	Multicellular (except yeast = unicellular)	Present (chitin)	Present	Absent
Plants	Multicellular	Present (cellulose)	Present	Present
Animals	Multicellular	Absent	Present	Absent



Ferns vs Flowering Plants

Flowering plants:

• Reproduce sexually by means of flowers, seeds and other sexual organs

• Seeds are produced inside the ovary found at the base of the flower

• Can be divided into two groups – monocotyledons and dicotyledons

Ferns:

• Have leaves called fronds

• Do not produce flowers but instead reproduce asexually by spores produced on the underside of fronds

Viruses

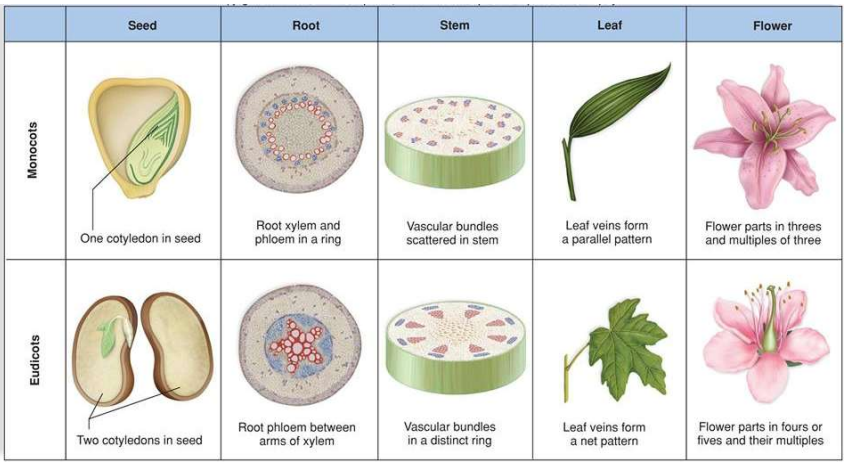
- Viruses are not part of any classification system as they are acellular and not considered living things. They lack the necessary cellular features to be considered
- They do not carry out the seven life processes for themselves, instead they take over a host cell's metabolic pathways in order to make multiple copies of themselves
- Virus structure is simply genetic material (RNA or DNA) inside a protein coat

Fungi

- They feed saprophytically, or parasitically, on organic material like faeces, human foods and dead plants or animals.
- A fungus is made of hyphae, which are long tubes, called a mycelium**,** and form branches.
- Fungi secrete extracellular enzymes (outside of their cells) to digest their food.

Monocotyledons vs Dicotyledons

Monocotyledon	**Dicotyledon**
The monocotyledonous embryos have a single cotyledon	The dicotyledonous embryos have a pair of cotyledons
They have a fibrous root system	They have a tap root system
Leaves in monocots have parallel venation	Leaves in dicots have reticulate or net venation
In monocot flowers, the count of parts of the flower is a multiple of three or equal to three	The count of parts in a dicot flower is a multiple of four or five or equal to four or five
The roots and stems of monocotyledons do not possess a cambium and cannot increase in diameter	The roots and stems of dicotyledons possess a cambium and have the ability to increase in diameter
A few examples of monocotyledons are garlic, onions, wheat, corn and grass, etc.	A few examples of dicots are beans, cauliflower, apples and pear, etc.



Chapter 2 – Organisation of the Organism

Cell Structure (Animals vs Plants vs Bacteria)

Feature	Animal Cell	Plant Cell	Bacterial Cell
Cell membrane	Present	Present	Present
Cell wall	Absent	Present (made of cellulose)	Present (made of peptidoglycan)
Nucleus	Present (with nuclear membrane)	Present	No true nucleus (DNA in cytoplasm with circular DNA loops called plasmids)
Cytoplasm	Present	Present	Present
Mitochondria	Present	Present	Absent
Ribosomes	Present	Present	Present
Chloroplasts	Absent	Present (in photosynthetic cells only)	Absent
Vacuole	Small or temporary vacuoles	Large, permanent, central vacuole	Absent (or small storage granules only)

Magnification

- Magnification = Image Size/Actual Size
- I = AM
- 1 millimetre = 1000 micrometres
- Tissue = group of similar cells working together for a shared, specific function
- Organ = group of different tissues working together for a specific function
- Organ system = group of different organs working together
- Metabolism = all chemical reactions in the body

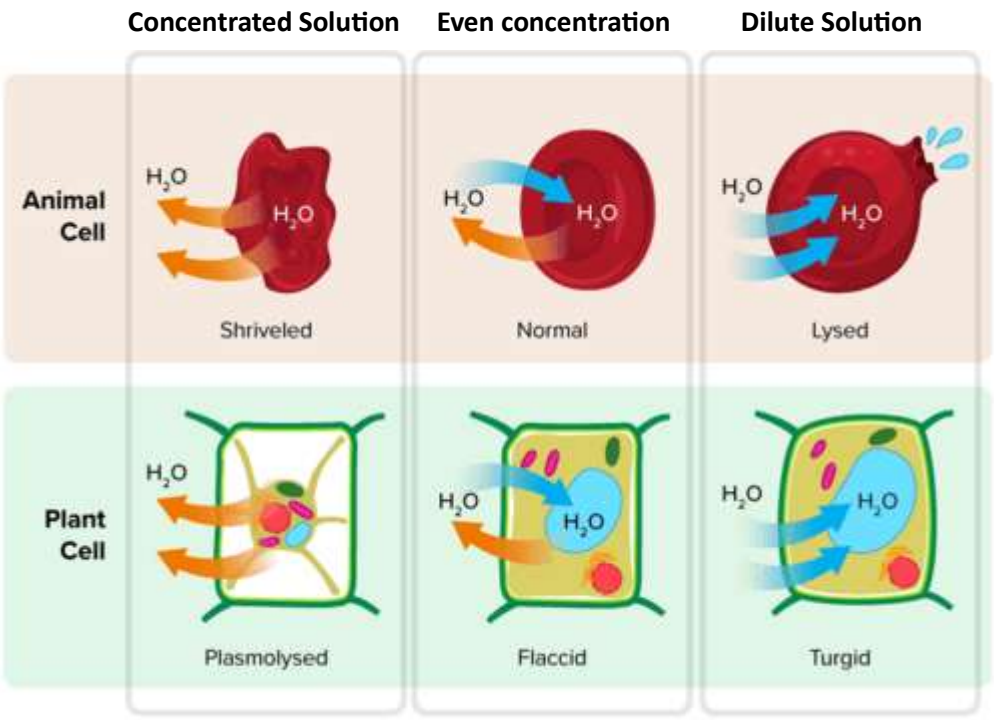
Cell < Tissue < Organ < Organ System

Specialized Cell	Function	Key Adaptations
Red Blood Cell	Transports oxygen from lungs to body tissues	Biconcave shape increases surface area No nucleus More space for hemoglobin Contains hemoglobin that binds to oxygen Flexible to pass through narrow capillaries
White Blood Cell: Phagocyte (later in Unit 10)	Engulfs and digests pathogens (part of immune system)	Irregular shape helps engulf microbes Digestive enzymes break down bacteria Lobed nucleus helps squeeze through tissues
White Blood Cell: Lymphocyte (later in Unit 10)	Produces antibodies to fight infections	Large nucleus for making antibodies Recognizes specific antigens
Nerve Cell: Neurone (later in Unit 12)	Transmits electrical impulses rapidly around the body	Long axon for long-distance transmission Branched dendrites to connect with other neurons Myelin sheath insulates and speeds up impulses
Muscle Cell	Contracts to cause movement	Long and elastic for contraction Many mitochondria for energy (ATP)
Ciliated Cell	Moves mucus (or egg) along a surface	Cilia (tiny hairs) beat rhythmically In airways, move mucus and trapped dust/microbes
Sperm Cell	Fertilizes the egg cell	Tail (flagellum) for swimming Mitochondria for energy Acrosome contains enzymes to digest egg membrane
Egg Cell (Ovum)	Joins with sperm during fertilization	Large size with food reserves Jelly coat for sperm recognition After fertilization, membrane changes to block others
Root Hair Cell	Absorbs water and minerals from soil	Long extension increases surface area Thin cell wall for faster diffusion No chloroplasts (underground – no light)
Palisade Mesophyll Cell	Carries out photosynthesis	Many chloroplasts and large surface area for maximum light absorption Tall, tightly packed for more chloroplast exposure
Xylem Vessel Cell	Transports water and minerals; supports plant	No cytoplasm Hollow for water flow Lignin in walls for strength Dead cells joined end to end

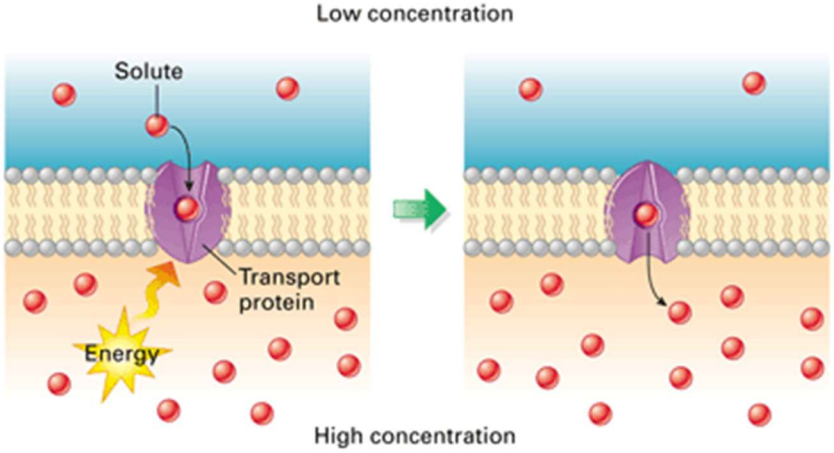
Chapter 3 – Movement In and Out of the Cell

Feature	Diffusion	Osmosis	Active Transport
Definition	Net movement of molecules from **high to low** concentration	Movement of **water molecules** from high to low **water potential** across a partially permeable membrane	Movement of substances from **low to high** concentration (against gradient)
Type of transport	Passive (no energy needed)	**Passive** (no energy needed)	**Active** (requires **energy from respiration/ATP**)
Substances involved	Gases (O_2, CO_2), small molecules like glucose	Only **water**	Ions (e.g. Na^+, K^+), glucose, amino acids
Requires membrane?	No (but can happen across a membrane)	Yes — must cross a **partially permeable membrane**	Yes — needs **carrier proteins** in the membrane
Direction of movement	Down concentration gradient	Down water potential gradient	**Against** concentration gradient
Energy required?	No	No	**Yes**
Example in body	O_2 diffuses into blood in lungs	Water into root hair cells	Glucose absorption in small intestine (into blood)
Example in plants	CO_2 diffuses into leaf for photosynthesis	Water into root cells from soil	Mineral ions absorbed by root hair cells

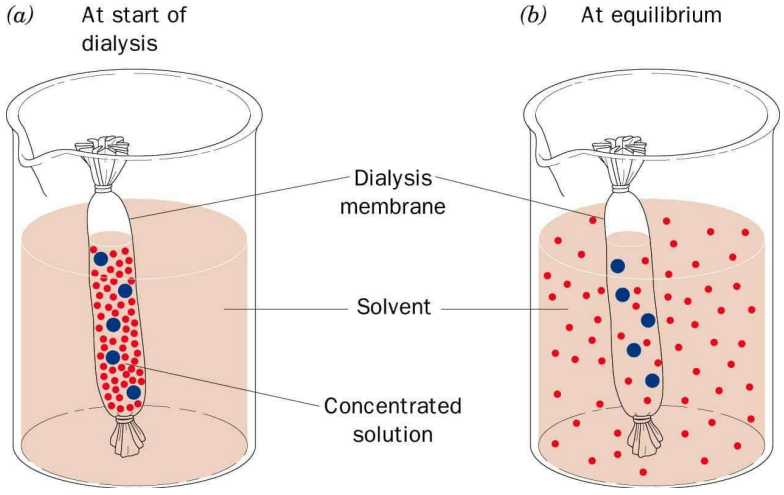
- **Turgid** (full of water, water enters the cell via osmosis)
- **Flaccid** (water lost, water leaves the cell via osmosis)
- **Plasmolysis** (severe water loss in plants, cytoplasm and vacuole are pulled away from the cell wall)



Active Transport



Diffusion in Dialysis

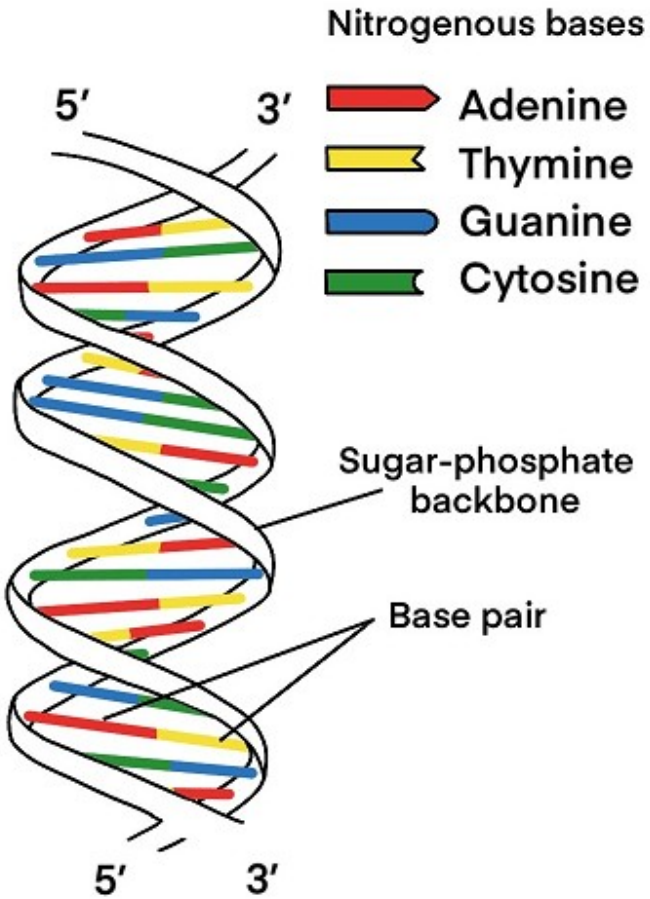


Chapter 4 – Biological Molecules

Molecule	Elements	Sub-units	Functions	Food Test	Examples
Carbohydrates	C, H, O	Simple sugars (e.g. glucose)	Immediate energy source Storage (starch/glycogen) Keeping structure (cellulose in plants) Transport (sucrose in plants) Making nectar	**Benedict's test** for reducing sugars: Heat with Benedict's solution → **light blue solution to brick-red precipitate** **Iodine solution** for starch → **brown to blue-black**	Glucose, starch, glycogen, cellulose
Proteins	C, H, O, N (sometimes S)	Amino acids	Growth and repair Producing enzymes, hormones, antibodies, etc.	**Biuret test**: Add Biuret solution → blue to **purple/lilac**	Enzymes, hemoglobin, collagen
Lipids (Fats & Oils)	C, H, O	Glycerol + 3 fatty acids (triglyceride)	Long-term energy store Insulation Mechanical Protection of organs Component of membranes	**Ethanol emulsion test**: Add ethanol, shake, then add water → **milky-white emulsion**	Oils, fats, phospholipids
Water	H_2O	—	Solvent for chemical reactions Transport medium Regulates temperature Helps in digestion and excretion	— (No test, only in chemistry)	Makes up ~70% of body cells
Vitamins & Minerals	Various (depends on type)	—	Needed in small amounts for specific functions: Vitamin C for healing, Iron for hemoglobin	DCPIP test for Vitamin C: Add DCPIP solution → **blue to purple**	Vitamin C, Iron, Calcium, etc.

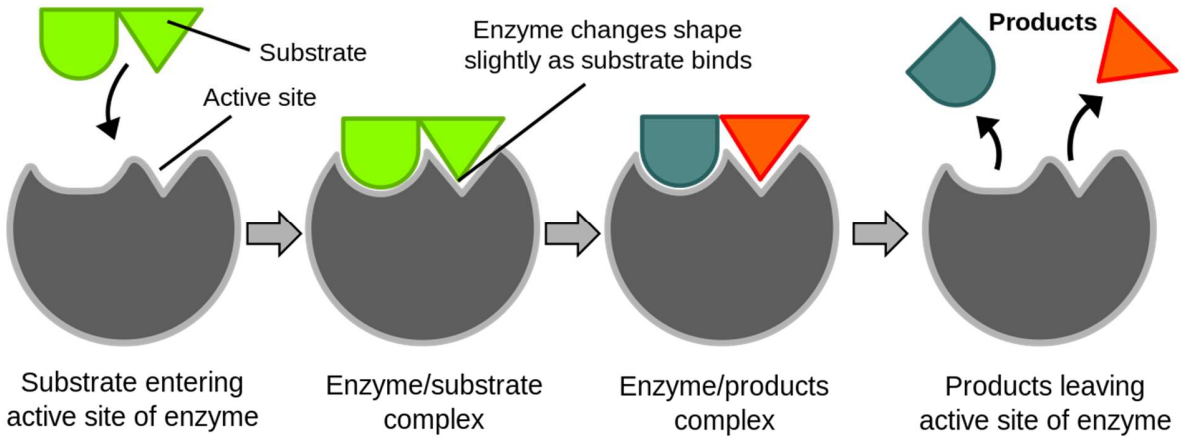
The structure of a DNA molecule

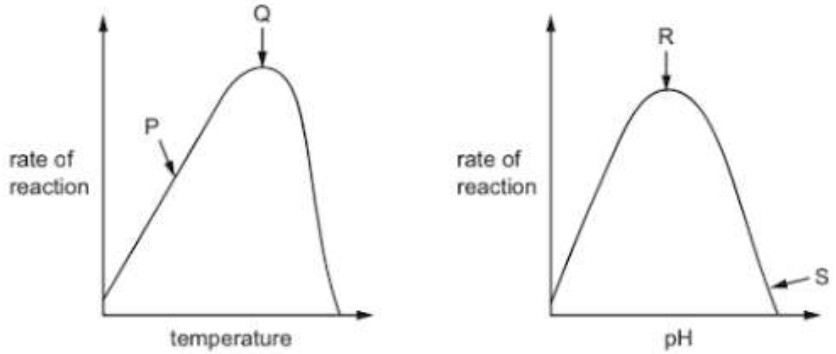
- **Two strands coiled together to form a double helix**
- **Each strand contains chemicals called bases**
- **Bonds between pairs of bases hold the strands together**
- **The bases always pair up in the same way: A with T, and C with G**
- **The 'backbone' consists of a sugar and a phosphate**
- **DNA stores the important genetic material inside the nucleus**



Chapter 5 – Enzymes

- Enzymes are biological catalysts and a **type of proteins** that **speed up** reactions
- **Lock and key** model – the enzyme, acting like a 'lock' fits the specific substrate, acting like a 'key'
- The active site of the enzyme must always be complementary to the substrate, making them specific to breaking down one type of substrate only (one function)
- Affected by:
  - **Temperature**: Optimum at 37°C; denatures if the temperature gets too high; little activity if the temperature gets too low
  - **pH**: Enzymes have specific pH ranges (denatures if pH becomes extreme)
  - Pepsin has a pH of 2 (works in the stomach acid) but most enzymes in the human body has a pH of 7 (neutral)

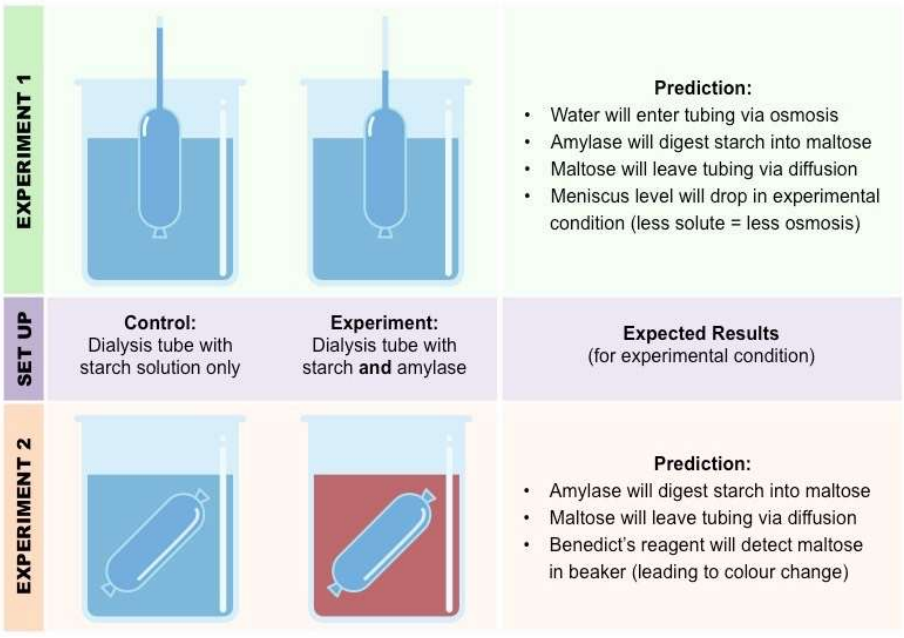




Region P is when the enzyme activity is steadily increasing due to the increase in temperature. An increase in temperature provides more kinetic energy for the enzymes and substrates, increasing their velocity, creating more successful collisions and enzyme-substrate complexes. More products are therefore released.

Region Q is the optimum temperature due to the maximum enzyme activity. Likewise, Region R is the optimum pH. Region S occurs when the enzyme loses its shape due to an extreme pH, so the active site is no longer complementary to the substrate so they cannot bind together and enzyme-substrate complexes can no longer form. The rate of reaction decreases rapidly.

Enzyme	Substrate	Product(s)	Site of Production	Site of Function	Optimum pH	Function
Amylase	Starch	Maltose (a sugar)	Salivary glands, pancreas	Mouth, small intestine	~7 (neutral)	Breaks down starch into maltose
Maltase	Maltose	Glucose	Wall of small intestine	Small intestine	~7	Breaks maltose into glucose
Protease (Pepsin)	Protein	Short peptides/amino acids	Stomach lining	Stomach	~2 (acidic)	Begins protein digestion
Protease (Trypsin)	Protein or peptides	Peptides/amino acids	Pancreas	Small intestine	~8 (alkaline)	Continues protein digestion
Lipase	Lipids (fats & oils)	3 Fatty acids + 1 glycerol	Pancreas	Small intestine	~8	Breaks down fats into fatty acids + glycerol
Sucrase	Sucrose	Glucose + fructose	Small intestine	Small intestine	~7	Breaks down sucrose
Lactase	Lactose	Glucose + galactose	Small intestine	Small intestine	~6–7	Breaks down lactose



🎓 Stay Connected with ReviseRoom!

Subscribe to ReviseRoom on YouTube for:

- *Bite-sized videos explaining ALL IGCSE topics*
- *IGCSE Past Paper Walkthroughs*
- *Tips & Tricks for Exam Success*
- *Topic-by-Topic Revision Guides*

🔔 Enable notifications so you never miss a new upload!

🌐 Visit Our Upcoming Website

Get access to:

- *1-on-1 Tutoring via a Credit-Based System*
- *Topical Past Paper Compilations*
- *Exclusive Mock Tests & Resources*
- *Full IGCSE Revision Materials, All in One Place*

🗓️ Upcoming Releases

- June 2025 IGCSE Paper Solved Videos
- Subject-by-subject Exam Predictions
- Understanding the IGCSE Marking Scheme

📬 Got Questions, Feedback, or Requests?

Drop a comment on any of our socials or email us at reviseroom.official@gmail.com!