B2: Organisation

AQA · GCSE Biology · Revision Notes

Specification reference: 4.2

Note: Sections marked ★ HIGHER TIER ONLY are for Higher tier students only. Foundation tier students should focus on the unmarked sections.

4.2.1 Principles of Organisation

Multicellular organisms are organised in a hierarchy: **cells** → **tissues** → **organs** → **organ systems** → **organism**.

Key Terms

Tissue: A group of similar cells working together (e.g. muscle tissue)
Organ: A group of tissues working together to perform a function (e.g. the heart)
Organ system: A group of organs working together (e.g. the digestive system)

4.2.2 Animal Tissues, Organs and Organ Systems

4.2.2.1–2 The Digestive System

The digestive system breaks down large, insoluble food molecules into small, soluble ones that can be absorbed into the bloodstream.

- **Mouth** — mechanical digestion (chewing); salivary amylase breaks down starch.
- **Oesophagus** — carries food to the stomach using peristalsis.
- **Stomach** — muscular; produces protease and hydrochloric acid; churns food.
- **Small intestine** — produces and receives bile, protease and lipase; absorbs digested food through villi.
- **Large intestine** — absorbs water from undigested food.
- **Liver** — produces bile, which emulsifies fats.
- **Pancreas** — produces amylase, protease, and lipase.

4.2.2.3–4 Enzymes

Enzymes are biological catalysts — they speed up chemical reactions without being used up. Each enzyme has an active site with a specific shape that only fits one type of substrate (lock and key model).

- **Amylase** — breaks down starch into sugars (produced in mouth and pancreas).
- **Protease** — breaks down proteins into amino acids.
- **Lipase** — breaks down fats (lipids) into fatty acids and glycerol.

Factors affecting enzyme activity:

- **Temperature** — too low: slow reaction. Optimum: fastest rate. Too high: enzyme denatures (active site changes shape permanently).
- **pH** — each enzyme has an optimum pH. Wrong pH denatures the enzyme.

Required Practical 4: Investigating the effect of pH on the rate of amylase activity using starch and iodine solution.

Key Terms

Catalyst: A substance that speeds up a reaction without being used up
Denaturation: Permanent change in enzyme shape — the active site no longer works
Optimum: The temperature or pH at which an enzyme works best

4.2.2.6–7 The Heart and Blood Vessels

The heart is a muscular pump that keeps blood moving around a double circulatory system (one loop to the lungs, one loop to the body).

- Right side — pumps deoxygenated blood to the lungs.
- Left side — pumps oxygenated blood to the body.
- Valves prevent blood flowing backwards.
- **Arteries** — carry blood AWAY from the heart; thick walls, small lumen, high pressure.
- **Veins** — carry blood TOWARDS the heart; thin walls, large lumen, low pressure, have valves.
- **Capillaries** — one cell thick; allow exchange of substances between blood and tissues.

- **Red blood cells** — no nucleus, biconcave, carry oxygen using haemoglobin.
- **White blood cells** — fight infection (phagocytes engulf pathogens; lymphocytes make antibodies).
- **Plasma** — liquid part of blood; transports CO_2, urea, hormones, digested food.
- **Platelets** — fragments that help blood clot at wounds.

4.2.2.8–10 Coronary Heart Disease and Lifestyle

Coronary heart disease (CHD) occurs when fatty deposits (plaques) build up inside coronary arteries, narrowing them and reducing blood flow to the heart muscle.

- Risk factors: smoking, high fat diet, lack of exercise, high blood pressure, obesity.
- Treatments: statins (lower blood cholesterol), stents (widen arteries), bypass surgery, artificial valves.

Exam Tip: Learn the difference between communicable (infectious) and non-communicable (not infectious) diseases. CHD is non-communicable.

4.2.2.11 Cancer

Cancer is caused by changes (mutations) in cells, leading to uncontrolled cell division. Benign tumours are contained; malignant tumours spread to other parts of the body (metastasize).

- Risk factors: UV radiation, smoking, viruses, obesity.

4.2.3 Plant Tissues, Organs and Systems

4.2.3.1–2 Plant Tissues

Plants have their own tissues and organ systems for transport and support.

- **Epidermis** — protective outer layer.
- **Palisade mesophyll** — packed with chloroplasts; main site of photosynthesis.
- **Spongy mesophyll** — air spaces allow CO_2 to diffuse to palisade cells.

• **Xylem** — transports water and mineral ions upwards from roots (transpiration stream).
• **Phloem** — transports sugars (mainly sucrose) made in leaves to all parts of the plant (translocation).
• **Guard cells** — control opening and closing of stomata to regulate gas exchange and water loss.
• **Root hair cells** — large surface area for absorbing water (osmosis) and minerals (active transport).