

Class 10 Science – Life Processes – Topic: Nutrition in Living Organisms (Topicwise Notes)

ALPHA CLASSES DEOBAND | Session 2026–27 | CBSE Board Pattern

Concept – The Big Picture

- Every living organism needs food for energy and body-building — nutrition is the process of obtaining and using this food (khaana haasil karna aur istemal karna).
 - Green plants are **autotrophs** — they make their own food using sunlight, CO₂, and water through photosynthesis (apna khaana khud banaana), while animals are **heterotrophs** — they depend on food made by other organisms (doosron par nirbhar rehna).
 - In humans, food travels through a long tube called the alimentary canal, where it is broken down step by step by enzymes — digestion is like a factory assembly line in reverse (todne ki factory).
 - The **small intestine** is the real hero — tiny finger-like projections called **villi** absorb digested food into the blood; if villi are damaged, a person can starve even while eating well (khaana khaakar bhi kamzor rehna).
 - Photosynthesis is the starting point of almost all food chains on Earth — without it, there would be no food for any living organism, which is why this topic connects to everything else in biology.
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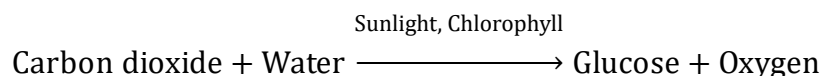
Key Definitions

Term	Definition
Nutrition	The process by which an organism obtains food, breaks it into usable substances, and uses those substances for energy, growth, and repair.
Autotrophic Nutrition	A mode of nutrition in which an organism prepares its own food from simple inorganic substances (CO ₂ , water) using an external energy source such as sunlight. Green plants are the main example.
Heterotrophic Nutrition	A mode of nutrition in which an organism depends on complex organic food made by other organisms because it cannot prepare food on its own. Animals, fungi, and most bacteria are heterotrophs.

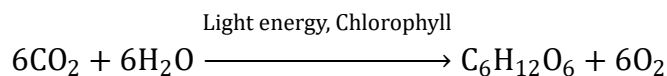
Term	Definition
Photosynthesis	The process by which green plants use carbon dioxide, water, and sunlight energy (trapped by chlorophyll) to prepare glucose and release oxygen as a by-product.
Chlorophyll	The green pigment found in the chloroplasts of plant cells; it absorbs sunlight and makes photosynthesis possible.
Digestion	The process of breaking down large, insoluble food molecules into small, soluble molecules that can be absorbed into the blood.
Absorption	The passage of digested food molecules from the small intestine into the bloodstream through the villi.
Assimilation	The use of absorbed nutrients by body cells for producing energy (through respiration), building new tissues, and repair.
Egestion	The removal of undigested food material from the body through the anus. This food was never absorbed and is not a metabolic waste.
Villi	Tiny finger-like projections on the inner wall of the small intestine that greatly increase the surface area for absorption of digested food.
Bile	A yellowish-green fluid produced by the liver and stored in the gall bladder. It emulsifies fats (breaks large fat globules into smaller droplets) but contains no enzyme.
Emulsification	The process of breaking large fat globules into tiny droplets by bile, increasing the surface area for enzyme action.

Important Equations & Pathways

1. Photosynthesis — Word Equation



2. Photosynthesis — Balanced Chemical Equation



3. Nutrition Pathway in Humans

Ingestion → Digestion → Absorption → Assimilation → Egestion

4. Path of Food in the Alimentary Canal

Mouth → Oesophagus → Stomach → Small intestine → Large intestine → Rectum → Anus

5. Autotrophic vs Heterotrophic Nutrition — Quick Comparison

Feature	Autotrophic	Heterotrophic
Food preparation	Organism prepares its own food	Depends on food made by others
Raw materials	Inorganic (CO ₂ , water, minerals)	Organic (pre-formed food)
Energy source	Sunlight (mainly)	Chemical energy in consumed food
Example	Green plants, some bacteria	Humans, animals, fungi

6. Functions of Major Digestive Organs

Organ	Secretion	What It Acts On
Mouth	Saliva (contains salivary amylase)	Starch → Maltose
Stomach	Gastric juice (HCl + pepsin)	Proteins begin digestion; HCl kills bacteria and activates pepsin
Liver	Bile (no enzyme)	Emulsifies fats (large globules → tiny droplets)
Pancreas	Pancreatic juice (amylase, trypsin, lipase)	Starch, proteins, fats
Small intestine	Intestinal juice (various enzymes)	Completes digestion of all nutrients; main site of absorption via villi
Large intestine	No digestive juice	Reabsorbs water; forms and stores faeces

Solved Examples

Example 1 — Why Are Green Plants Called Autotrophs?

Q. Why are green plants called autotrophs? Name the process by which they prepare their food.

Solution:

Step 1: Define autotrophic nutrition. Autotrophic nutrition means the organism prepares its own food from simple inorganic substances.

Step 2: Explain how plants do this. Green plants absorb carbon dioxide from the air and water from the soil. Using sunlight energy trapped by chlorophyll in their leaves, they convert these into glucose (food) and release oxygen.

Step 3: Name the process. This process is called **photosynthesis**.

∴ Green plants are called **autotrophs** because they synthesise their own food through **photosynthesis**, using CO₂, water, sunlight, and chlorophyll.

Example 2 — Starch Test on a Covered Leaf

Q. A potted plant is kept in sunlight. One of its leaves is covered with black paper on both sides. After a few hours, the leaf is tested for starch using iodine solution. The covered part shows no blue-black colour. Give two reasons for this observation.

Solution:

Step 1: Recall the conditions needed for photosynthesis — sunlight, CO₂, water, and chlorophyll.

Step 2: Analyse the covered part. (i) The black paper blocks sunlight from reaching the covered area. Without light energy, the light-dependent reactions of photosynthesis cannot occur, so no glucose (and hence no starch) is produced. (ii) The paper also partially restricts the exchange of gases, reducing CO₂ availability to the covered cells.

Step 3: Conclude. Since photosynthesis did not take place in the covered region, no starch was synthesised there, and the iodine test gives a negative result.

∴ The covered part shows no starch because **(i) sunlight was blocked**, preventing photosynthesis, and **(ii) gas exchange was restricted**, reducing CO₂ supply.

Example 3 — Gall Bladder Removal and Fat Digestion

Q. Rajan's gall bladder was surgically removed. After eating a meal rich in fats, he feels heavy and uncomfortable. Explain why.

Solution:

Step 1: Role of the gall bladder. The gall bladder stores bile produced by the liver and releases it into the small intestine when fatty food arrives.

Step 2: What happens without the gall bladder? Without the gall bladder, bile is not stored in a concentrated form and is released slowly and in smaller quantities directly from the liver.

Step 3: Impact on fat digestion. Bile emulsifies fats — it breaks large fat globules into tiny droplets, increasing the surface area for lipase (fat-digesting enzyme) to act. With less bile available at once, emulsification is incomplete, and lipase cannot efficiently digest all the fat.

Step 4: Result. Undigested or partially digested fat remains in the intestine longer, causing the feeling of heaviness and discomfort.

∴ Rajan feels heavy because **without the gall bladder, bile release is insufficient** for complete emulsification of fats, leading to **slower and incomplete fat digestion**.

Example 4 — Damaged Villi: Predict the Effects

Q. A patient's small intestine has severely damaged villi. Predict two effects this would have on the patient's health, even if the patient continues to eat normally.

Solution:

Step 1: Role of villi. Villi are tiny finger-like projections on the inner wall of the small intestine. They provide a very large surface area for the absorption of digested food into the bloodstream.

Step 2: Effect of damaged villi. (i) **Poor nutrient absorption:** With damaged villi, the surface area available for absorption is drastically reduced. Even though food is digested properly, the nutrients cannot pass efficiently into the blood. (ii) **Weakness and weight loss:** Since cells do not receive adequate glucose, amino acids, and fatty acids, the body cannot produce enough energy or build/repair tissues. The patient will lose weight and feel weak despite eating normally.

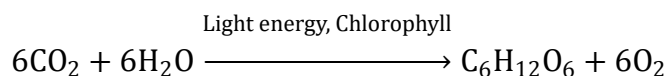
∴ Damaged villi cause (i) **poor absorption of digested food** and (ii) **progressive weakness and weight loss** — the patient effectively starves at the cellular level even while eating adequate meals.

Example 5 — Board-Level: Photosynthesis Equation and Details

Q. (a) Write the balanced chemical equation for photosynthesis. (b) Name the raw materials required. (c) State the conditions necessary. (d) Name the by-product released.

Solution:

Step 1: Write the balanced equation.



Step 2: Raw materials. (b) The raw materials are **carbon dioxide** (absorbed from the air through stomata) and **water** (absorbed from the soil through roots).

Step 3: Conditions necessary. (c) Two conditions are essential: (i) **Sunlight** — provides the energy to drive the reaction. (ii) **Chlorophyll** — the green pigment in leaves that traps sunlight.

Step 4: By-product. (d) The by-product released is **oxygen** (O_2), which is given out through the stomata.

∴ (a) $6\text{CO}_2 + 6\text{H}_2\text{O} \xrightarrow{\text{light, chlorophyll}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$; (b) CO_2 and water; (c) Sunlight and chlorophyll; (d) **Oxygen**.