Chapter: 7 Human nutrition
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Exam level: Cambridge IGCSE (0610)

1) Big-picture overview

This chapter explores human nutrition, starting with the definition of a balanced diet and the seven essential nutrients your body needs: carbohydrates, proteins, fats, vitamins, minerals, fibre, and water (p. 2). It explains why we need food for energy, growth, and repair (p. 1). You'll learn how energy requirements vary with age, gender, and activity level (p. 4). The chapter then details the structure and function of the human digestive system, or alimentary canal (p. 20). It breaks down digestion into two types: physical digestion, involving the teeth and stomach churning (p. 23), and chemical digestion, which uses specific enzymes like amylase, protease, and lipase to break large food molecules into smaller ones (p. 28). Finally, it explains how these small, soluble nutrients are absorbed into the bloodstream through the villi in the small intestine (p. 38) and used by the body's cells in a process called assimilation (p. 33).

2) Syllabus mapping

Outcome code	Outcome description	Where covered (page)
(6.1)	List the chemical elements that make up carbohydrates, fats and proteins.	6, 7, 9
(6.1)	Describe the structure of large molecules from smaller basic units, e.g. simple sugars to starch and glycogen, amino acids to proteins, and fatty acids and glycerol to fats and oils.	7, 9, 29
(6.2)	List the principal sources of and describe the importance of carbohydrates, fats, proteins, vitamins (C and D only), mineral salts (calcium and iron only), fibre (roughage), and water.	5, 10, 12, 13, 15, 16, 17

Outcome code	Outcome description	Where covered (page)
(6.2)	Describe the deficiency symptoms for vitamins C and D, and for mineral salts calcium and iron.	12, 13, 15, 16
(6.2)	Describe a balanced diet and explain how age, sex and activity affect dietary needs.	2, 4
(6.3)	Identify the main regions of the alimentary canal and associated organs including the mouth, salivary glands, oesophagus, stomach, small intestine (duodenum and ileum), pancreas, liver, gall bladder and large intestine (colon, rectum, anus).	30
(6.3)	Describe the functions of the main regions of the alimentary canal.	35
(6.3)	Describe the functions of teeth in physical digestion.	23, 25
(6.3)	Describe the process of chemical digestion, including the action of amylase, protease, and lipase.	28, 36, 37
(6.3)	State the functions of hydrochloric acid in the stomach.	31
(6.3)	Describe the role of bile in neutralising stomach acid and emulsifying fats.	27, 37
(6.4)	Describe the structure of a villus and the roles of capillaries and lacteals in absorption.	39, 41
(6.4)	State the function of the hepatic portal vein.	39
(6.4)	Define assimilation and describe the fate of glucose and amino acids after absorption.	29, 33

3) Key terms and definitions

Term	One-sentence definition	First appears (page)	Example/application
Balanced diet	A diet containing all essential nutrients in the correct proportions to maintain good health (p. 2).	2	Eating a mix of fruits, vegetables, grains, and protein sources daily.
Physical digestion	The breakdown of food into smaller pieces without chemical change to the food molecules (p. 23).	23	Chewing a piece of bread with your teeth.
Chemical digestion	The breakdown of large, insoluble molecules into small, soluble molecules (p. 29).	29	The enzyme amylase breaking down starch into maltose.
Ingestion	The taking of substances, like food and drink, into the body through the mouth (p. 29).	29	Taking a bite of an apple.
Digestion	The breakdown of food (p. 29).	29	The entire process occurring in the alimentary canal.
Absorption	The movement of nutrients from the intestines into the blood (p. 29).	29	Glucose passing from the ileum into the blood capillaries.
Assimilation	The uptake and use of nutrients by cells (p. 29).	29	Muscle cells using amino acids to build new proteins.
Egestion	The passing out of food that has not been digested or absorbed, as faeces, through the anus (p. 29).	29	Going to the toilet to pass stools.

4) Core concepts explained

Diet (p. 2)

- A **balanced diet** provides all seven essential nutrients in the right amounts for health (p. 2).
- The nutrients are: **carbohydrates**, **fats**, **proteins**, **vitamins**, **minerals**, **fibre**, and **water** (p. 2).
- Food is needed for three main reasons: for **growth** (making new cells), as a source of **energy** (for metabolic reactions, movement, and warmth), and for **replacement** of damaged tissues (p. 1-2).
- Energy needs vary based on **age** (needs increase during growth), **gender** (males generally need more), and **activity level** (more active people need more energy) (p. 4).

Classes of Food (p. 5)

Nutrient	Main Use in Body	Good Food Sources	Deficiency Disease
Carbohydrate	Main source of energy (p. 6).	Rice, potatoes, bread, pasta, sugary foods (p. 11).	Not stated.
Protein	Growth and repair of tissues; making enzymes (p. 11).	Meat, fish, eggs, beans, nuts (p. 8).	Not stated.
Fat	Source of energy (more than twice that of carbs); insulation; making cell membranes (p. 11).	Butter, milk, cheese, nuts, oils (p. 7).	Not stated.
Vitamin C	Maintains healthy skin and gums (p. 12).	Citrus fruits (oranges, lemons), green vegetables (p. 12).	**Scurvy** (bleeding gums, weak connective tissue) (p. 12).
Vitamin D	Helps absorb calcium for strong bones and teeth (p. 13).	Oily fish, milk, cheese, egg yolk; made by skin in sunlight (p. 13).	**Rickets** (soft, deformed bones in children) (p. 13).
Calcium	For strong bones and teeth; blood clotting;	Milk, cheese, fish (p. 16).	Rickets, weak bones, muscle cramps (p. 16).

Nutrient	Main Use in Body	Good Food Sources	Deficiency Disease
	muscle contraction (p. 15).		
Iron	Needed to make haemoglobin in red blood cells for oxygen transport (p. 15).	Red meat, liver, eggs, green vegetables (spinach) (p. 15).	**Anaemia** (tiredness, lack of energy due to reduced oxygen transport) (p. 15).
Fibre (Roughage)	Adds bulk to faeces to prevent constipation (p. 17).	Vegetables, fruit, wholemeal bread (p. 17).	Constipation (p. 17).
Water	Solvent for chemical reactions; transport of substances in blood; part of cytoplasm (p. 17).	Drinks, fruits, vegetables (p. 17).	Dehydration (p. 34).

The Alimentary Canal (p. 20)

- This is the long tube running through the body where digestion occurs (p. 20).
- It includes the **mouth, oesophagus, stomach, small intestine (duodenum and ileum), and large intestine (colon and rectum)** (p. 30).
- Associated organs like the **salivary glands, liver, gall bladder, and pancreas** produce digestive juices (p. 22).
- The walls of the canal contain muscles for moving food along by **peristalsis** (wave-like contractions) and are lined with an **epithelium** that produces protective mucus (p. 21-22).

Physical Digestion (p. 23)

- **Definition:** Breaking food down into smaller pieces to increase the surface area for enzymes to act on (p. 23, 451). This does not involve chemical changes.
- **In the mouth:** Teeth cut, tear, and grind food.
  - **Incisors:** Chisel-shaped for biting off pieces (p. 25).
  - **Canines:** Pointed, for functions similar to incisors (p. 25).
  - **Premolars & Molars:** Broad, cusped surfaces for crushing and grinding (p. 25).
- **In the stomach:** Muscular walls churn and mix food with gastric juice, turning it into a creamy liquid (p. 26).

- **In the duodenum: Bile**, produced by the liver, **emulsifies** fats. This means it breaks large fat globules into tiny droplets, increasing their surface area for lipase to digest (p. 27).

Chemical Digestion (p. 28)

- **Definition:** The breakdown of large, insoluble food molecules into small, soluble ones using enzymes (p. 29).
- **Carbohydrates (Starch):**
  - **Amylase** breaks starch into the sugar **maltose** (p. 36).
  - This happens in the **mouth** (salivary amylase) and the **duodenum** (pancreatic amylase) (p. 31, 36).
  - **Maltase** in the ileum lining breaks maltose into **glucose** (p. 36).
- **Proteins:**
  - **Proteases** break proteins into **amino acids** (p. 31).
  - In the **stomach**, **pepsin** works in acidic conditions (due to **hydrochloric acid**) (p. 31).
  - In the **duodenum**, **trypsin** (from the pancreas) works in alkaline conditions (p. 37).
- **Fats:**
  - **Lipase** (from the pancreas) breaks fats into **fatty acids** and **glycerol** (p. 32).
  - This happens in the **duodenum** (p. 32).

Absorption (p. 38)

- This is the movement of digested food molecules from the intestine into the blood (p. 29).
- It mainly occurs in the **ileum** (the second part of the small intestine) (p. 38).
- The ileum is adapted for efficient absorption:
  - It's **very long** with a folded inner surface, creating a huge surface area (p. 38).
  - The surface is covered in millions of tiny, finger-like projections called **villi** (singular: villus) (p. 38).
  - The cells on the villi have even smaller folds called **microvilli** (p. 39).
  - The wall of a villus is only **one cell thick**, so nutrients can pass through quickly (p. 39).
  - Each villus has a rich blood supply (**capillary network**) and a **lacteal** (p. 39, 41).
- **Glucose and amino acids** are absorbed into the blood **capillaries** (p. 39).
- **Fatty acids and glycerol** are absorbed into the **lacteal**, which is part of the lymphatic system (p. 39).
- Most water is also absorbed in the small intestine, with the remainder absorbed in the colon (p. 34, 38).

5) Diagrams and micrographs (figures)

- **Figure 7.10 & 7.11: Human teeth (p. 24)**
  - **What it shows:** The arrangement and types of teeth in the human jaw.
  - **Labels:** Incisor (biting), Canine (tearing), Premolar, Molar (grinding/chewing), Crown (visible part), Root (embedded in jaw).
- **Figure 7.12: Structure of a molar tooth (p. 25)**
  - **What it shows:** A cross-section of a single molar tooth.
  - **Labels:**
    - **Enamel:** Hard, outer protective layer.
    - **Dentine:** Bone-like tissue under the enamel.
    - **Pulp cavity:** Contains nerves and blood vessels providing nourishment.
    - **Gum:** Tissue covering the jaw bone.
    - **Cement:** Layer covering the root, helps anchor the tooth.
    - **Nerve:** Detects stimuli like temperature and pain.
- **Figure 7.14: The human alimentary canal (p. 30)**
  - **What it shows:** The main organs of the digestive system and their positions.
  - **Labels:** Mouth, Salivary gland, Oesophagus, Liver, Stomach, Gall bladder, Pancreas, Small intestine (duodenum, ileum), Large intestine (colon, rectum), Anus.
- **Figure 7.17 & 7.18: Structure of the ileum wall and a villus (p. 40, 41)**
  - **What it shows:** How the small intestine is folded (Fig 7.17) and the detailed structure of a single villus (Fig 7.18).
  - **Labels:**
    - **Villus:** Finger-like projection to increase surface area for absorption.
    - **Epithelium:** The one-cell-thick outer layer of the villus.
    - **Blood capillary:** Tiny blood vessel that absorbs glucose and amino acids.
    - **Lacteal:** Tube in the centre of the villus that absorbs fatty acids and glycerol.
    - **Mucus-producing cell:** Secretes mucus to protect the lining.

6) Processes and cycles

Digestion of Starch

1. **Location:** Mouth and Duodenum.
2. **Enzyme:** Amylase (from salivary glands and pancreas).

3. **Process:** Large, insoluble starch molecules are broken down into smaller, soluble maltose molecules.
4. **Final step (Ileum):** Maltase enzymes in the lining of the ileum break maltose into glucose, which is small enough to be absorbed.
5. **Word Equation:**
    - Starch $xrightarrow{Amylase}$ Maltose
    - Maltose $xrightarrow{Maltase}$ Glucose

Digestion of Protein

1. **Location:** Stomach and Duodenum.
2. **Enzymes:** Proteases (e.g., pepsin in the stomach, trypsin in the duodenum).
3. **Process:**
    - In the stomach, **hydrochloric acid** creates an acidic pH (optimum for pepsin) and kills bacteria (p. 31). Pepsin begins breaking large protein molecules into smaller peptides (p. 37).
    - In the duodenum, **bile** and pancreatic juice neutralise the acid, creating an alkaline pH (optimum for trypsin) (p. 32, 37). Trypsin continues breaking down proteins and peptides.
4. **Final step (Ileum):** Other proteases (peptidases) in the ileum lining break peptides into amino acids for absorption (p. 37).
5. **Word Equation:** Protein $xrightarrow{Protease}$ Amino Acids

Digestion and Absorption of Fat

1. **Location:** Duodenum.
2. **Substances involved:** Bile (from liver) and Lipase (from pancreas).
3. **Process:**
    - **Physical Digestion:** Bile salts emulsify large fat globules into tiny droplets, increasing the surface area (p. 27).
    - **Chemical Digestion:** Lipase enzymes break down the fat droplets into fatty acids and glycerol (p. 32).
4. **Absorption (Ileum):** Fatty acids and glycerol pass into the epithelial cells of the villi, where many re-form into fats, and are then absorbed into the lacteal (p. 39).
5. **Word Equation:** Fat $xrightarrow{Lipase}$ Fatty Acids + Glycerol

7) Formulae and calculations

The calculation in this chapter is for estimating the energy content of food from a practical experiment.

Quantity	Formula	Units	Typical values	Worked example (from p. 19)
Energy transferred to water	Energy = mass of water × specific heat capacity of water × temperature rise	Joules (J)	Not specified, but a peanut might raise 20g of water by 20–50°C.	**1.** Measure water volume: 20 cm^3 (which has a mass of 20 g) (p. 19). **2.** Measure temperature rise: Let's say it went from 20°C to 60°C. Rise = 40°C. **3.** Calculate energy: Energy = 20 g × 4.2 J/g°C × 40°C = **3360 J** (p. 19).
Energy per gram of food	Energy per gram = Total energy released / mass of food burned	Joules per gram ($J\ g^{-1}$)	Official value for peanut: 2385 kJ per 100 g, or 23,850 $J\ g^{-1}$ (p. 20).	**1.** Weigh the peanut: Let's say it was 0.5 g. **2.** Calculate energy per gram: 3360 J / 0.5 g = **6720 $J\ g^{-1}$**. (Note: The experimental value is much lower than the official value due to heat loss).

8) Required practicals / experiments

Experiment 2: Action of Salivary Amylase on Starch (p. 43-44)

- **Aim:** To show that saliva contains an enzyme (amylase) that digests starch into a reducing sugar.
- **Apparatus:** Test tubes, water bath, Bunsen burner, droppers, saliva, starch solution, iodine solution, Benedict's solution.
- **Method:**
  i. Collect saliva in two test tubes (A and B).
  ii. Boil the saliva in tube B for 30 seconds and cool it (this denatures the enzyme).
  iii. Add starch solution to both tubes and leave for 5 minutes.

iv. Divide the contents of tube A into two new tubes. Test one for starch (add iodine) and the other for reducing sugar (add Benedict's and heat).
v. Repeat step 4 for the contents of tube B.

- **Variables:**
  - **IV:** Presence of active enzyme (unboiled vs. boiled saliva).
  - **DV:** Presence of starch and reducing sugar.
  - **Controls:** Temperature, pH, concentration of starch. Tube B acts as the control to show the enzyme is responsible.
- **Safety:** Wear eye protection (p. 43). Do not taste or ingest chemicals.
- **Expected Results:**
  - **Tube A (unboiled saliva):** Starch test is negative (brown). Sugar test is positive (orange/red).
  - **Tube B (boiled saliva):** Starch test is positive (blue-black). Sugar test is negative (blue).
- **Conclusion:** An enzyme in saliva digests starch to reducing sugar. Boiling destroys this enzyme (p. 45).

Experiment 4: Action of Pepsin on Egg White Protein (p. 47-48)

- **Aim:** To investigate the conditions needed for pepsin to digest protein.
- **Apparatus:** Test tubes, water bath, egg-white suspension, pepsin solution, dilute hydrochloric acid (HCl).
- **Method:**
  i. Set up four test tubes with egg white suspension.
  ii. Add solutions as follows:
    - **A:** Pepsin only.
    - **B:** HCl only.
    - **C:** Pepsin + HCl.
    - **D:** Boiled pepsin + HCl.
  iii. Place all tubes in a warm water bath (35°C) for 10-15 minutes.
  iv. Observe which suspension turns from cloudy to clear.
- **Variables:**
  - **IV:** Presence of pepsin; presence of acid.
  - **DV:** Clarity of the egg-white suspension (digestion of protein).
  - **Controls:** Temperature, concentration of egg white. Tubes A, B, and D are controls.
- **Safety:** Wear eye protection (p. 47). Handle acid with care.
- **Expected Results:** Only tube C (pepsin + acid) will go clear (p. 48).
- **Conclusion:** Pepsin digests protein and works best in acidic conditions. Boiling denatures pepsin (p. 48).

9) Data handling and graphing

- **Bar Charts (Figure 7.1, p. 3 and Figure 7.2, p. 5):**
  - **What they show:** Figure 7.1 compares the percentage composition (% weight) of different nutrients in four food types (meat, fish, bread, beans). Figure 7.2 compares the energy requirements (kJ) of males and females at different ages and activity levels.
  - **How to read them:** The height of each bar represents the value of the variable on the y-axis (e.g., % weight or energy requirements). The x-axis shows the different categories being compared (e.g., food type or age group).
  - **Trends to look for:** Look for the highest and lowest values. For example, in Fig 7.2, notice that energy needs increase with age to adulthood and that males consistently require more energy than females (p. 4). Very active adults need the most energy.
  - **Typical exam prompts:** "Calculate the difference in energy requirement between an 11-year-old male and an 11-year-old female." or "Which food in Figure 7.1 has the highest protein content?"

10) Common misconceptions and exam tips

- **Misconception:** Most water is absorbed in the large intestine.
  - **Correct understanding:** The vast majority of water (from food, drink, and digestive juices) is absorbed in the **small intestine (ileum)**. The large intestine (colon) absorbs the remaining water (p. 34, 38).
  - **Tip:** Remember 'S' for small intestine and 'S' for significant water absorption.
- **Misconception:** Egestion is the same as excretion.
  - **Correct understanding: Egestion** is the removal of undigested food (faeces), which has never entered the body's cells (p. 34). **Excretion** is the removal of metabolic waste products (like urea or carbon dioxide) made by the body's cells.
  - **Tip: E**gestion = **E**xit of undigested food. **Ex**cretion = **Ex**it of metabolic waste.
- **Misconception:** Bile is an enzyme.
  - **Correct understanding:** Bile does **not** contain any enzymes. It performs physical digestion by **emulsifying** fats and chemical preparation by **neutralising** stomach acid (p. 27).
  - **Tip:** Bile is a helper, not a digester. It prepares the food for the real enzymes (lipase).
- **Misconception:** We digest fibre (cellulose) for energy.
  - **Correct understanding:** Humans do not have the enzyme to digest cellulose. It passes through the digestive system as fibre, which is important for preventing constipation (p. 6,

16).

- **Tip:** Fibre keeps things moving; it's a cleaner, not a fuel.

11) Exam-style practice

Multiple Choice Questions (MCQs)

1. Which nutrient is primarily used for the growth and repair of tissues?
   A. Carbohydrate
   B. Fat
   C. Protein
   D. Fibre

   > **Answer: C.** Protein provides amino acids needed to build new cells and tissues (p. 8).

2. What is the function of the incisor teeth?
   A. Grinding food
   B. Tearing food
   C. Biting off pieces of food
   D. Crushing food

   > **Answer: C.** Incisors are chisel-shaped and located at the front for biting (p. 25).

3. Where in the alimentary canal does the digestion of starch begin?
   A. Stomach
   B. Mouth
   C. Duodenum
   D. Ileum

   > **Answer: B.** Salivary amylase in the mouth starts breaking down starch (p. 31).

4. A lack of which vitamin leads to the disease scurvy?
   A. Vitamin A
   B. Vitamin C
   C. Vitamin D
   D. Vitamin B

   > **Answer: B.** Vitamin C is needed for healthy gums and connective tissue; a deficiency causes scurvy (p. 12).

5. What is the role of bile in digestion?
   A. To digest fats into fatty acids

B. To provide an acidic pH for pepsin
C. To break large fat globules into smaller droplets
D. To digest proteins into amino acids

> **Answer: C.** Bile emulsifies fats, which is a form of physical digestion (p. 27).

6. Which structures greatly increase the internal surface area of the small intestine?
   A. Capillaries
   B. Villi
   C. Lacteals
   D. Glands

   > **Answer: B.** Villi are finger-like projections that vastly increase the surface area for absorption (p. 38).

7. What are the end products of fat digestion?
   A. Amino acids
   B. Glucose
   C. Fatty acids and glycerol
   D. Maltose

   > **Answer: C.** Lipase breaks down fats into fatty acids and glycerol (p. 29).

8. Which process describes the uptake and use of nutrients by the body's cells?
   A. Ingestion
   B. Absorption
   C. Digestion
   D. Assimilation

   > **Answer: D.** Assimilation is the use of absorbed nutrients by cells (p. 29).

9. Hydrochloric acid in the stomach has two main functions. One is to kill bacteria. What is the other?
   A. To emulsify fats
   B. To provide the optimum pH for amylase
   C. To provide the optimum pH for protease
   D. To digest starch

   > **Answer: C.** HCl creates acidic conditions, which is the optimum pH for the protease enzyme pepsin (p. 31).

10. In which organ is most water absorbed?
    A. Stomach
    B. Liver

C. Small intestine

D. Large intestine

> **Answer: C.** Nearly all digested food and most of the water are absorbed in the ileum (small intestine) (p. 38).

Short-Answer Questions

1. **Define** a balanced diet.
   - **Answer:** A diet that contains all the essential nutrients [1] in the correct proportions [1] to maintain good health (p. 2).
2. **State** two reasons why the human body needs energy from food.
   - **Answer:** To keep internal processes working (e.g., heartbeat) [1]. To maintain body temperature [1]. (Also accept: for chemical reactions/metabolism, movement/activities) (p. 1-2, 4).
3. **Explain** why chewing food well helps it to be digested more quickly.
   - **Answer:** Chewing is a form of physical digestion that breaks food into smaller pieces [1]. This increases the surface area for digestive enzymes to act on [1].
4. A person has anaemia. **Identify** the mineral that is deficient in their diet and **explain** why this deficiency causes them to feel tired.
   - **Answer:** The mineral is iron [1]. Iron is needed to make haemoglobin in red blood cells. A lack of iron reduces the amount of haemoglobin, so less oxygen can be transported to the tissues [1]. This reduces aerobic respiration in cells, leading to a lack of energy and tiredness [1] (p. 15).
5. **Describe** how glucose is absorbed from the small intestine into the blood.
   - **Answer:** Glucose passes through the single-cell wall (epithelium) of the villus [1] and then into the blood capillaries within the villus [1] (p. 39).

Structured Questions

1. The diagram shows a villus from the small intestine.
   a) **Identify** the structures labeled X (blood capillary) and Y (lacteal). [2]
   b) **Explain** three ways in which the small intestine is adapted for the absorption of food. [3]
   c) **Name** one food molecule absorbed into structure X and one absorbed into structure Y. [2]
   - **Marking points:**
     - a) X is a (blood) capillary [1]. Y is a lacteal [1].
     - b) **(Any three from:)** It is very long, providing a large surface area [1]. The inner surface has folds covered with villi, which further increases surface area [1]. The wall of the villus is only one cell thick, providing a short diffusion distance [1]. Each villus has a rich blood

supply to carry absorbed nutrients away quickly, maintaining a concentration gradient [1].
    - c) Structure X (capillary): glucose OR amino acids [1]. Structure Y (lacteal): fatty acids OR glycerol [1].
2. An experiment was set up to investigate starch digestion, as shown in the diagram. A Visking tubing bag containing starch solution and amylase was placed in a beaker of water. Visking tubing is partially permeable.
   a) **State** which part of the digestive system the Visking tubing represents. [1]
   b) After 30 minutes, samples were taken from the beaker and the Visking tubing. **Predict** and **explain** the results of testing both samples for starch and for reducing sugar. [4]
   - **Marking points:**
     - a) The small intestine (or its wall/epithelium) [1].
     - b) **Beaker:** No starch will be present because starch molecules are too large to pass through the tubing [1]. Reducing sugar will be present because amylase digested the starch into smaller sugar molecules, which could pass through the tubing [1].
     - **Visking tubing:** Starch will be absent (or reduced) as it has been digested by amylase [1]. Reducing sugar will be present as it is the product of digestion [1].

12) Quick revision checklist

- ☐ I can define a balanced diet and list the seven types of nutrients.
- ☐ I can state the main functions of carbohydrates, proteins, and fats.
- ☐ I can name the deficiency diseases for vitamin C (scurvy), vitamin D (rickets), calcium, and iron (anaemia).
- ☐ I can explain how energy needs are affected by age, gender, and activity.
- ☐ I can identify the four types of human teeth and describe their functions in physical digestion.
- ☐ I can label the main parts of the alimentary canal on a diagram.
- ☐ I know the functions of the stomach, small intestine, and large intestine.
- ☐ I can explain the role of enzymes in chemical digestion (amylase, protease, lipase).
- ☐ I can state the function of hydrochloric acid in the stomach.
- ☐ I can describe the role of bile in emulsifying fats and neutralising acid.
- ☐ I can list the final products of carbohydrate, protein, and fat digestion.
- ☐ I can describe how the villi in the small intestine are adapted for absorption.
- ☐ I can explain the difference between absorption into capillaries and into lacteals.
- ☐ I can define ingestion, digestion, absorption, assimilation, and egestion.

13) Flashcards (ready-to-use)

Question	Answer
What are the 7 components of a balanced diet?	Carbohydrates, proteins, fats, vitamins, minerals, fibre, and water (p. 2).
What is the main function of carbohydrates?	To provide energy (p. 6).
What is the main function of protein?	Growth and repair of tissues (p. 8).
What disease is caused by a lack of Vitamin C?	Scurvy (p. 12).
What disease is caused by a lack of Vitamin D?	Rickets (p. 13).
What is the function of iron in the body?	To make haemoglobin for oxygen transport in red blood cells (p. 15).
What is physical digestion?	The mechanical breakdown of food into smaller pieces (e.g., by teeth) (p. 23).
What is chemical digestion?	The breakdown of large molecules into small molecules using enzymes (p. 29).
What enzyme digests starch?	Amylase (p. 31).
What enzyme digests protein?	Protease (e.g., pepsin, trypsin) (p. 31).
What enzyme digests fat?	Lipase (p. 32).
What is the function of the stomach?	To churn food and start protein digestion with pepsin and HCl (p. 31).
What are the two functions of bile?	1. Emulsify fats. 2. Neutralise stomach acid (p. 27, 37).
Where does most chemical digestion and absorption occur?	In the small intestine (duodenum and ileum) (p. 31, 38).
What are villi?	Tiny, finger-like projections in the small intestine that increase surface area for absorption (p. 38).

Question	Answer
What is absorbed into the blood capillaries in a villus?	Glucose and amino acids (p. 39).
What is absorbed into the lacteal in a villus?	Fatty acids and glycerol (p. 39).
What is assimilation?	The uptake and use of absorbed nutrients by the body's cells (p. 29).
What is egestion?	The removal of undigested food as faeces (p. 29).
What is the role of fibre (roughage)?	To add bulk to faeces and prevent constipation (p. 17).
What are the final products of protein digestion?	Amino acids (p. 29).
What are the final products of starch digestion?	Glucose (p. 29, 36).

14) 60-second recap

Human nutrition requires a balanced diet containing seven key nutrients for energy, growth, and repair. The food you ingest is broken down in the alimentary canal. First, physical digestion by teeth and the stomach increases the surface area. Then, chemical digestion uses enzymes—amylase for starch, protease for protein, and lipase for fat—to break large molecules into small, soluble ones. Starch becomes glucose, protein becomes amino acids, and fat becomes fatty acids and glycerol. These products are absorbed through the villi of the small intestine, which are highly adapted with a huge surface area. Glucose and amino acids enter the blood capillaries, while fats enter the lacteals. Finally, the cells assimilate these nutrients for life processes, and any undigested waste is egested.

15) References to pages

- Absorption: 29, 33, 38, 39, 41
- Alimentary Canal: 20, 21, 22, 30, 35
- Assimilation: 29, 33
- Balanced Diet: 2, 4

- Bile: 27, 32, 37
- Carbohydrates: 2, 5, 6, 7, 11, 36
- Chemical Digestion: 28, 29, 31, 37
- Egestion: 29, 34
- Energy from food: 1, 3, 4, 19
- Enzymes (Amylase, Lipase, Protease): 31, 32, 36, 37
- Experiments (Practicals): 19, 43, 45, 47
- Fats: 2, 7, 11, 27, 32
- Fibre (Roughage): 2, 16, 17
- Ingestion: 29, 30
- Minerals (Calcium & Iron): 2, 15, 16
- Physical Digestion: 23, 26, 27
- Proteins: 2, 8, 9, 11, 31, 33, 37
- Stomach: 26, 31
- Teeth: 23, 24, 25
- Villi: 38, 39, 40, 41
- Vitamins (C & D): 2, 11, 12, 13, 14
- Water: 2, 17

16) Excluded "Going further" sections (not summarized)

Section title	Pages
Energy requirements	3–4
Protein requirements	10
Peristalsis	26

Total excluded: 3