

Human nutrition revision notes

Human nutrition is about how the body gets the materials and energy it needs from food. You will learn what a balanced diet contains, and how the organs of the digestive system break food down physically and chemically into small soluble molecules.

For Cambridge IGCSE Combined Science 0653, **Supplement** is Extended content, only examined on Papers 2 and 4.

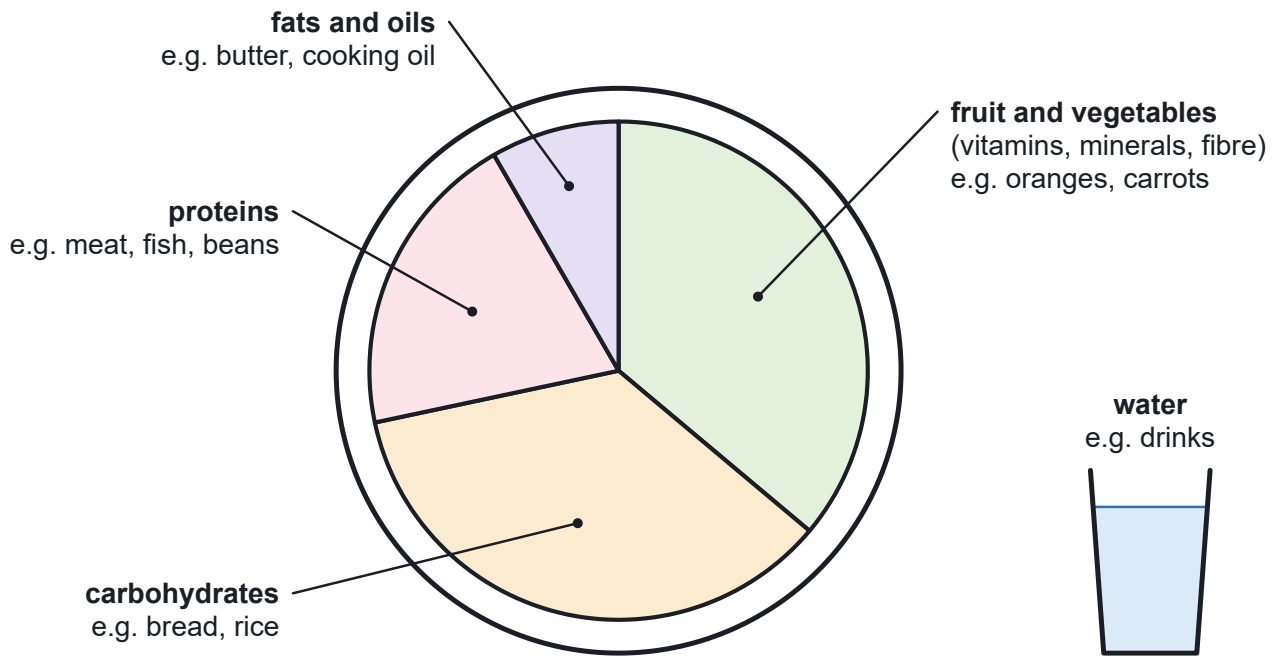
1 Diet **Spec B7.1**

A balanced diet and the main nutrients **Spec B7.1.1, B7.1.2**

A **balanced diet** contains all the nutrients the body needs, in the correct proportions, and gives the right amount of energy for the person. The amount of energy needed depends on age, sex and how active the person is.

You need to know the main source of each nutrient and why the body needs it. Vitamins are limited to C and D, and mineral ions are limited to calcium and iron.

Nutrients: sources and importance		
Nutrient	Main dietary sources	Importance in the body
Carbohydrates	Bread, rice, pasta, potatoes	Provide energy
Fats and oils	Butter, cooking oils, fatty meat, nuts	Provide energy, act as an energy store and give insulation (keeping the body warm)
Proteins	Meat, fish, eggs, beans	Growth and repair of tissues
Vitamin C	Citrus fruits, fresh fruit and vegetables	Needed for healthy skin and gums; prevents scurvy
Vitamin D	Oily fish, eggs, margarine (also made in the skin in sunlight)	Helps the body absorb calcium, so bones and teeth are hard; prevents rickets
Calcium	Milk, cheese, yoghurt	Making bones and teeth
Iron	Red meat, liver, green leafy vegetables	Making haemoglobin in red blood cells
Fibre (roughage)	Wholemeal bread, fruit, vegetables	Provides bulk for the muscles of the gut to push food along, which helps prevent constipation
Water	Drinks and most foods	Needed as a solvent and for the reactions in cells; forms the blood plasma, sweat and urine



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A balanced diet contains all the nutrients in the **correct proportions**, plus fibre and water.

Common mistake: Do not say fibre 'gives energy' or is digested. Fibre is not digested by humans; it adds bulk to the food.

Exam tip: Give a specific use, not just 'for health'. Write 'iron for making haemoglobin' or 'calcium for strong bones and teeth'.

Quick check

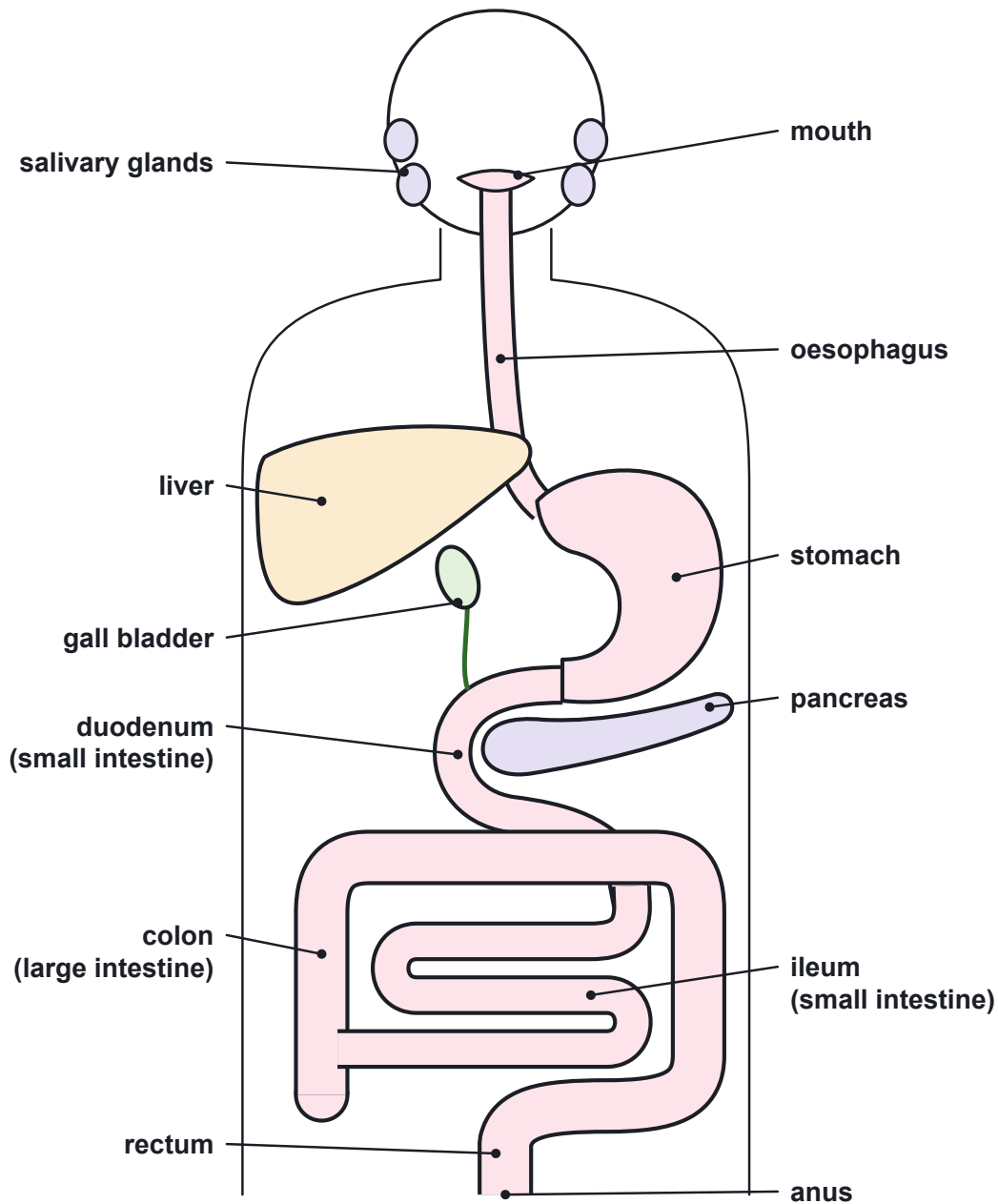
1. What is a balanced diet?
2. Which nutrient is needed for growth and repair?
3. Why does the body need iron?

2 The digestive system Spec B7.2, B7.3

Organs of the digestive system Spec B7.2.1, B7.2.2

The **alimentary canal** is the long tube that food passes through from mouth to anus. The **associated organs** are not part of the tube, but they make and store the juices that digest food.

- Alimentary canal: mouth, oesophagus, stomach, small intestine (duodenum and ileum) and large intestine (colon, rectum and anus).
- Associated organs: salivary glands, pancreas, liver and gall bladder.



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The **alimentary canal** (pink) runs from mouth to anus; the **associated organs** (salivary glands, liver, gall bladder, pancreas) are shown in other colours.

Five processes of nutrition

Ingestion	The taking of substances, e.g. food and drink, into the body.
Digestion	The breakdown of food.
Absorption	The movement of nutrients from the intestines into the blood.
Assimilation	Uptake and use of nutrients by cells.
Egestion	The removal of undigested food from the body as faeces.

Functions of the organs		
Organ	Function	Process
Mouth	Food and drink are taken in; teeth break food up; food mixes with saliva	Ingestion; digestion
Salivary glands	Make saliva containing amylase, which starts chemical digestion of starch	Digestion
Oesophagus	Carries food from the mouth to the stomach	(moves food along)
Stomach	Churns food; makes gastric juice containing protease and hydrochloric acid	Digestion
Liver	Makes bile; absorbed nutrients are carried to the liver in the blood, and some are used there, e.g. amino acids to make proteins	Digestion; assimilation
Gall bladder	Stores bile and releases it into the duodenum	Digestion
Pancreas	Makes enzymes (amylase, protease, lipase) and releases them into the duodenum	Digestion
Small intestine: duodenum	Receives bile and pancreatic juice; digestion of food continues	Digestion
Small intestine: ileum	Digestion is completed; nutrients and most of the water are absorbed into the blood	Digestion; absorption
Large intestine: colon	Absorbs some water from the undigested food	Absorption
Rectum	Stores faeces	(before egestion)
Anus	Faeces leave the body	Egestion

Assimilation happens after absorption. The blood carries the absorbed nutrients to the body's cells, which take them up and use them, for example glucose for respiration and amino acids to make proteins.

Common mistake: Egestion is the removal of undigested food as faeces. It is not excretion, and it is not the same as absorption.

Physical digestion and teeth Spec B7.3.1, B7.3.3

Physical digestion is the breakdown of food into smaller pieces without chemical change to the food molecules.

Supplement

Physical digestion increases the **surface area** of the food, so enzymes in chemical digestion can act on more of it at once.

The stomach, acid and bile Spec B7.3.7

The stomach

Supplement

Hydrochloric acid in gastric juice has two functions:

Supplement

- It kills harmful microorganisms in food.
- It provides an acidic pH, which is the optimum pH for the protease enzyme in the stomach to work.

Bile

Bile is made in the liver, stored in the gall bladder and released into the duodenum.

Quick check

1. Name the process: the removal of undigested food as faeces.
2. **Supplement** Give two functions of hydrochloric acid in the stomach.

3 Chemical digestion Spec B7.3

Chemical digestion and digestive enzymes Spec B7.3.2, B7.3.4, B7.3.5, B7.3.6

Chemical digestion is the breakdown of large insoluble molecules into small soluble molecules. It is carried out by enzymes.

Supplement

The small soluble molecules made by chemical digestion can be **absorbed** into the blood. Large insoluble molecules cannot pass through the wall of the gut.

Supplement

Digestive enzymes

Enzyme	Breaks down	Into	Secreted by (made in)	Acts in
Amylase	Starch	Simple reducing sugars	Salivary glands and pancreas	Mouth and small intestine
Protease	Protein	Amino acids	Stomach and pancreas	Stomach and small intestine
Lipase	Fats and oils	Fatty acids and glycerol	Pancreas	Small intestine

Supplement

starch → simple reducing sugars (amylase)

Supplement

protein → amino acids (proteases)

Supplement

fats and oils → fatty acids + glycerol (lipase)

Supplement

Enzymes made in the pancreas flow into the duodenum, so the pancreas is where they are **secreted** but the small intestine is where they **act**. Quote both places if a question asks where an enzyme is secreted and where it acts.

Supplement

Exam tip: Learn each enzyme as a set of three: substrate, product, and where it is secreted and acts. Mark schemes ask for the product by name.

Quick check

- 1 . What is chemical digestion?
- 2 . **Supplement** What does lipase break down fats and oils into?
- 3 . **Supplement** Where is amylase secreted?

Quick check answers

Diet

1. A diet containing all the nutrients in the correct proportions, giving the right amount of energy for the person.
2. Protein.
3. To make haemoglobin in red blood cells.

The digestive system

1. Egestion.
2. It kills harmful microorganisms in food and provides an acidic pH for optimum enzyme activity.

Chemical digestion

1. The breakdown of large insoluble molecules into small soluble molecules.
2. Fatty acids and glycerol.
3. Salivary glands and pancreas.