

Chemical digestion

Revision notes · How digestive enzymes break large insoluble molecules into small soluble ones, where they are made and act, and the digestion of starch and protein.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Chemical digestion Spec 7.4

Chemical digestion and digestive enzymes Spec 7.4.1, 7.4.2, 7.4.3, 7.4.4

Chemical digestion is the breakdown of large insoluble molecules into small soluble molecules. It is carried out by enzymes. The small soluble molecules can be **absorbed** into the blood. Large insoluble molecules cannot pass through the wall of the gut.

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

starch → simple reducing sugars (amylase)

protein → amino acids (proteases)

fats and oils → fatty acids + glycerol (lipase)

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.

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.

Digesting starch and protein in detail Spec 7.4.6, 7.4.7 Supplement

Starch

1. Amylase from the salivary glands and the pancreas breaks starch down to **maltose**.
2. Maltase breaks maltose down to **glucose**. Maltase is on the membranes of the epithelium lining the small intestine.
3. Glucose is small and soluble, so it can be absorbed into the blood.

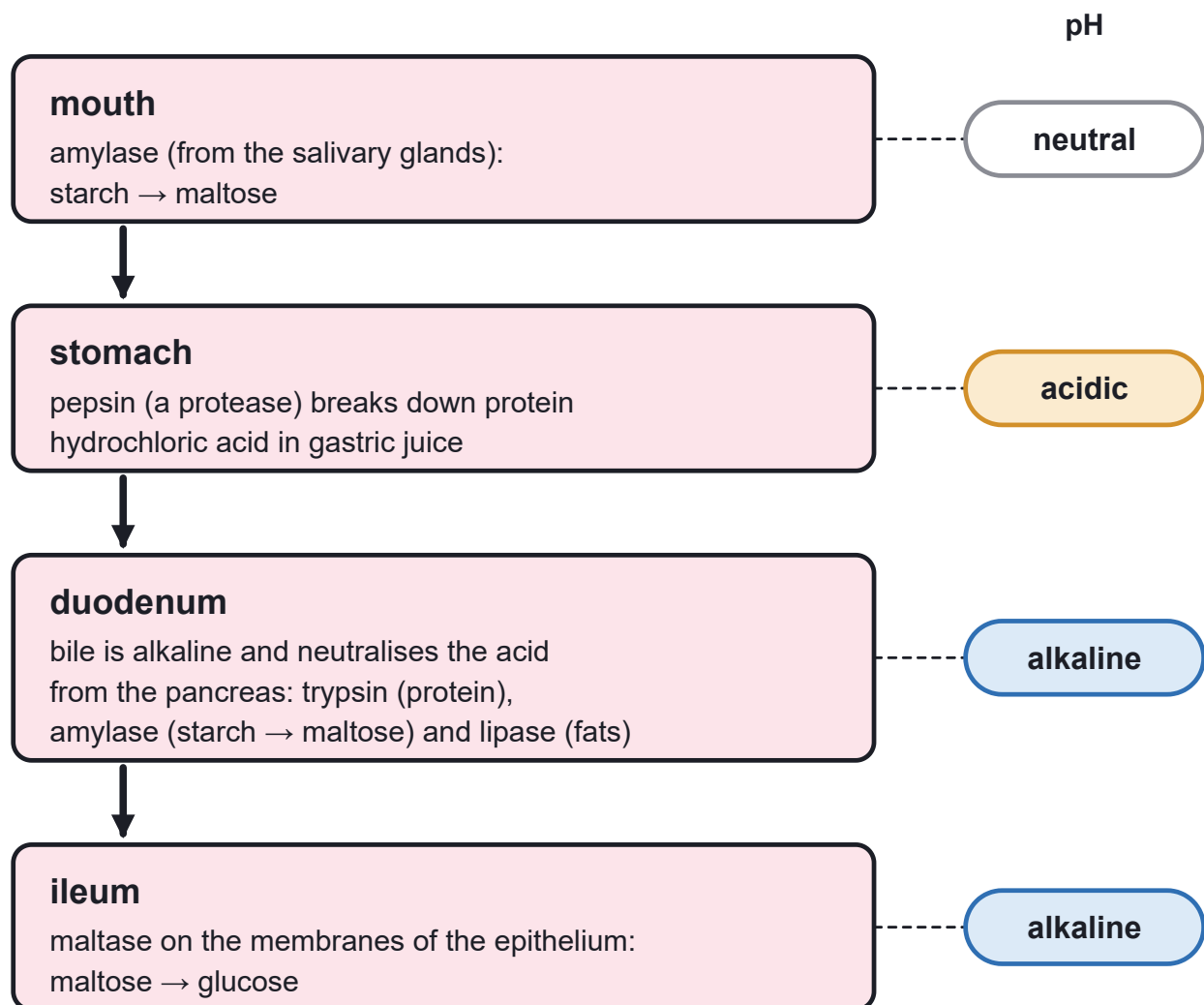
starch → maltose (amylase); maltose → glucose (maltase)

Protein

Two proteases

Protease	Where it works	Conditions
Pepsin	Stomach	Acidic, because of the hydrochloric acid in gastric juice
Trypsin	Small intestine	Alkaline, because of the bile mixed with the food

Each enzyme has an optimum pH. Pepsin works best in acid and trypsin works best in alkali. Both are proteases, so both break down protein.



Pepsin works in the **acidic** stomach; trypsin works in the **alkaline** small intestine, where bile has neutralised the acid.

Common mistake: Amylase does not make glucose directly. It makes maltose, and maltase then makes glucose. Link each enzyme to its own product.

Quick check

- 1 . What is chemical digestion?
- 2 . What does lipase break down fats and oils into?
- 3 . Where is amylase secreted?
- 4 . **Supplement** Which enzyme breaks maltose down to glucose, and where is it found?
- 5 . **Supplement** Why does trypsin work in the small intestine but pepsin does not?

Quick check answers

Chemical digestion

1. The breakdown of large insoluble molecules into small soluble molecules.
2. Fatty acids and glycerol.
3. Salivary glands and pancreas.
4. Maltase, on the membranes of the epithelium lining the small intestine.
5. Trypsin works in alkaline conditions and pepsin works in acidic conditions; bile makes the small intestine alkaline.