

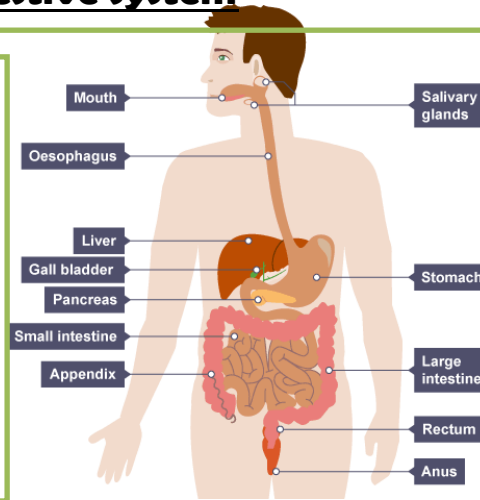
# Biology Knowledge Organiser

## B3 - Organisation and the digestive system

### The human digestive system

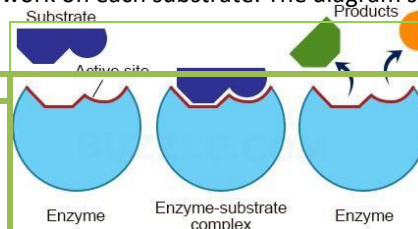
The digestive system **breaks down food molecules** into molecules our cells can actually use, and **absorbs** the simpler molecules resulting from digestion. The products of digestion are used to make new molecules we need, and the glucose is used in respiration. It is an **organ system**; the organs of the digestive system are shown on the diagram.

**Mechanical digestion** occurs in the mouth and stomach especially, where food is physically broken up into smaller pieces. This does not, however, break down the large molecules that our food is made from (carbohydrates, lipids and proteins). That is the role of **chemical digestion**, which is what enzymes do.



### Enzymes and digestion

Enzymes are **large proteins**; there are many different types. All organisms use enzymes to control chemical reactions (**metabolism**). Enzymes are **catalysts**, so they speed up chemical reactions. They work by having an **active site** with a specific shape. A specific molecule slots into the active site (like a key into a lock) and the reaction takes place. So, the shape of the active site is vitally important, and only one sort of enzyme will work on each substrate. The diagram shows this '**lock and key**' model of enzyme action.



### Bile

Bile is a vital substance for digestion. It is made in the **liver** and stored in the **gall bladder** before being released into the small intestine just after the stomach. It is **alkaline**, to neutralise the stomach acid and to make the partly digested food pH 8 – the optimum pH for enzymes in the small intestine. It also **emulsifies** fats, meaning it breaks them up into small droplets. This increases the fat droplets' **surface area**, increasing the rate of digestion by lipase.

Key Terms	Definitions
Enzyme	A biological catalyst that speeds up chemical reactions in living organisms. Enzymes are large proteins.
Digestive enzyme	Enzyme that works in the digestive system, breaking down large food molecules into simpler, smaller molecules for absorption into the blood.
Active site	The part of an enzyme where the reaction takes place. They are very specific in shape, so that a specific substrate fits into the active site.
Denature	To change the shape of the active site of an enzyme. Denaturation happens when the enzyme is at too high a temperature or at the wrong pH for that enzyme.
Substrate	The molecule that fits into an enzyme's active site and reacts to make a product or products.
Carbohydrate	A type of molecule found in all living things. Made of carbon, hydrogen and oxygen. Simple sugars like glucose are carbohydrates, and so are complex sugars like starch – in fact, starch is made of many glucose molecules joined up.
Lipid	Scientific name for fat. Lipids are made up of <b>glycerol</b> and <b>fatty acids</b> . Made mainly of carbon and hydrogen (+ oxygen).
Protein	Type of molecule made from <b>amino acids</b> . Proteins in the body can be <b>structural</b> (e.g. muscle is made mainly of proteins) or <b>metabolic</b> (control chemical reactions – e.g. enzymes). Made mainly of carbon, hydrogen, oxygen and nitrogen.
Optimum	The ideal temperature or pH for enzymes to work.

Digestive enzyme	Site of production	Site of action	Substrate	Product
Carbohydrase - e.g. amylase	Salivary glands, pancreas and small intestine wall	Mouth, small intestine	Complex carbohydrates - e.g. starch	Simple sugars - e.g. glucose
Protease	Stomach, pancreas, small intestine wall	Stomach, small intestine	Proteins	Amino acids
Lipase	Pancreas, small intestine wall	Small intestine	Lipids	Glycerol and fatty acids

