

**Subject: Physiology**  
**Year: 7**  
**Term: 2a**  
**Topic: Diet and Health**

**Lesson Sequence**

1. A Balanced Diet
2. Digestion
3. Enzymes
4. Bacteria in Digestion
5. Food Tests
6. Nutrients
7. Nutrient Deficiencies
8. Energy in Food
9. Drugs
10. Caffeine
11. Alcohol

**Key Assessments**

EA Exam 2

Key Assessment:  
Digestion of a Cheese Sandwich

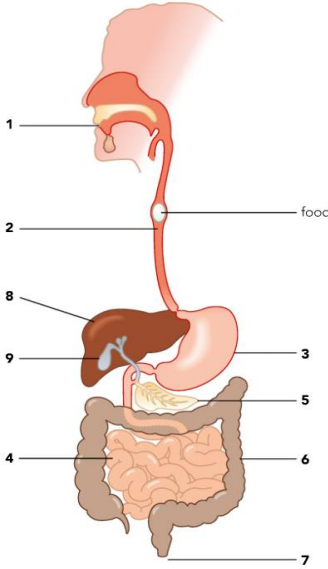
**Core Texts**

Smart Science  
Textbook

**Key Words**

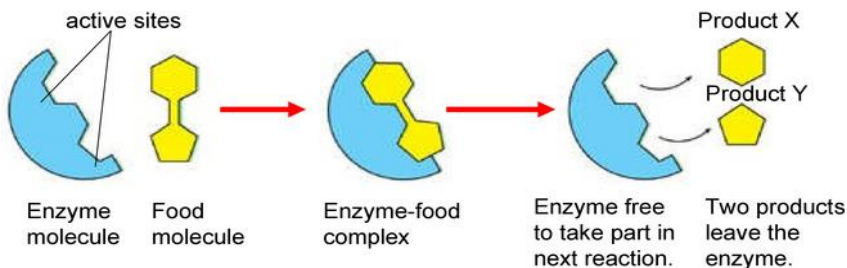
<b>Active Site</b>	The uniquely-shaped part of an enzyme that matches one substrate.	<b>Drug</b>	A substance that changes the function of the human body when it is consumed.
<b>Assimilated</b>	The process where food molecules are used in the body following digestion.	<b>Egestion</b>	The process in which undigested food leaves the body.
<b>Calorie</b>	A unit of energy used to measure the energy content of food. It is the approximate amount of energy needed to raise the temperature of one gram of water by one degree Celsius.	<b>Enzymes</b>	Proteins that speed up chemical reactions e.g. Digestion.
<b>Chemical Digestion</b>	The digestion of food by chemicals such as stomach acid and enzymes.	<b>Excretion</b>	To pass the waste produced from chemical reactions out of the body.
<b>Deficiency</b>	A lack or shortage of a key component of a balanced diet.	<b>Faeces</b>	Undigested food that is passed of the body.
<b>Denature</b>	When the active site of an enzyme changes in a way that the enzyme no longer works.	<b>Joule</b>	A unit of energy (J).

**The Digestive system**



- 1 – **Mouth and Teeth** – Teeth mash food into smaller pieces. Enzymes (amylase) in saliva digest starch.
- 2 – **Oesophagus** – A tube that connects the mouth and stomach.
- 3 – **Stomach** – Mechanical digestion by muscles and chemical digestion by enzymes (proteases) and hydrochloric acid (also to kill bacteria).
- 4 – **Small Intestine** – Absorbs food molecules into the bloodstream through villi.
- 5 – **Pancreas** – Secretes enzymes into the small intestine.
- 6 – **Large Intestine** – Absorbs water
- 7 – **Anus and rectum** – Faeces is stored in the rectum before leaving the body through the anus.
- 8 – **Liver** – Secretes bile to help digest fats and keep the pH of the gut optimum for enzymes.
- 9 – **Gall bladder** – Stores bile made by the liver before it is added to the small intestine.

**Enzymes – The Lock and Key Hypothesis**



**Components of a Balanced Diet**

Substance	From which foods?	Use
<b>Carbohydrates</b>	Wheat products, sugar	For energy.
<b>Proteins</b>	Meat, fish, dairy products	For growth.
<b>Fats</b>	Meat, dairy products	For storing energy and keeping us warm.
<b>Vitamins</b>	Various from fruits and vegetables	To help with chemical reactions in the body.
<b>Minerals</b>	Various from fruits and vegetables	For healthy bones, teeth, blood and other purposes.
<b>Fibre</b>	Wheat, dark parts of rice, some vegetables	To help food move through the digestive system.
<b>Water</b>	Water drinks, fruit and vegetables	For all chemical reactions in cells.

**Food Tests**

Substance	Test	Results
<b>Starch</b>	Add a few drops of iodine	Blue/Black if starch is present, brown if it is not.
<b>Fat</b>	Wipe food on filter paper	If wet smear remains fat is present.
<b>Sugar</b>	Add a few drops of Benedict's solution and heat in warm water	Orange if sugar is present, blue if it is not.
<b>Protein</b>	Add a few drops of Biuret solution	Purple if protein is present, blue if it is not.

## Key Words

<b>Malnutrition</b>	When a person is eating too much or too little of some types of food and becomes ill.	<b>Probiotic</b>	Food containing living bacteria that may 'help' digestion.
<b>Mechanical Digestion</b>	The digestion of food by physical processes in the body such as chewing, peristalsis and the churning of the stomach.	<b>Rate</b>	The speed at which a chemical reaction takes place.
<b>Medicinal</b>	A substance that is consumed for its health benefits.	<b>Recreational</b>	Drugs that are not medicinal, that are taken for the effects they have on the human body.
<b>Narcotic</b>	A drug that affects mood or behaviour, such as making the user feel sleepy.	<b>Saliva</b>	A watery-liquid containing enzymes that is produced in the mouth to make swallowing easier and aid digestion.
<b>Optimum</b>	The conditions in which an enzyme works at its fastest rate.	<b>Substrate</b>	The substance that an enzyme is breaking down.
<b>Peristalsis</b>	A circular, muscular contraction in the gut that squeezes food through the digestive system.	<b>Villi</b>	Small folds in the small intestine that help the absorption of food molecules.

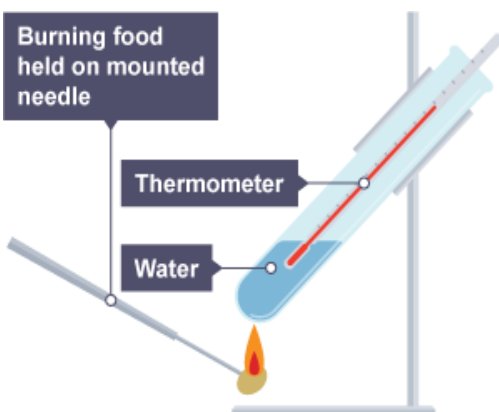
## Nutrient Deficiencies

Name	Cause	Effect on the Body
<b>Obesity</b>	Too much fat, sugar or carbohydrates	Increased risk of heart disease and cancer. May lead to diabetes.
<b>Kwashiorkor</b>	Lack of protein	Swollen stomach, feet and hands. Wasted muscles and failure to grow.
<b>Scurvy</b>	Lack of vitamin C from fresh fruit	Bleeding gums, bruising and swelling of joints.
<b>Rickets</b>	Lack of vitamin D from fish	Softening of bones causing them to bend, commonly bent or bowed legs.
<b>Diabetes</b>	Too much fat or sugar, lack of exercise	Loss of natural ability to control blood sugar, can be managed with a strict diet or insulin injections.
<b>Anaemia</b>	Lack of iron from meat or vegetables	Feeling tired, pale gums.

## Drug Classification – Key Terms

- **Stimulant** – Increases alertness and increases the speed of the users reactions. Examples: Caffeine, cocaine.
- **Depressant** – Decreases alertness and slows the users reaction speed. Examples: Cannabis, alcohol, heroin.
- **Pain Killers** – Blocks pain receptors reducing the brain ability to sense pain. Examples: Paracetamol, morphine.
- **Hallucinogen** – A drug that causes hallucinations – changing a person's perception of reality. Examples: LSD, magic mushrooms.
- **Addictive** – A chemical that is difficult to stop doing and eventually the body cannot function normally without it. Examples: Caffeine, cocaine, alcohol, nicotine.

## Energy in Food - Method



1. Weigh and record the mass of the dry food.
2. Fill test tube or calorimeter (metal beaker) with fixed volume of water. Record the starting temperature of the water with a thermometer.
3. Place food on a mounted needle and ignite.
4. Hold burning food under the container of water and record the final temperature of the water when the food is no longer burning.
5. Calculate change in temperature. This can be used to calculate the amount of energy contained in the food.

**Hint:** The amount of energy in food is proportional to the increase in temperature. The more energy that is in the food, the more the water will increase in temperature when that food is burnt.

## Enzymes

Enzyme	Target	Product
Amylase	Starch	Sugars
Lipase	Lipids	Fatty acids and glycerol
Protease	Proteins	Amino acids

## Calculating Energy in Food

### Energy Transferred (J) =

$$\text{Mass of water (g)} \times 4.2 \text{ (J/g } ^\circ\text{C)} \times \text{Temperature increase (} ^\circ\text{C)}$$

### Energy released from food per gram (J) =

$$\frac{[\text{Mass of water (g)} \times 4.2 \text{ (J/g } ^\circ\text{C)} \times \text{Temperature increase (} ^\circ\text{C)}]}{\text{Mass of food sample (g)}}$$