

Keywords

Balanced diet – “A balanced diet contains the correct amount of all nutrient groups”.

Unbalanced diet – “An unbalanced diet doesn't contain the correct amount of all nutrient groups”.

Energy

Three factors can affect how much energy someone needs per day

- Gender
- Age
- Daily activity



Food labels



Green – healthy choice, can be eaten all the time.
Amber – medium, can be eaten most of the time.
Red – high, should only be eaten sometimes.

Food Science

*Synsepalum
dulcificum*

Food groups

Nutrient	Found in... (examples)	What it does/they do
carbohydrates		Provide energy quickly
protein		Help to build and grow muscles.
fibre		Keep the digestive system healthy
fats		A store of energy
vitamins		Keep you healthy.
minerals		Keep you healthy.
water		Moves nutrients around your body and helps get rid of waste products.

It's a red berry that's native to West Africa. In 1968, scientists isolated the active protein responsible for making things taste sweet. Because of its miraculous way of making things taste so good, the protein was dubbed **miraculin**. When miracle fruit is consumed, the miraculin in the berry binds to the taste buds on the tongue. A person has receptors on their taste buds that identify sweet, sour, bitter and savory tastes. Normally, if you were to eat a lemon, your sour receptors would start firing. Under the influence of miraculin, however, the sweet receptors start signaling and suppress the sour tastes. The miraculin rewires the sweet receptors to temporarily identify acids as sugars. The FDA have classified it as a food additive.

Vitamin C

Vitamin C (ascorbic acid) is needed to help heal wounds and maintain healthy connective tissue (which gives support to other tissues and organs).

Good sources of vitamin C include:

- citrus fruits (such as oranges, lemons and limes)
- leafy green vegetables (such as sprouts and broccoli)

Vitamin C deficiency leads to scurvy. The symptoms of **scurvy** include bleeding and swelling of the gums, loss of teeth, tiredness and muscle and joint pain.



Oranges are a good source of vitamin C

Deficiency diseases

Deficiency diseases

Some people eat enough food to supply their energy needs, but are short of certain vitamins and minerals. This causes deficiency diseases. For example:

- Iron deficiency causes **anaemia**. This leads to tiredness and shortness of breath.
- Vitamin A deficiency can result in **blindness**.
- Vitamin C deficiency causes **scurvy**. Symptoms of scurvy include bleeding gums, bulging eyes and scaly skin.
- Protein deficiency can affect many bodily functions, often resulting in swollen, puffy skin and muscle wastage.



Oranges contain vitamin C.

Vitamin D

The human body can make vitamin D when our skin is exposed to sunlight.

Good dietary sources of vitamin D include:

- eggs
- margarine and breakfast cereals fortified with vitamin D
- oily fish

Vitamin D is needed to maintain healthy bones and teeth. Vitamin D deficiency leads to rickets and bone pain.



Oily fish such as mackerel and sardines are a good source of vitamin D

Keywords

Key Vocabulary

digest	Break down food so it can be used by the body.
oesophagus	A muscular tube which moves food from the mouth to the stomach.
stomach	An organ in the digestive system where food is broken down with stomach acid and by being churned around.
small intestine	Part of the intestine where nutrients are absorbed into the body.
large intestine	Part of the intestine where water is absorbed from remaining waste food. Stools are formed in the large intestine.
rectum	Part of the digestive system where stools are stored before leaving the body through the anus.

Digestion

Digestion - breaking down of large molecules into smaller molecules so that they can diffuse through the small intestine into the blood stream.

Starts with **physical digestion** - chewing and squeezing in the stomach this increases the surface area for the enzymes to work on.

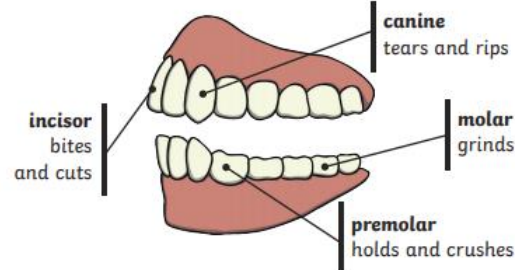
Chemical digestion - Enzymes break down large insoluble molecules into small soluble molecules so they can diffuse through the small intestine.

Gut bacteria

Gut bacteria have different jobs - helping control digestion, make vitamins & enzymes.

Adaptations

Human Teeth and Their Functions



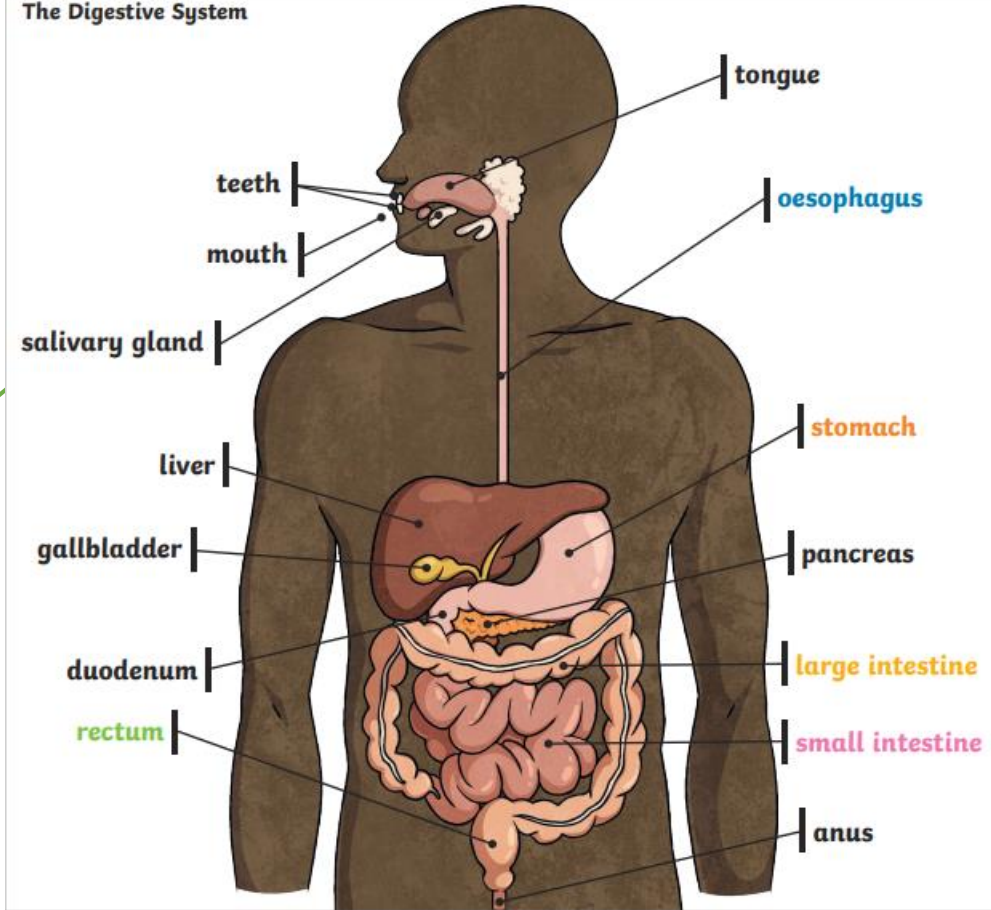
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Bile

Bile is produced in the **liver** and stored in the gall bladder. It is an **alkaline** substance which **neutralises** the hydrochloric acid in the stomach. It also works to **emulsify** fats into small droplets. The fat droplets have a higher **surface area** and so the rate of their digestion by lipase is increased.

Digestive System

The Digestive System

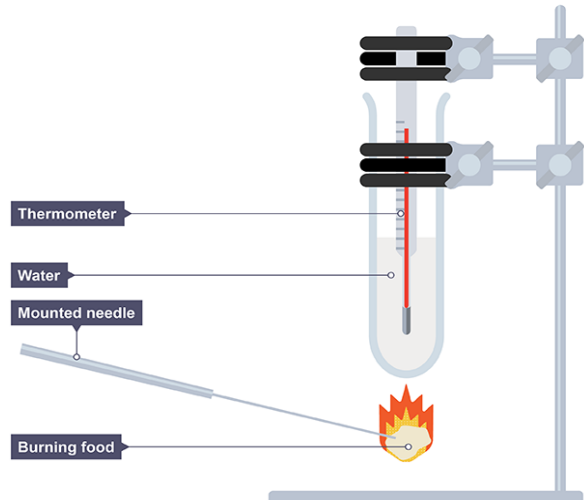


Region	Function
Mouth	Begins the digestion of carbohydrates
Stomach	Begins the digestion of protein; small molecules such as alcohol absorbed
Small intestine - Duodenum	Continues the digestion of carbohydrate and protein; begins the digestion of lipids
Small intestine - Ileum	Completes the digestion of carbohydrates and proteins into single sugars and amino acids; absorption of single sugars, amino acids and fatty acids and glycerol
Large intestine	Absorption of water; egestion of undigested food

Energy In food practical

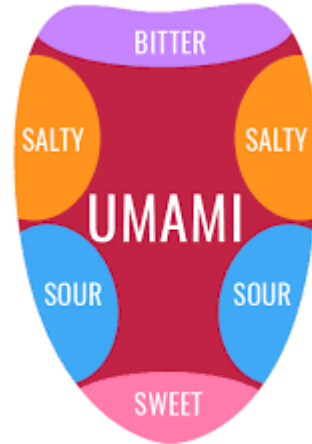
A simple investigation can be conducted to investigate the energy content of a food sample.

Procedure



1. Add water - around 20cm^3 - to a boiling tube clamped in a retort stand.
2. Record the starting temperature of the water.
3. Place food sample on mounted needle.
4. Ignite the food sample using a Bunsen burner.
5. Hold the burning food sample under the boiling tube of water until completely burned – it may be necessary to relight the food sample.
6. Record the final temperature of the water.
7. Record results in a table.
8. Calculate the change in temperature caused by the burning food sample.
9. Repeat steps 1- 8 with this food type to increase reliability.
10. Calculate the average change in temperature for this food type.
11. Calculate the energy released by this food type using this equation: Energy released (J) = mass of water (g) x rise in temperature ($^{\circ}\text{C}$) x 4.2
12. Repeat steps 1-8 with different food types for comparison.

Different taste types



Emulsions

An emulsion is defined as a mixture of oily watery liquid.

Food additives

Food may contain additives. These are substances intended to improve the properties of the food.

Benefits of food additives

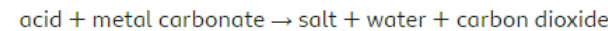
Additive	Purpose
Colouring	Improves the appearance of the food
Flavouring	Improves the taste of the food
Sweetener	Makes the food taste sweeter. Artificial sweeteners are used to sweeten 'diet' foods.
Emulsifier	Stabilises mixtures containing oil and water
Preservative	Stops the growth of microbes (such as bacteria or moulds in food), giving it a longer 'shelf life'
Antioxidant	Stops chemical reactions in food that make it go stale

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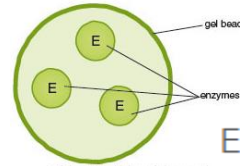
E-Numbers

Acids and metal carbonates

When acids react with carbonates, such as calcium carbonate (found in chalk, limestone and marble), a salt, water and carbon dioxide are made.



Alginate



Enzymes are very sensitive chemicals.

To protect them and make them easier to use they are **immobilised**. This is done by trapping them inside gel beads.

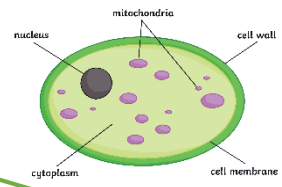
To make gel beads, the enzyme is first mixed with a chemical called **alginate**. The mixture is then dropped into calcium chloride solution. A reaction takes place, forming a coat of calcium alginate around the enzyme.

Additives with an **E number** have been licensed by the European Union. Some are natural and some are artificial. They have all been safety tested and passed for use. The UK Food Standards Agency sets strict limits on the amounts allowed in food.

There are health hazards associated with certain food additives. For instance, some additives:

- cause allergic reactions in some people
- may cause hyperactivity and behavioural problems in some children
- have been associated with an increase in childhood asthma in recent years

Yeast Cells







The respiration of yeast during the baking process produces carbon dioxide gas. The gas builds up as bubbles inside the bread dough, forming air pockets, which make the dough expand and rise.

Food Tests Results

What are you testing for?	Which indicator do you use?	What does a positive result look like?
sugar	Benedict's reagent	Once heated, the solution will change from blue-green to yellow-red.
starch	iodine	Blue-black colour indicates starch is present.
protein	biuret	The solution will change from blue to pink-purple.
lipid	sudan III	The lipids will separate and the top layer will turn bright red.

Food Science

Food Tests

CHEMICAL	TESTS FOR ...?	HOW TO CARRY OUT THE TEST	RESULT	CHEMICAL	TESTS FOR ...?	HOW TO CARRY OUT THE TEST	RESULT
	Starch	1.) Add the iodine solution directly to the substance to be tested (in solid or liquid form) and look for a colour change.	Turns blue black with starch		Protein	1.) Add Biuret's to the solution/ suspension to be tested and look for a colour change.	Turns purple with protein
	Reducing Sugar	1.) Add Benedict's to the solution/ suspension to be tested. 2.) Heat for 2 mins in a water bath at boiling point and look for a colour change.	Turns brick red with reducing sugars (green/ yellow/ orange if less sugar present)		Lipid (known as the Emulsion test)	1.) Add ethanol to the solution/ suspension to be tested and shake thoroughly. 2.) Then add water and look for a colour change.	Turns cloudy/ milky with lipid

Enzyme	Large insoluble molecule	Small soluble molecule
Carbohydrase	Starch	Glucose
Protease	Protein	Amino acids
Lipase (think liposuction)	Fats	Fatty acids and glycerol

Food Test Method

Iodine is used to test for the presence of starch. If starch is present, the colour will change to blue-black.



The independent variable in the investigation is the pH of the buffer solution.

The dependent variable in the investigation is the time taken for the reaction to complete (how long it takes for all the starch to be digested by the amylase).

Method:

1. Use the marker pen to label a test tube with the first value of pH buffer solution (pH 4) and stand it in the test tube rack.
2. Into each well of the spotting tiles, place a drop of iodine.
3. Using a measuring cylinder, measure 2cm³ of amylase and pour into the test tube.
4. Using a syringe, measure 1cm³ of the buffer solution and pour into the test tube.
5. Leave this to stand for five minutes and then use the thermometer to measure the temperature. Make a note of the temperature.
6. Add 2cm³ of starch solution into the test tube, using a different measuring cylinder to measure, and begin a timer (leave the timer to run continuously).
7. After 10 seconds, use a pipette to extract some of the amylase/starch solution, and place one drop into the first well of the spotting tile. Squirt the remaining solution back into the test tube.
8. Continue to place one drop into the next well of the spotting tile, every 10 seconds, until the iodine remains orange.
9. Record the time taken for the starch to be completely digested by the amylase by counting the wells that were tested positive for starch (indicated by the blue/black colour change of the iodine). Each well represents 10 seconds of time.
10. Repeat steps 1 to 8 for pH values 7 and 10.