



**8Aa Nutrients**

Our diet should contain the **raw materials**, or nutrients needed for energy, growth and repair, and health.

The nutrients we need are: **carbohydrates** (including starch and sugar), **fats**, **proteins**, **vitamins**, **minerals**, **fibre** and **water**.

**Fibre** is made of plant cell walls. It helps food to move through the gut, **preventing constipation**.

**Water** acts as a **lubricant**, **dissolves** substances to be carried around the body, keeps the **shape** of cells, and cools the body by **sweating**.

**Starch test:** Add **iodine solution**. If starch is present, it turns a **blue-black** colour.

**Protein test:** Add **Biuret solution**. If protein is present, it turns a **purple** colour.

**Fat test:** Rub the food sample on white paper. If fat is present, a **greasy mark** will be left.

**8Ab Uses of Nutrients**

**Carbohydrates:** source of energy.

**Fats:** energy store, insulation.

**Proteins:** growth and repair of cells.

The units for energy in food are **kilojoules (kJ)**.

**Respiration** releases energy from food.

**Vitamins** and **minerals** are needed in very small amounts to keep the body healthy.

**8Ac Balanced Diets**

A **balanced diet** is eating the right nutrients in the right amounts.

**Malnutrition** is too much or too little of a nutrient in the diet.

**Starvation** is a lack of nearly all the nutrients needed.

**Obesity** is caused by taking in more energy in food than is used.

Obesity can cause **heart disease**, **high blood pressure** and **diabetes**.

**Deficiency diseases** are caused by the lack of a nutrient in the diet.

**8Ae Absorption**

Digested nutrients are absorbed by **diffusion** from the **small intestine** into the blood **plasma**.

The wall of the small intestine is folded to form **villi**.

The cell membrane of the cells of the villi is folded to form **microvilli**.

These adaptations **increase the surface area** for more diffusion.

The wall of villus is **very thin** (one layer of cells thick) so there is a **short distance** for substances to diffuse across.

Drinking too much **alcohol** for a long time can damage the villi.

**8Ad Digestion**

Digestion is breaking down **large, insoluble** molecules into **smaller, soluble** ones.

Food is **ingested** and mixed with **saliva**, a digestive juice produced by salivary glands.

Food passes along the **oesophagus** to the **stomach**.

The stomach churns the food with **acid** and more digestive juices.

More digestive juices are added in the **small intestine**. These help to digest the food.

The **liver** produces a substance that helps to digest fats.

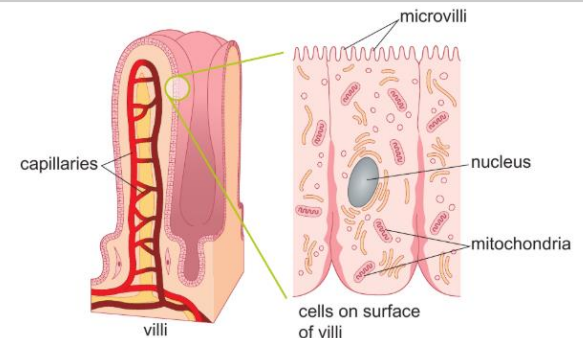
Small molecules are absorbed from the **small intestine** into the blood.

**Undigested food** passes into the **large intestine**. **Water** is absorbed to form **faeces**.

Faeces are stored in the **rectum**, until **egested** through the **anus**.

**Gut bacteria** help to digest food and prevent harmful bacteria from growing.

The digestive juices contain **enzymes**. Enzymes are **biological catalysts** which speed up the digestion reactions.



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**8Ba Classification and Biodiversity**

All living organisms are **classified** into groups based on their **characteristics**.

The **five kingdoms** of living organisms:

**Animals:** no cell walls, multicellular, feed on other organisms.

**Plants:** cell walls are made of cellulose, multicellular, make their own food.

**Fungi:** cell walls are made of chitin, mostly multicellular, live on dead organisms.

**Protoctists:** mostly unicellular.

**Prokaryotes:** cells have no nucleus, unicellular.

The **scientific name** of an organism uses the names of the last two classification groups, the **genus** and the **species**.

Habitats containing many different species have greater **biodiversity**.

If an organism becomes **extinct** it will affect other organisms in the habitat.

**8Bb Types of Reproduction**

Individuals in the **same species** can reproduce by **sexual reproduction** to produce new organisms. These offspring can also reproduce sexually.

Individuals from two different species cannot usually reproduce, but if they do, the offspring are called **hybrids**. Hybrids are **not fertile** (cannot reproduce sexually).

Offspring from **sexual reproduction** are not identical to their parents but show **inherited variation**.

**Gametes** (sex cells) produced by the parents will join together to make a fertilised egg cell (**zygote**).

**Asexual reproduction** does not need gametes.

Offspring from **asexual reproduction** are **identical** to the parent.

**8Bc Pollination**

The **anthers** in flower make **pollen grains** which contain the **male gamete**.

**Pollination** is transfer of the pollen grains to the **stigmas** of other flowers.

**Insect pollinated flowers** have brightly coloured petals; large, rough pollen grains; scent and nectar.

**Wind pollinated flowers** have large anthers that hang outside the flower; feathery stigmas; small, smooth and light pollen grains.

**Self pollination** is when the pollen grains land on the stigma of the same plant.

Some plants have mechanisms to ensure only **cross-pollination** occurs to ensure the offspring have characteristics from two parents.

**8Bd Fertilisation and Dispersal**

The pollen grain lands on a **stigma** and grows a **pollen tube** down the **style** into the **ovary** to an **ovule**.

The gamete from the pollen grain travels down the pollen tube and joins the egg cell in the ovule. This is **fertilisation** and forms a **zygote**.

The zygote divides again and again to form an **embryo**.

The **ovule** becomes the **seed** containing the embryo and a store of food.

The **ovary** swells and becomes the **fruit** around the seed.

The **seed** has a hard seed coat to protect it.

**Seed dispersal** is when the fruits spread the seeds away from the parent plants.

Seed dispersal allows plant species to spread to new areas so they are not in **competition** with the parent plants.

**8Be Germination and Growth**

**Germination** is when the seed starts to grow.

Germination needs **water, oxygen** and **warmth**.

**Photosynthesis** makes food for the plant.  
carbon dioxide + water → glucose + oxygen

Light energy is absorbed by **chloroplasts** in the leaf cells for photosynthesis.

Glucose is turned into **starch** for storage.

Plants also need **mineral ions** from the soil for growth e.g. nitrates, phosphates and potassium.

Plants and insects are **interdependent** which means they rely on each other for many things.



8Ea Burning Fuels

A fuel is a substance from which stored energy can be transferred usefully.

Hydrogen fuel cells use hydrogen gas as a fuel:  

$$\text{hydrogen} + \text{oxygen} \rightarrow \text{water}$$
*reactants product*

Petrol and diesel are types of **fossil fuels**. They are **hydrocarbons** – made of hydrogen and carbon only.

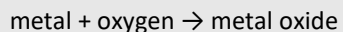
**Combustion** is reacting with oxygen:  

$$\text{hydrocarbon} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$$

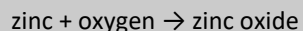
**Limewater** is used to test for carbon dioxide. It turns cloudy.  
**Cobalt chloride paper** is used to test for water. Blue cobalt chloride paper turns pink.

8Eb Oxidation

**Oxidation** is a reaction with oxygen to form a compound called an **oxide**.



The **law of conservation of mass** states that mass is never gained or lost in a chemical reaction. For example:



The mass of the zinc and oxygen that react will be equal to the mass of the zinc oxide produced.

Early scientists used to think that substances contained **phlogiston** which escaped when a substance burned.

8Ec Fire Safety

Combustion reactions are **exothermic**. Energy is transferred to the surroundings.

The fire triangle shows the three factors needed for combustion. To put out a fire, at least one of these factors must be removed.



Hazard symbols are used to identify substances that are likely to cause fires.



**Fire extinguishers** work by cooling a fire (removing the heat) or stopping oxygen getting to the fuel.

Different fire extinguishers are needed for different types of fire.

**Petrol or oil fires** should be extinguished using a fire blanket or foam.

**Electrical fires** should be extinguished by turning off the electricity at the mains and using a powder or carbon dioxide extinguisher.

8Ed Air Pollution

Carbon dioxide contributes to global warming.

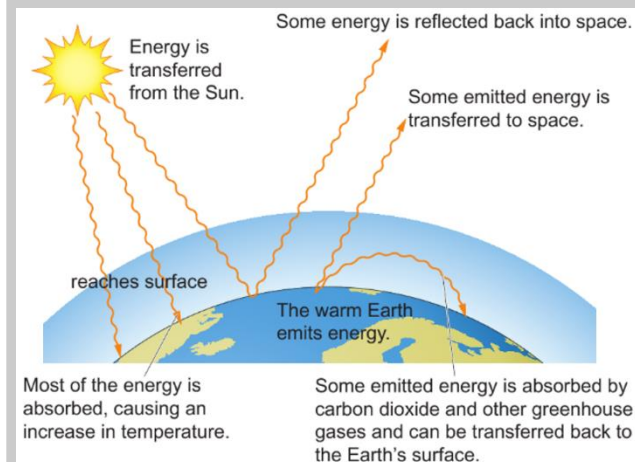
Carbon monoxide is produced from the incomplete combustion of carbon. It is a poison and can kill.

Soot is produced from incomplete combustion. It can damage lungs and trigger asthma.

Impurities in fuel produce the gases sulfur dioxide and nitrogen oxides. These can cause acid rain.

**Catalytic converters** are used to reduce pollutants in vehicle exhaust gases.

8Ee Global Warming



The **greenhouse effect** is the warming effect caused by greenhouse gases trapped in the Earth's atmosphere. Increased combustion of **fossil fuels** has increased the amount of carbon dioxide released into the atmosphere. **Global warming** is an increase in the greenhouse effect and leads to **climate change**.