

**Respiration**

Respiration is the chemical reaction which occurs inside the mitochondria in all living cells to release energy for living function and processes. The reaction is exothermic meaning that energy is released to the surroundings. Aerobic respiration:

Glucose + oxygen -> carbon dioxide + water

In anaerobic respiration the glucose is not completed oxidised as there is not enough oxygen so less energy is released:

Glucose -> lactic acid

In plants and yeast, anaerobic respiration is called fermentations and is used in bread making and beer brewing:

Glucose -> ethanol + carbon dioxide

**Effect of exercise**

When a person exercises, their body (specifically their muscles) need much more energy. To release more energy, the amount of respiration reactions occurring has to increase. The heart pumps faster and the breathing rate and breath volume all increase to supply more oxygen to the muscles via the bloodstream. If the muscles are not receiving enough oxygen to keep up the demand needed by the respiration reactions, then anaerobic respiration begins to occur. This incomplete oxidation of the glucose produces lactic acid, which can build up in the muscles and results in an oxygen debt. After long periods of exercise, the muscles can become fatigued and stop contracting. You might experience a pain commonly called a stitch.

**Limiting Factor**

A limiting factor is something that stop the **photosynthesis** reaction from occurring at a faster rate. **Temperature, light** intensityand **carbon dioxide** concentrationare all limiting factors.

Increasing the temperature of the surrounding will **increase** the rate of photosynthesis but only to a certain temperature. At higher temperatures, the **enzymes** will denature.

Increasing the light intensity will **increase** the rate of reaction because there is more **energy** to carry out more reactions.

Increasing carbon dioxide concentration will **increase** the rate of photosynthesis because there are more **reactants** available.

**Ambitious Vocabulary**

Limiting Factor

Endothermic

**Uses of Glucose**

The glucose made in photosynthesis is used for respiration, stored as starch, fats or oils, used to produce cellulose for cell walls or used to make amino acids for protein synthesis.

**Photosynthesis**

It uses **light** energy to power the chemical reaction which is absorbed by the green pigment **chlorophyll.** This means that photosynthesis is an example of an **endothermic** reaction. The whole reaction takes place inside the **chloroplasts** which are small organelles found in plant cells.

Plants acquire carbon dioxide via diffusion through the **stomata** of their leaves. The water is absorbed from the **soil** through the roots and transported to the cells carrying out photosynthesis via the **xylem.**

**Photosynthesis**

Photosynthesis is a **chemical** reaction which takes place in plants.

Carbon dioxide + Water -> Glucose + Oxygen

**Required Practical: The effect of light intensity on the rate of photosynthesis**

1. Measure 20cm3 of sodium hydrogen carbonate solution and pour into a boiling tube
2. Collect 10cm piece of pondweed and gently attach a paper clip to one end
3. Clamp the boiling tube, ensuring you will be able to shine light onto the pondweed
4. Place a metre ruler next to the clamp stand
5. Place the lamp 10cm away from the pondweed
6. Waiting 2 minutes until the pondweed has started to produce bubbles
7. Using the stopwatch count the number of bubbles produced in one minute
8. Repeat moving the lamp 10cm further 10cm away from the pondweed
9. Now repeat the experiment 3 times to calculate the mean

Independent= light intensity

Dependent = number of bubbles produced

Control = same mass and type of pondweed

**Metabolism**

Metabolism is the combination of all the reactions in a cell or in the body. Energy released during respiration is used during metabolic processes to synthesise new molecules:

• Glucose is converted to starch, glycogen and cellulose.

• Glycerol and three fatty acids are joined to form a lipid molecule.

• Glucose and nitrate ions are joined to form amino acids.

• Amino acids are joined to form proteins.

• Excess proteins are broken down and released as urea during excretion.

Respiration itself is also a process which is included in metabolism.

**Year 10 B4 Bioenergetics**

**Science**