

WJEC (Wales) Biology A-level

Topic 3.2 - Photosynthesis

Definitions and Concepts

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Absorption spectra - A graph showing the wavelengths of light absorbed by a pigment.

Action spectra - A graph of the rate of photosynthesis against each wavelength of light absorbed by a pigment.

Calvin cycle - See 'Light-independent reaction'.

Chlorophyll - A photosynthetic pigment located in the thylakoids of chloroplasts that absorbs light energy. There are two main types, chlorophyll a and chlorophyll b.

Chloroplast - An organelle found in plants and algae that is the site of photosynthesis.

Chromatography - The process of separating different substances from a mixture.

Cyclic photophosphorylation - The formation of ATP involving photosystem I only.

Glycerate-3-phosphate (GP) - A three-carbon molecule that is reduced by reduced NADP in the light-independent stage of photosynthesis to form two molecules of TP. This requires ATP.

Light-dependent reaction - The first stage of photosynthesis that uses light energy to produce ATP, reduced NADP and oxygen. It takes place in the thylakoids of the chloroplast.

Light-harvesting system - A collection of protein and chlorophyll molecules found in the thylakoid membranes of chloroplasts that absorbs light energy of varying wavelengths and transfers it to the reaction centre. It is also known as an antennae complex.

Light-independent reaction - The second stage of photosynthesis, also known as the Calvin cycle, in which the products of the light-dependent stage and carbon dioxide are used to build organic molecules. It does not require light energy and takes place in the stroma.

Limiting factor - A variable that limits the rate of a particular reaction.

Magnesium - An inorganic nutrient required in plant metabolism for the production of chlorophyll.

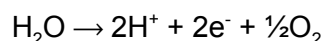
NADP - A coenzyme that becomes reduced when it takes up hydrogen atoms during the light-dependent stage of photosynthesis, forming reduced NADP.

Nitrogen - An inorganic nutrient required in plant metabolism for the production of amino acids, nucleotides and chlorophyll.

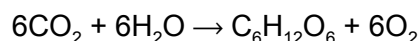
Non-cyclic photophosphorylation - The formation of ATP and reduced NADP involving both photosystems I and II.

Oxidation - The loss of electrons, gain of oxygen or loss of hydrogen in a substance.

Photolysis - The splitting of a molecule of water in the presence of light that occurs during the light-dependent stage of photosynthesis. This produces protons, electrons and oxygen:



Photosynthesis - A complex metabolic pathway that synthesises organic molecules in the presence of light. It consists of two main stages: light-dependent reaction and light-independent reaction. Overall:



Photosynthetic pigments - Molecules present in chloroplasts that absorb certain wavelengths of light e.g. chlorophyll a, chlorophyll b, xanthophylls and carotenoids.

Photosystem - A protein complex consisting of a light-harvesting system and reaction centre, that is involved in the absorption of light and transfer of electrons in photosynthesis. There are two types, photosystems I and II.

Reaction centre - The region of a photosystem where energy is funneled and photosynthetic reactions take place. It contains two chlorophyll a molecules.

Reduction - The gain of electrons, loss of oxygen or gain of hydrogen in a substance.

Retention value (R_f) - Calculated using the equation:

$$R_f = \frac{\text{Distance travelled by component}}{\text{Distance travelled by solvent}}$$

Ribulose bisphosphate (RuBP) - A five-carbon compound that reacts with carbon dioxide in the light-independent stage of photosynthesis, forming two molecules of GP.

Ribulose bisphosphate carboxylase (Rubisco) - An enzyme that catalyses the reaction of RuBP and carbon dioxide in the light-independent stage of photosynthesis.

Transducer - Something that converts one type of energy into another, e.g. chloroplasts transform light energy into the chemical energy of ATP.

Triose phosphate (TP) - A three-carbon compound formed in glycolysis and the light-independent stage of photosynthesis. It may serve as a starting material for the formation of organic molecules or be used to regenerate RuBP.

