5.1 PHOTOSYNTHESIS

Light-dependent reaction

- Occurs in the thylakoids (disc structures stacked together into grana)
- Absorption of light by chlorophyll in chloroplasts
- Photoionisation of chlorophyll
- Electrons are passed along electron carriers in the electron transfer chain within the thylakoid membrane
- Electrons lose energy at each stage
- This energy is used to make ATP
- ADP and inorganic phosphate ion
- Chemiosmotic theory
- Protons move from thylakoid space to stroma through ATP synthase channel proteins
- Produces protons for ATP synthesis
- The protons are taken up by NADP to produce reduced NADP
- Important products are ATP and reduced NADP
- Electrons become excited and leave the chlorophyll
- Oxidation = loss of electrons
  Reduction = gain of electrons
- Photolysis of water
- Produces oxygen, a waste product
- Produces electrons to replace those lost from the chlorophyll

Products of light-dependent reaction are used in the light-independent reaction

All within the chloroplasts

Light-independent reaction

- Occurs in the stroma
- Structure is adapted to function
- Calvin cycle
- Carbon dioxide reacts with ribulose bisphosphate (RuBP), a 5-carbon molecule
- CO2 diffuses through stomata into the leaf
- Catalysed by rubisco enzyme
- Forms 2 glycerate 3-phosphate molecules (GP), a 3-carbon molecule
- Reduced NADP and ATP provides protons and energy to reduce GP into 2 triose phosphate molecules (3 carbon molecule)
- NADP is returned to the light-dependent reaction
- Some triose phosphate is converted into organic molecules e.g. starch, cellulose, amino acids
- Most of the triose phosphate is used to regenerate RuBP
- Does not need light directly

AQA

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