

A* A-LEVEL BIOLOGY TOPIC 5 NOTES

ENERGY TRANSFERS

Eutrophication

Caused by the leaching of fertiliser into water
 (think about eutrophication in a pond before)

Eutrophication

Eutrophication is a process by which shallow natural processes that occurs readily in freshwater

How eutrophication occurs

1. Nitrate concentration increases in water
2. Rapid growth of algae occurs in ponds and reservoirs with algae this is known as **algal bloom**
3. Algae photosynthesise (blocks light) → die
4. Death of algae leads to light becoming less
5. Aerobically respired aerobically decrease concentration of water
6. This leads to the death of aquatic organisms for aerobic respiration
7. Anaerobic respiration starts to increase
8. Anaerobic respiration further depletes oxygen from water (eg. hydrogen sulphide which is toxic)

Diagram to show how eutrophication happens



Diagram of eutrophication

Chemical phosphorylation

The first stage of aerobic respiration is oxidative phosphorylation
 Most oxidative phosphorylation

Occurs in the matrix of mitochondria (inner membrane). There are lots of proteins and proteins

How oxidative phosphorylation works

1. Electrons (from NADH) are used to reduce oxygen → O_2
2. Electrons transferred down electron transport chain at decreasing energy levels
3. Energy released by electrons used to produce ATP
 - Energy used by electron carriers to actively transport protons from matrix and across inner membrane
 - Protons diffuse down an electrochemical gradient
 - Releasing energy to combine ADP → ATP
4. In the matrix at the end of the ETC, oxygen and electrons combine to form water

Diagram



Diagram of oxidative phosphorylation

Measuring biomass

Biomass is the mass of living material in the system

At a time, biomass can be measured in terms of

1. Mass of system
2. Dry mass of biomass per given area per given time

Measuring dry mass of biomass per given area per given time

1. A sample of an organism / tissue is dried in an oven
2. Sample is weighed at regular intervals (eg. 10 min)
3. All water removed when mass remains constant
4. Mass of carbon taken to be 45% of dry mass

The chemical energy stored in dry biomass can be

1. A sample of dry biomass burnt
2. The energy released is used to heat a known volume of water
3. The change in temperature of water used to calculate energy

At home, set up for calorimetry

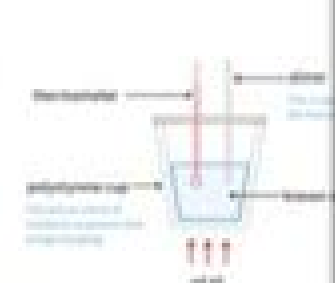


Diagram of calorimetry

The light independent stage of photosynthesis (Calvin cycle)

As mentioned at the start, the light independent stage (Calvin cycle) occurs in the stroma of chloroplasts. This could come up as a new marker question in the exam.

Before the light dependent stage, the light independent stage is the stage of photosynthesis that does not require light energy. It is also known as the Calvin cycle since it is a cycle

How the Calvin cycle works

1. CO_2 reacts with RuBP to form **oxaloacetate** (Ox), catalysed by the enzyme rubisco
2. Phosphate is transferred to oxaloacetate to form **phosphoenolpyruvate** (PEP)
3. PEP is used to form glucose (Glc) using products from light dependent reaction → energy for this process is provided from the hydrolysis of ATP and for this reduced NADP+ returns the GP
4. Some GP converted into useful organic substances (eg. glucose)
5. Most GP used to regenerate RuBP using one of ATP

Diagram of the Calvin cycle

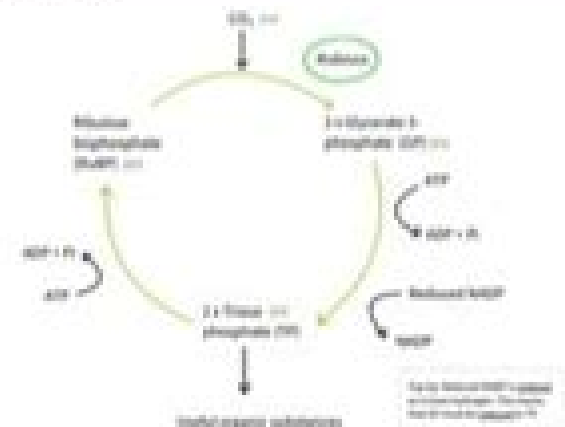


Diagram of the Calvin cycle

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The Athenæum James Silk Buckingham, John Sterling, Frederick Denison Maurice, Henry Stebbing, Charles Wentworth Dilke, Thomas Kibble Hervey, William Hepworth Dixon, Norman Maccoll, Vernon Horace Rendall, John Middleton Murry, 1897

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