

A* A-LEVEL BIOLOGY TOPIC 5 NOTES

ENERGY TRANSFERS

Eutrophication

Caused by the leaching of fertiliser into water
Effect: algal eutrophication is related to eutrophication

Eutrophication

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

How eutrophication occurs

1. Nitrate concentration increases in water
2. Rapid growth of algae occurs at ponds and reservoirs with algae this is known as **algal bloom**
3. Algae photosynthesise (blocks light) in the pond
4. Death of algae occurs in light becomes 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 of dissolved oxygen eg. hydrogen sulphide which is toxic

Diagram to show how eutrophication happens



Diagram to show how eutrophication happens

Respiratory phosphorylation

The final 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 in the matrix

How oxidative phosphorylation works

1. Electrons (from NADH) are used to reduce oxygen in the matrix
2. Electrons transferred down electron transport chain at decreasing energy levels
3. Energy released by electrons used to produce ATP
4. Energy used by electron carriers to actively transport protons from the matrix to the intermembrane space
5. Protons diffuse down an electrochemical gradient releasing energy to combine ADP + P_i to ATP
6. In the matrix at the end of the ETC, oxygen and electrons combine to form water

Diagram

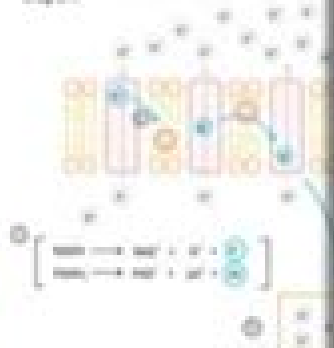


Diagram of oxidative phosphorylation

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 40% 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 setup

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.

Unlike 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. CO₂ 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 **glyceraldehyde** (GP) using products from light dependent reactions → 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

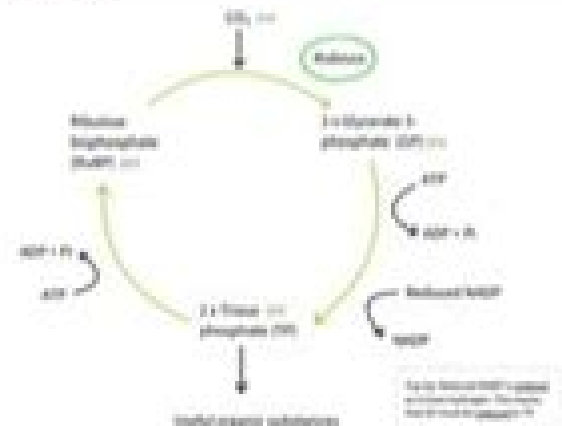


Diagram of the Calvin cycle

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Patrick Vollmar



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