

- A metabolic pathway is a sequence of chemical reactions (enzyme catalyzed)
- An enzyme is protein, biological catalyst
- Activation energy is the energy required to start a chemical reaction
- An enzyme inhibitor is a molecule that slows down an enzyme catalyzed reaction
- Competitive inhibitors bind to the active site of the enzyme
- Non-competitive inhibitors bind to an other site on the enzyme (allosteric)
- End product inhibitors is when the 'end product' of a metabolic pathway inhibits the start of the enzyme in the pathway

Re-order the bullet points to explain cell respiration

- Pyruvate is decarboxylated, oxidised and attached to coenzyme A. **G = GLYCOLYSIS 1,2,3**
- Glucose is converted to pyruvate in glycolysis **L = LINK REACTION!**
- Glucose is phosphorylated to make it less stable **K = KREBS CYCLE**
- The link reaction converts pyruvate to acetyl coenzyme A **E = ELECTRON TRANSPORT CHAIN**
- In the Krebs cycle the acetyl group is oxidised and NAD is reduced, forming CO₂.
- Electron carriers in the inner membrane transfer electrons and pump protons to the intermembrane space
- Oxygen binds to free protons (H⁺ ions) forming water
- Energy released from the oxidation reactions is carried to mitochondria inner membranes by NADH (READH)
- Glycolysis provides a small gain of ATP & doesn't require oxygen

Photosynthesis is composed of 2 sets of reactions light dependent and light independent

Photolysis is the splitting of water and it occurs in the photosystem (thylakoid) found in the thylakoid membrane.

Light dependent reactions make NADPH (reduced NADP) and ATP which are needed for light independent reactions.

The stroma of the chloroplast is the liquid and this is where the light independent reactions occur.

RuBP is the molecule which binds to CO₂ catalysed by the enzyme rubisco

Describe the carboxylation of RuBP

CO₂ binds to RuBP

catalysed by rubisco.

in the stroma of a chloroplast

What is Calvin's Lollipop apparatus?

A glass vessel resembling a lollipop

Threonine → X → Y → Z → Isoleucine

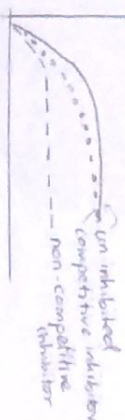
The diagram illustrates a metabolic pathway controlled by end product inhibition. Explain what the arrows represent

Each arrow represents an enzyme controlled reaction of the pathway

Isoleucine binds to an allosteric site on the enzyme

High concentrations of isoleucine result in partial conversion of Threonine so the production of isoleucine slows with increasing concentration of isoleucine

Draw a sketch graph which show how an enzyme controlled reaction rate increase as the substrate concentration increases.



Add lines showing rate of the same reaction after the addition of a competitive & a non-competitive inhibitor.

What happens to each of these chemicals in light independent reactions?

Glycerate-3-phosphate

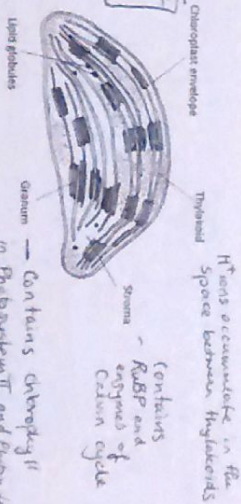
Reduced to make triose phosphate

Triose phosphate

Some leave Calvin cycle to make glucose

most use to re-make RuBP

Annotate the chloroplast to show how it is adapted for photosynthesis



Evidence to support endosymbiotic theory

↑ ions occur in the space between thylakoids

contains RuBP and enzymes of Calvin cycle

Contains chlorophyll in Photosystem II and Photosystem I for light dependent reactions

Calculate the rate of reaction of the enzyme below. Show your working.

Time / seconds	Volume of oxygen / ml
0	0
60	240
120	480

Volume per second units

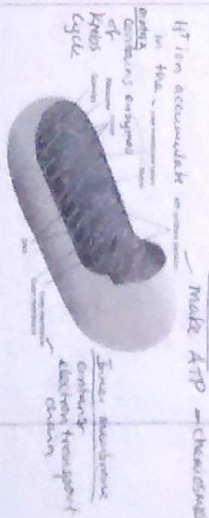
Rate = $\frac{240 \text{ ml}}{60 \text{ s}} = 4 \text{ ml/s}$

Chemiosmosis is the flow of protons from intermembrane space to

matrix (respiration) or stroma (photosynthesis) through the enzyme which makes ATP, called ATP synthase

A concentration gradient of H⁺ ions is maintained by proton pumps, which pump H⁺ into intermembrane space by the reaction of oxygen which produces H₂O

Annotate the mitochondrion to show how it is adapted to its function



Describe the use of electron tomography

It uses TEM imaging and software to produce 3D images of cell organelles and make protein structures (10nm)

Why is it better than electron microscope imaging?

It produces 3D images which have reduced edge effects

Crucial to better understanding of structures such as electron transporters of mitochondria and their channels

