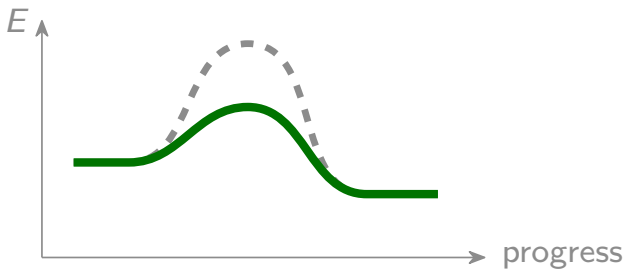
Exercise walk-through

3.3
Cellular Energy

AP Biology

What we will cover

1. Enzymes as catalysts
2. Enzyme conditions and inhibitors
3. ATP and energy coupling
4. Photosynthesis
5. Cellular respiration



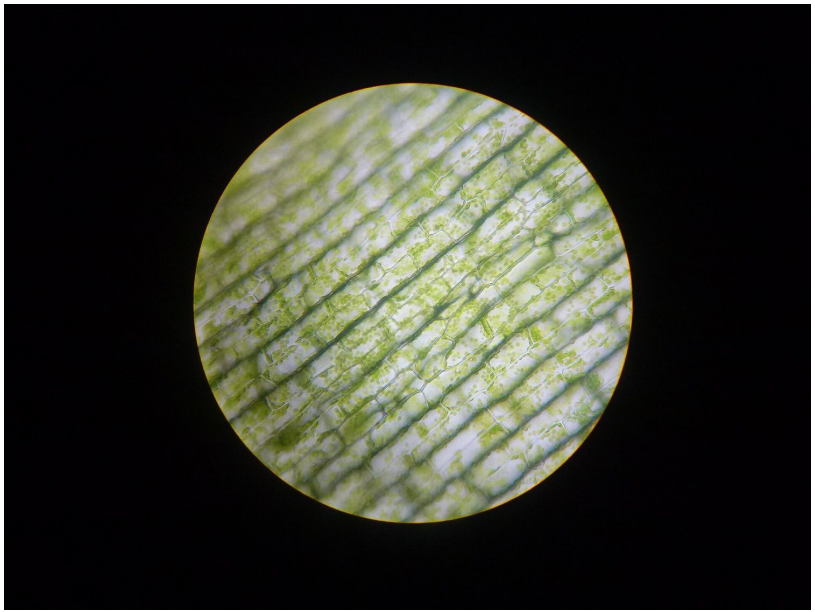
Photosynthesis

In the **chloroplast** , light energy becomes sugar:

$$6\mathrm{CO_2} + 6\mathrm{H_2O} \xrightarrow{\text{light}} \mathrm{C_6H_{12}O_6} + 6\mathrm{O_2}$$

overall

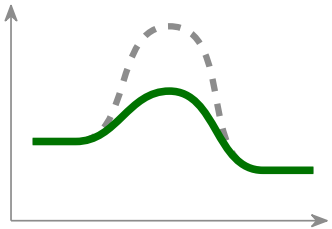
- **light reactions** – thylakoid: split $\mathrm{H_2O}$, make $\mathrm{O_2}$
- **Calvin cycle** – stroma: fix $\mathrm{CO_2}$ into sugar



Chloroplasts capture light and fix carbon

Check yourself

1. How does an enzyme speed up a reaction?
2. What molecule carries energy for the cell?
3. Which organelle carries out photosynthesis?
4. Aerobic respiration yields how many ATP vs fermentation?



Answers **1.** it lowers the activation energy **2.** ATP **3.** the chloroplast **4.** ∼30 vs 2

Exercises 2.1·2.3

2.1 What does ATP stand for and store? [1]

2.2 Write the reaction when ATP releases energy. [1]

2.3 How is ATP recharged? [1]

Exercises 2.1·2.3

2.1 What does ATP stand for and store? [1]

2.1

- Adenosine triphosphate; it stores energy (in its phosphate bonds)

2.2 Write the reaction when ATP releases energy. [1]

2.2

- $\mathrm{ATP} \rightarrow \mathrm{ADP} + \mathrm{P}_i + \text{energy}$

2.3 How is ATP recharged? [1]

2.3

- Energy from respiration rebuilds ATP from $\mathrm{ADP} + \mathrm{P}_i$

Exercise 3.1

3.1 Energy is released from ATP when it is converted to [1]

- **A** ADP + phosphate
- **B** glucose
- **C** DNA
- **D** a lipid

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3.1 Energy is released from ATP when it is converted to [1]

- [ ] **A** ADP + phosphate
- [ ] **B** glucose
- [ ] **C** DNA
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3.1 A

- ADP + phosphate

Exercise 3.2 (a)

3.2 A muscle cell uses ATP to contract.

(a) Write the hydrolysis reaction of ATP. [2]

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(a)

- $\mathrm{ATP} \rightarrow \mathrm{ADP} + \mathrm{P}_i + \text{energy}$

Exercise 3.2 (b)

3.2 A muscle cell uses ATP to contract.

(b) Explain how this powers the contraction (coupling). [2]

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(b) Explain how this powers the contraction (coupling). [2]

(b)

- The energy released is coupled to the contraction, providing the energy the muscle proteins need to move

Exercise 3.3

3.3 Explain why ATP is described as a “rechargeable” energy currency. [2]

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3.3

- ATP is hydrolyzed to ADP + P_i (used), and respiration re-adds the phosphate to remake ATP (recharged); this cycle repeats continuously