

Photosynthesis

State the overall equation of photosynthesis.

Photosynthesis

Where does the oxygen released in photosynthesis come from?

Photosynthesis

What is photophosphorylation?

Photosynthesis

Why is ATP an immediate source of energy?

Photosynthesis

Where do the light-dependent reactions take place?

Photosynthesis

What is photolysis?

Photosynthesis

What are the products of non-cyclic photophosphorylation?

Photosynthesis

What is made in cyclic photophosphorylation?

From water, by photolysis in the light-dependent reactions.

$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$, using light energy and chlorophyll.

Its terminal phosphate is hydrolysed in a single step, quickly releasing a small, usable amount of energy.

The addition of phosphate to ADP to make ATP, using light energy.

The light-driven splitting of water: $2\text{H}_2\text{O} \rightarrow 4\text{H}^+ + 4\text{e}^- + \text{O}_2$. The electrons replace those lost from chlorophyll.

On the thylakoid membranes (in the grana) of the chloroplast.

ATP only. Electrons return to photosystem I; no reduced NADP and no oxygen are made.

ATP, reduced NADP and oxygen.

Photosynthesis

Where does the Calvin cycle take place?

Photosynthesis

Name the enzyme and the 5C compound in carbon fixation.

Photosynthesis

What does GP become, and what is needed?

Photosynthesis

Name the biological molecules made from the products of photosynthesis.

Photosynthesis

What are grana?

Photosynthesis

What does the stroma contain?

Photosynthesis

What is the chloroplast envelope?

Photosynthesis

What is an absorption spectrum?

Rubisco catalyses the combination of carbon dioxide with RuBP (a 5C compound) to give two molecules of GP.

In the stroma of the chloroplast.

Polysaccharides, amino acids and proteins, lipids and nucleic acids.

GP is reduced to GALP using ATP and reduced NADP.

Enzymes of the Calvin cycle (including rubisco), starch grains, lipid droplets, DNA and ribosomes.

Stacks of thylakoids that give a large surface area for photosynthetic pigments.

A graph of how much light of different wavelengths a pigment absorbs.

Two membranes around the chloroplast that control what enters and leaves.

Photosynthesis

What is an action spectrum?

Photosynthesis

How is Rf calculated?

Photosynthesis

Why is pencil used for the origin line in chromatography?

Photosynthesis

How is the rate of photosynthesis measured with an aquatic plant?

Photosynthesis

Why is a heat shield used between a lamp and the plant?

Photosynthesis

How is carbon dioxide availability varied in core practical 10?

Productivity and ecosystems

What is gross primary productivity (GPP)?

Productivity and ecosystems

Write the equation for net primary productivity.

Distance moved by the pigment $\div$ distance moved by the solvent front. It has no units.

A graph of the rate of photosynthesis at different wavelengths of light.

Count bubbles of oxygen, or measure the volume of oxygen released, per unit time.

Pencil does not dissolve in the solvent or move with it, unlike ink.

By using different concentrations of sodium hydrogencarbonate solution.

To prevent the lamp raising the temperature, so that temperature is controlled when light intensity is varied.

$NPP = GPP - R$, where R is the energy lost in plant respiration.

The total chemical energy fixed by photosynthesis in a given area in a given time.

Productivity and ecosystems

What does NPP represent?

Productivity and ecosystems

How do you calculate efficiency of energy transfer?

Productivity and ecosystems

Name four reasons energy is lost between trophic levels.

Productivity and ecosystems

Why is dry mass used to measure biomass?

Productivity and ecosystems

Define population.

Productivity and ecosystems

Define community and ecosystem.

Productivity and ecosystems

Give two biotic and two abiotic factors.

Productivity and ecosystems

Define niche.

$$\left(\frac{\text{energy or biomass in the next trophic level}}{\text{energy or biomass in the previous level}} \right) \times 100.$$

The energy stored in plant biomass, available to the next trophic level and decomposers.

Water content varies and water stores no chemical energy.

Respiration (heat), egestion, excretion, and parts not eaten.

Community: all the populations of different species in a habitat. Ecosystem: the community plus the abiotic environment.

All the organisms of one species living in a habitat at the same time.

The role of a species in its habitat, including its interactions with biotic and abiotic components of the environment.

Biotic: competition, predation. Abiotic: temperature, light, pH, water availability.

Productivity and ecosystems

What happens if two species have the same niche?

Productivity and ecosystems

How does niche account for distribution?

Productivity and ecosystems

Why are quadrats placed at random?

Productivity and ecosystems

When is a transect used?

Productivity and ecosystems

How do you estimate the size of a population using quadrats?

Productivity and ecosystems

What is a pioneer species?

Productivity and ecosystems

What is a climax community?

Productivity and ecosystems

What is the difference between primary and secondary succession?

A species is found only where the conditions and resources of its niche are available.

They compete strongly and one tends to outcompete and exclude the other.

To show how distribution changes along an environmental gradient.

To avoid bias and make the sample representative.

The first species to colonise bare ground, tolerant of harsh conditions, which changes the environment for others.

Mean number per $\text{m}^2 \times$ total area of the habitat in m^2 .

Primary starts on bare land with no soil.
Secondary starts where soil already exists.

The stable end point of succession, in balance with the abiotic environment, with no further net change.

Climate change

What is dendrochronology?

Climate change

Why is pollen preserved in peat bogs?

Climate change

Does a correlation show that one factor causes another?

Climate change

Name four greenhouse gases.

Climate change

Describe the greenhouse effect.

Climate change

Name two human activities that increase carbon dioxide levels.

Climate change

What is the source of extra methane from farming?

Climate change

Which processes remove CO₂ from the atmosphere?

Peat is acidic, waterlogged and anaerobic, so pollen does not decay.

Using the pattern and width of annual tree rings to date past events and infer past climate.

Carbon dioxide, methane, water vapour, nitrous oxide (and CFCs).

No. Another factor may cause both. A known mechanism and repeated independent data support a causal link.

Burning fossil fuels and deforestation.

Greenhouse gases absorb infra-red radiation from Earth and re-radiate it back, warming the lower atmosphere.

Photosynthesis and dissolving in the oceans.

Ruminant animals and rice paddies (anaerobic decomposition).

Climate change

Which processes return CO₂ to the atmosphere?

Climate change

Why does reforestation reduce atmospheric CO₂?

Climate change

What is extrapolation?

Climate change

Give two limitations of climate models.

Climate change

Give an example of a positive feedback in climate change.

Climate change

How does warming change the distribution of species?

Climate change

How does climate change affect life cycles?

Climate change

What is a timing mismatch?

Growing trees photosynthesise, removing CO₂ and storing the carbon in wood.

Respiration, decomposition and combustion.

Complex system with feedback loops; incomplete data; assumptions about future emissions.

Extending a trend in data beyond the range measured to make a prediction.

Species move towards the poles or to higher altitude.

Melting ice exposes darker surfaces that absorb more heat, causing more melting.

When interacting species respond at different rates, for example food peak and hatching of young no longer coincide.

Development is faster and seasonal events such as flowering and hatching occur earlier.

Climate change

Why can conclusions on climate change depend on who reaches them?

Climate change

How can you judge a scientific source?

Climate change

What is a sustainable resource?

Climate change

Give one advantage and one disadvantage of biofuels.

Climate change

How does reforestation help manage the conflict between needs and conservation?

Temperature, evolution and speciation

What is Q_{10} ?

Temperature, evolution and speciation

Write the formula for Q_{10} .

Temperature, evolution and speciation

What does a Q_{10} of 2 mean?

Check the author's expertise, funding, peer review and whether data support the conclusion.

Vested interests, funding and selective use of data can influence how evidence is presented.

Advantage: close to carbon neutral.
Disadvantage: needs land, which may replace forest or food crops.

One used no faster than it is replaced, so it remains available for future generations.

The factor by which the rate of a reaction increases for a 10 °C rise in temperature.

It provides timber while restoring habitats and removing CO₂, if managed sustainably.

The rate of the reaction doubles for every 10 °C rise in temperature.

$$Q_{10} = \text{rate at } (T + 10) \text{ }^{\circ}\text{C} \div \text{rate at } T \text{ }^{\circ}\text{C}.$$

Temperature, evolution and speciation

Why do enzyme-controlled reactions slow above the optimum?

Temperature, evolution and speciation

Name two organisms used in core practical 12.

Temperature, evolution and speciation

Name three variables to control in the brine shrimp investigation.

Temperature, evolution and speciation

Give two ways of taking account of the ethical use of organisms.

Temperature, evolution and speciation

Define evolution.

Temperature, evolution and speciation

What is the source of new alleles?

Temperature, evolution and speciation

Outline how natural selection changes allele frequency.

Temperature, evolution and speciation

What is a species?

Brine shrimp (hatching) and seedlings such as cress (growth rate).

The enzyme denatures: bonds break and the active site changes shape.

Use the minimum number of organisms and avoid extreme conditions; dispose of them humanely.

Salinity and volume of solution, number of eggs, light, time.

Gene mutation.

A change in allele frequency in a population over generations.

A group of organisms that can interbreed to produce fertile offspring.

Individuals with an advantageous allele are more likely to survive and reproduce, so pass it on and its frequency increases.

Temperature, evolution and speciation

Define allopatric speciation.

Temperature, evolution and speciation

Define sympatric speciation.

Temperature, evolution and speciation

What is gene flow?

Formation of new species within the same area through reproductive isolation, for example by polyploidy.

Formation of new species from populations isolated by a geographical barrier.

The movement of alleles between populations by interbreeding.