

Edexcel Biology GCSE

Topics 9.12 to 9.19B - Nutrient cycles and decomposers

Flashcards

What are the three types of nutrient cycle?

What are the three types of nutrient cycle?

- Carbon cycle
- Water cycle
- Nitrogen cycle

Why are the nutrient cycles important?

Why are the nutrient cycles important?

- Carbon, water and nitrogen are essential to life
- There is a fixed amount of nutrients on Earth which must be constantly recycled

Describe how materials cycle through
the living and non-living components of
an ecosystem

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- Organisms take in elements from their surroundings e.g. soil, air
- Elements converted to complex molecules which become biomass
- Elements transferred along food chains
- Elements returned to environment during excretion and decomposition of dead organisms

Describe the stages of the carbon cycle

Describe the stages of the carbon cycle

1. Photosynthesising plants remove CO_2 from the atmosphere
2. Eating passes carbon compounds along a food chain
3. Respiration in plants and animals returns CO_2 to the atmosphere
4. Organisms die and decompose. Decomposers (bacteria and fungi) break down dead material and release CO_2 via respiration
5. Combustion of materials (e.g. wood, fossil fuels) releases CO_2

Describe the stages of the water cycle

Describe the stages of the water cycle

1. Energy from the sun evaporates water from sources such as lakes and oceans. Transpiration also releases water vapour.
2. Water vapour rises, cools and condenses forming clouds
3. Precipitation occurs
4. Water is absorbed by the soil and taken up by roots. Some is used in photosynthesis or becomes part of the plant, entering the food chain.
5. Excretion returns water to the soil
6. Surface runoff returns to streams, rivers and eventually the sea

What is potable water?

What is potable water?

Drinking water

How can potable water be prepared?

How can potable water be prepared?

Desalination

What is desalination?

What is desalination?

A process that removes salts from saline water

Name two methods of desalination

Name two methods of desalination

- Thermal desalination
- Reverse osmosis

Describe thermal desalination

Describe thermal desalination

Salt water is boiled. Water evaporates, rises and condenses down a pipe. This separates pure water from salts.

Describe reverse osmosis

Describe reverse osmosis

- Saline water pumped into a vessel containing a partially permeable membrane at high pressure
- High pressure forces water molecules to move from an area of low water concentration (high salt concentration) to an area of high water concentration (low salt concentration)
- Pure water separated from salts

What do plants use to make proteins?

What do plants use to make proteins?

Nitrates

Why can't nitrogen be used directly by plants to form proteins?

Why can't nitrogen be used directly by plants to form proteins?

Nitrogen is unreactive

Name the four types of bacteria involved
in the nitrogen cycle

Name the four types of bacteria involved in the nitrogen cycle

- Decomposers
- Nitrogen-fixing bacteria
- Nitrifying bacteria
- Denitrifying bacteria

What is the role of **decomposers** in the nitrogen cycle?

What is the role of **decomposers** in the nitrogen cycle?

- Break down proteins and urea into ammonia
- Ammonia dissolves in solution forming ammonium ions

What is the role of **nitrogen-fixing** bacteria in the nitrogen cycle?

What is the role of **nitrogen-fixing** bacteria in the nitrogen cycle?

- Convert nitrogen gas into ammonia
- Ammonia dissolves in solution forming ammonium ions

Where are nitrogen-fixing bacteria found?

Where are nitrogen-fixing bacteria found?

- Soil
- Root nodules of legumes

What type of relationship is exhibited between nitrogen-fixing bacteria and legumes?

What type of relationship is exhibited between nitrogen-fixing bacteria and legumes?

- Mutualistic relationship
- Plants receive ammonium ions from bacteria
- Bacteria gain sugars from the plant

What is the role of **nitrifying** bacteria in the nitrogen cycle?

What is the role of **nitrifying** bacteria in the nitrogen cycle?

- Convert ammonium ions into nitrites
- Convert nitrites into nitrates

What is the role of **denitrifying** bacteria
in the nitrogen cycle?

What is the role of **denitrifying** bacteria in the nitrogen cycle?

Convert nitrates into nitrogen gas

Where are denitrifying bacteria commonly found?

Where are denitrifying bacteria commonly found?

Waterlogged soils

Describe the stages of the nitrogen cycle

Describe the stages of the nitrogen cycle

1. **Lightning** and **nitrogen-fixing bacteria** convert nitrogen gas to ammonia which dissolves to form ammonium ions
2. **Nitrifying** bacteria convert ammonium ions to nitrate ions which are taken up by plants and used to build proteins
3. Feeding passes nitrogen through the food chain
4. Organisms die and decompose. **Decomposers** break down proteins and urea to form ammonia which dissolves to form ammonium ions
5. **Denitrifying** bacteria convert nitrates in the soil back to nitrogen gas

How can the amount of nitrates in the soil be increased?

How can the amount of nitrates in the soil be increased?

- Using **fertilisers** e.g. animal manure, compost, artificial fertilisers
- **Crop rotation** replenishes nitrates that may have been depleted by the previous crop e.g. planting a nitrogen-fixing crop

What is meant by decomposition?

What is meant by decomposition?

The breakdown of dead materials into simpler organic matter

How do decomposers break down dead matter?

How do decomposers break down dead matter?

Decomposers release enzymes which catalyse the breakdown of dead material into smaller molecules.

What factors affect the rate of decomposition? (biology only)

What factors affect the rate of decomposition? (biology only)

- Oxygen availability
- Temperature
- Water content

Why is oxygen required for decomposition? (biology only)

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(biology only)

Most decomposers require oxygen for
aerobic respiration

How does the availability of oxygen
affect the rate of decomposition?
(biology only)

How does the availability of oxygen affect the rate of decomposition? (biology only)

- As oxygen levels increase, the rate of decomposition increases
- As oxygen levels decrease, the rate of decomposition decreases

Why can decomposition still occur in the
absence of oxygen?
(biology only)

Why can decomposition still occur in the absence of oxygen? (biology only)

Some decomposers respire anaerobically

*However, the rate of decomposition is slower as anaerobic respiration produces less energy

How does temperature affect the rate of decomposition? (biology only)

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Decomposers release enzymes:

- Rate highest at 50°C (optimum temperature for enzymes)
- Lower temperatures, enzymes work too slowly, rate decreases
- High temperatures, enzymes denature, decomposition stops

How does soil water content affect the rate of decomposition? (biology only)

How does soil water content affect the rate of decomposition? (biology only)

Decomposers require water to survive:

- In moist conditions the rate of decomposition is high
- In waterlogged soils there is little oxygen for respiration so the rate of decomposition decreases

What conditions are required to make
compost? (biology only)

What conditions are required to make compost? (biology only)

Conditions that give a high rate of decomposition:
plentiful supply of oxygen, warm, moist etc.

Describe the methods of food storage
used to slow down the rate of
decomposition (biology only)

Describe the methods of food storage used to slow down the rate of decomposition (biology only)

- Stored in a fridge/freezer to slow down the activity of microbes
- Stored in airtight cans to prevent the entry of microorganisms
- High temperatures sterilise cans, destroying any bacteria
- Adding salt or sugar kills microbes (lose water by osmosis)
- Food kept dry to reduce the ability of microorganisms to survive

What is an indicator species? (biology only/higher)

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A species whose presence or absence in an environment provides indication of environmental conditions e.g. pollution levels

What indicator species can be used to
identify polluted water?
(biology only/higher)

What indicator species can be used to identify polluted water? (biology only/higher)

- Bloodworms
- Sludgeworms

(adapted to live in polluted water)

What indicator species can be used to
identify clean water?
(biology only/higher)

What indicator species can be used to identify clean water? (biology only/higher)

- Freshwater shrimps
- Stonefly

(sensitive to oxygen concentrations so can only survive in clean water)

What indicator species can be used to identify clean air? (biology only/higher)

What indicator species can be used to identify clean air? (biology only/higher)

Blackspot fungus found on rose leaves

(sensitive to sulfur dioxide concentrations so can only survive in clean air)

What are lichens used for? (biology only/higher)

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Used to monitor air pollution

How can lichens indicate air pollution? (biology only/higher)

How can lichens indicate air pollution? (biology only/higher)

- Sensitive to the concentration of sulfur dioxide
- Different types of lichens grow in different levels of air pollution
e.g. bushy lichens grow in cleaner air than crusty lichens
- Abundance and distribution of lichens indicate levels of pollution

Evaluate the use of indicator species as a measure of pollution (biology only/higher)

Evaluate the use of indicator species as a measure of pollution (biology only/higher)

- Cheaper and simpler
- Used to monitor pollution levels over long periods of time

However...

- Less accurate than non-living indicators e.g. electronic meters
- Do not provide a definitive figure for pollution levels