

AQA Biology A-level

5.4 - Nutrient cycles

Flashcards

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Name the general stages in the phosphorus cycle.



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1. Weathering
2. Runoff
3. Assimilation
4. Decomposition
5. Uplift



Why is the phosphorus cycle a slow process?



Why is the phosphorus cycle a slow process?

- Phosphorus has no gas phase, so there is no atmospheric cycle.
- Most phosphorus is stored as PO_4^{3-} in rocks.



What happens during weathering and runoff?



What happens during weathering and runoff?

Phosphate compounds from sedimentary rocks leach into surface water and soil.



Explain the significance of phosphorus to living organisms.



Explain the significance of phosphorus to living organisms.

Plants convert inorganic phosphate into biological molecules e.g. DNA, ATP, NADP...

Phosphorus is passed to consumers via feeding.



What happens during uplift?



What happens during uplift?

Sedimentary layers from oceans (formed by the bodies of aquatic organisms) are brought up to land over many years.



How does mining affect the phosphorus cycle?



How does mining affect the phosphorus cycle?

Speeds up uplift.



Name the 4 main stages of the nitrogen cycle.



Name the 4 main stages of the nitrogen cycle.

1. Nitrogen fixation
2. Ammonification
3. Nitrification
4. Denitrification



Why can't organisms use nitrogen directly from the atmosphere?



Why can't organisms use nitrogen directly from the atmosphere?

N_2 is very stable due to strong covalent triple bond.



What happens during atmospheric fixation of nitrogen?



What happens during atmospheric fixation of nitrogen?

1. High energy of lightning breaks N_2 into N.
2. N reacts with oxygen to form NO_2^- .
3. NO_2^- dissolves in water to form NO_3^- .



Outline the role of bacteria in nitrogen fixation.



Outline the role of bacteria in nitrogen fixation.

Mutualistic nitrogen-fixing bacteria in nodules of legumes & free-living bacteria in soil.

Use the enzyme nitrogenase to reduce gaseous nitrogen into ammonia.



Outline the role of bacteria in
ammonification.



Outline the role of bacteria in ammonification.

1. Saprobionts feed on and decompose organic waste containing nitrogen (e.g. urea, proteins, nucleic acids...).
2. NH_3 released.
3. NH_3 dissolves in water in soil to form NH_4^+ .



Outline the role of bacteria in nitrification.



Outline the role of bacteria in nitrification.

2-step process carried out by
saprobionts in aerobic conditions:



Outline the role of bacteria in denitrification.



Outline the role of bacteria in denitrification.

Anaerobic denitrifying bacteria convert soil nitrates back into gaseous nitrogen.



Explain the significance of nitrogen to living organisms.



Explain the significance of nitrogen to living organisms.

Plant roots uptake nitrates via active transport & use them to make biological compounds e.g:

- amino acids
- NAD/ NADP
- nucleic acids



Outline the role of mycorrhizae.



Outline the role of mycorrhizae.

Mutualistic relationship between plant and fungus increases surface area of root system = increases uptake of water and mineral ions.



Give 3 benefits of planting a different crop on the same field each year.



Give 3 benefits of planting a different crop on the same field each year.

- Nitrogen-fixing crops e.g. legumes make soil more fertile by increasing soil nitrate content.
- Different crops have different pathogens.
- Different crops use different proportions of certain ions.



Name the 2 categories of fertiliser and state the purpose of using fertiliser.



Name the 2 categories of fertiliser and state the purpose of using fertiliser.

- Organic: decaying organic matter & animal waste.
- Inorganic: minerals from rocks, usually containing nitrogen, phosphorus, potassium.
- To increase gross productivity for higher yield.



At a certain point, using more fertiliser no longer increases crop yield. Why?



At a certain point, using more fertiliser no longer increases crop yield. Why?

A factor unrelated to the concentration of mineral ions limits the rate of photosynthesis, so rate of growth cannot increase any further.



Outline 2 main environmental issues
caused by the use of fertilisers.



Outline 2 main environmental issues caused by the use of fertilisers.

1. **Leaching:** nitrates dissolve in rainwater and 'runoff' into water sources.
2. **Eutrophication:** water source becomes putrid as a result of algal bloom.



What happens during eutrophication?



What happens during eutrophication?

1. Aquatic plants grow exponentially since nitrate level is no longer a limiting factor.
2. Algal bloom on water surface prevents light from reaching the bottom and plants die.
3. Oxygen levels decrease as population of aerobic saprobionts increases to decay dead matter, so fish die.
4. Anaerobic organisms reproduce exponentially and produce toxic waste which makes water putrid.



How can the risk of eutrophication be reduced?



How can the risk of eutrophication be reduced?

- Sewage treatment marshes on farms.
- Pumping nutrient-enriched sediment out of water.
- Using phosphate-free detergent.

