

Evolution

4.6.2.2 · Biology · revision notes

Evolution is a change in the inherited characteristics of a population over time through natural selection, which may result in a new species. The classic 4 to 6 mark question asks you to explain how a feature evolved by natural selection, using the details in the question.

Key facts

- Evolution = change in the inherited characteristics of a population over time, through natural selection
- Natural selection: variation → competition → best suited survive and reproduce → pass on alleles → alleles more common over many generations
- New species: populations can no longer interbreed to produce fertile offspring
- All species evolved from simple life forms that first developed more than 3 billion years ago
- Variation comes from mutations

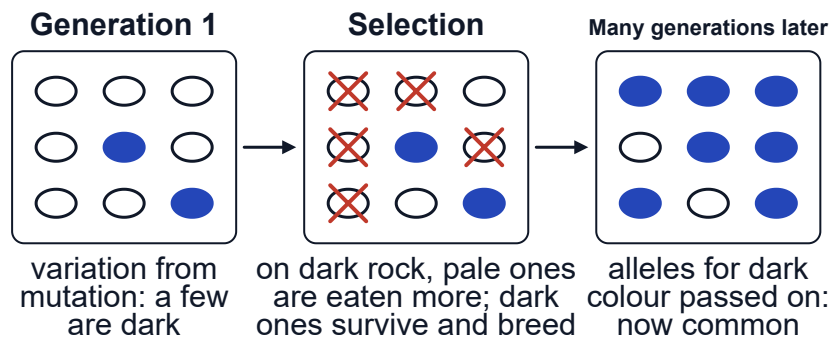
Notes

What evolution is

- **Evolution** is a change in the **inherited characteristics** of a **population** over time through a process of **natural selection**. It may result in the formation of a new species.
- The theory of evolution by natural selection states that all species of living things have evolved from **simple life forms** that first developed **more than three billion years ago**.

How natural selection works

- There is **variation** in a population, because of mutations. Some variants give phenotypes that are better suited to the environment.
- Individuals **compete** for limited resources such as food, water and mates, and face predators and disease.
- Individuals with phenotypes **best suited to their environment** are more likely to **survive and reproduce**.
- They pass on the **alleles** for these characteristics to their offspring.
- Over many generations, these alleles become **more common** in the population.



Natural selection: the best-suited individuals survive and breed, so their alleles become more common.

- Individuals do not change during their lives to suit the environment. The population changes because some individuals survive and breed more than others.

New species

- A **species** is a group of organisms that can interbreed to produce **fertile offspring**.
- If two populations of one species become so different in phenotype that they can **no longer interbreed to produce fertile offspring**, they have formed two new species.

How to answer each type of question

Define evolution or species

1 to 3 marks

Grade 4

1. Evolution: a change in the inherited characteristics of a population over time, through natural selection.
2. Species: organisms that can interbreed to produce fertile offspring.

Example. (a) What is meant by evolution?

(b) Horses and donkeys can breed together to produce mules, but mules are infertile.

Explain why horses and donkeys are different species. [3 marks]

Model answer. (a) A change in the inherited characteristics of a population over time (1) through natural selection (1)

(b) They cannot interbreed to produce fertile offspring (1)

Don't lose marks

- ✗ Saying an organism 'adapted because it needed to' or 'decided to change'. Mutations happen randomly, and selection acts on the variation that already exists.
- ✗ Saying the organism survives but forgetting that it reproduces and passes on its alleles.
- ✗ Saying that characteristics developed during an organism's life are passed on. Only inherited (genetic) characteristics are passed on.
- ✗ Writing 'survival of the fittest' without explaining what makes an individual better suited to that environment.
- ✗ Using 'species' when you mean 'population'.

More tips

Memory tricks

- Natural selection in five words: variation, competition, survival, reproduction, inheritance ('Very Clever Squirrels Reproduce Intelligently').
- Each step in the chain is usually a mark: don't skip 'reproduce' or 'pass on alleles'.
- Populations evolve; individuals don't.

Exam technique

- Use the context: name the predator, food or climate from the question in your answer.
- Write 'more likely to survive', not 'will survive'.
- Finish with 'over many generations' and 'the allele becomes more common in the population'.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3

Define evolution

A change in the inherited characteristics of a population over time through natural selection.

Grade 4

State when simple life first developed

All species evolved from simple life forms that first developed more than three billion years ago.

Grade 5

List the steps of natural selection

Variation, competition, the best suited survive and reproduce, alleles passed on, alleles become more common.

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