

Darwin, natural selection and antibiotic resistance

What is natural selection?

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What is evolution?

Darwin, natural selection and antibiotic resistance

What causes new alleles to appear in a population?

Darwin, natural selection and antibiotic resistance

Put natural selection in order: variation, alleles passed on, survival and reproduction, proportion increases.

Darwin, natural selection and antibiotic resistance

How do antibiotic-resistant bacteria emerge?

Darwin, natural selection and antibiotic resistance

What is the selection pressure in antibiotic resistance?

Darwin, natural selection and antibiotic resistance

Why does antibiotic resistance support Darwin's theory?

Evidence for evolution and classification

Ardi: age and key features?

A change in the inherited characteristics of a population over many generations.

Organisms better adapted to their environment are more likely to survive and reproduce, passing on their alleles.

Variation, survival and reproduction of the better adapted, alleles passed on, proportion with the advantageous allele increases.

Mutation.

The antibiotic.

A mutation makes a bacterium resistant.
The antibiotic kills the others, so the resistant ones survive, reproduce and pass on the allele.

4.4 million years ago. Walked upright but had a grasping big toe, so could still climb trees.

It shows natural selection happening: variation, a selection pressure, survival of the resistant, and inheritance of resistance.

Evidence for evolution and classification

Lucy: age and key features?

Evidence for evolution and classification

**What did Richard Leakey's team find,
and how old is it?**

Evidence for evolution and classification

**Put Ardi, Lucy and Leakey's fossils in
order, oldest first.**

Evidence for evolution and classification

**Why is fossil evidence for human
evolution incomplete?**

Evidence for evolution and classification

**Write 4.4 million years in standard
form.**

Evidence for evolution and classification

How do stone tools change over time?

Evidence for evolution and classification

**How can stone tools be dated from
their environment?**

Evidence for evolution and classification

Name the five kingdoms.

Fossils from 1.6 million years ago, including a nearly complete skeleton with a larger brain and longer legs, much more like a modern human.

3.2 million years ago. Walked upright on two legs, with a small brain.

Fossils are rare and often incomplete, because most remains decay before they fossilise.

Ardi (4.4 million), Lucy (3.2 million), Leakey's (1.6 million years ago).

They become more complex and better made, showing greater skill and intelligence.

4.4×10^6 years.

Animals, plants, fungi, protists and prokaryotes.

By the age of the rock layer or materials found with them.

Evidence for evolution and classification

Name the three domains.

Evidence for evolution and classification

What led to the suggestion of three domains?

Selective breeding and tissue culture

What is selective breeding?

Selective breeding and tissue culture

Give two characteristics selected for in food plants.

Selective breeding and tissue culture

Give two characteristics selected for in domesticated animals.

Selective breeding and tissue culture

What is a disadvantage of selective breeding?

Selective breeding and tissue culture

Two Rr plants are crossed (R dominant). What is the probability of an rr offspring?

Genetic engineering

What is genetic engineering?

Genetic analysis showed that the prokaryotes are not one closely related group.

Archaea, Bacteria and Eukarya.

Any two of: disease resistance, larger fruit or grains, better taste, higher yield.

Humans choosing parents with desired characteristics to breed together, repeated over many generations.

It reduces genetic variation, so the population is at greater risk from disease; inbreeding can cause health problems.

Any two of: more milk, more meat, more eggs, a gentle nature.

A process which involves modifying the genome of an organism to introduce desirable characteristics.

1/4 or 25%.

Genetic engineering

Give an example of genetic engineering in medicine.

Genetic engineering **Higher tier**

What does a restriction enzyme do?

Genetic engineering **Higher tier**

What are sticky ends?

Genetic engineering **Higher tier**

What does ligase do?

Genetic engineering **Higher tier**

What is a vector in genetic engineering?

Genetic engineering **Higher tier**

Give the main stages of genetic engineering in order.

Agriculture and evaluating biotechnology

Give a benefit of selective breeding in agriculture.

Agriculture and evaluating biotechnology

Give a risk of genetic engineering in agriculture.

Cuts DNA at a specific base sequence.

Bacteria given the human gene for insulin, so they make human insulin.

Joins pieces of DNA together, for example the gene and the vector.

Short, unpaired strands of DNA left at the ends of a cut, which join with complementary sticky ends.

Cut out the gene (restriction enzyme), cut the vector (same enzyme), join with ligase, insert the vector into the target cells.

A carrier, such as a plasmid or virus, used to insert a gene into another organism's cells.

Unknown effects on the environment or health, or genes spreading to wild species.

Higher yields and better quality food, with no special technology needed.

Agriculture and evaluating biotechnology

Give an ethical implication of genetic engineering.

Agriculture and evaluating biotechnology

Give a practical implication of genetic engineering or selective breeding.

Agriculture and evaluating biotechnology

A yield rises from 4.0 to 5.0 tonnes per hectare. What is the percentage increase?

Cost, time (selective breeding takes many generations), skill, and the method may not work.

Some people think it is wrong to alter the genes of organisms, especially animals.

$$(5.0 - 4.0) \div 4.0 \times 100 = 25\%.$$