Experiment worksheet answers

2.2 Natural selection is the mechanism of evolution

Pages 44–45 and 189

Experiment 2.2: What if the habitat of bean prey was changed?

Inquiry

What if the habitat of bean prey was changed?

1 Write a hypothesis for your inquiry.

If the habitat of the bean prey was changed, (Students’ independent variable) then the numbers of (Students’ dependent variable) tribe will increase/decrease/remain unchanged. This is because the independent variable acts as a selection pressure for the survival of the (dependent variable) bean and this affects the survival of the tribe.

2 What is the independent variable?

Students’ results will vary. Students should choose another surface other than grass, for example pebble surface.

3 What is the dependent variable?

The survival or extinction of a tribe.

4 List at least three variables that will need to be controlled. How will you control them?

• The starting number of each type of bean.

• The people acting as a predator.

• The types of tribes and their hunting methods.

Discussion

1 Which tribes became extinct first? What was the selection pressure that contributed to their extinction?

Students’ answer will vary according to their independent variable.

2 Why were the bean prey numbers doubled after each generation?

Beans represented prey. Surviving prey would reproduce regularly.

3 Which beans were selected against?

Students answers will vary.

4 Use the mechanism of natural selection to explain the change in bean prey numbers.

Beans that were easy to grab were more likely to get eaten.

Beans that were hard to grab were more likely to survive.

Beans that survived were able to reproduce and increase in number.

5 Suggest a similar example to this experiment that might occur in nature.

Students’ answers will vary.

Experiment worksheet answers

2.3 Different selection pressures cause divergence. Similar selection pressures cause convergence

Pages 46–47 and 190

Experiment 2.3: Divergent and convergent evolution of big beaks and small beaks

Discussion

1 Describe what happened to the North Trayland population of birds after they were isolated from South Trayland.

North Trayland birds had less popcorn and kidney beans. This meant it was harder for the Babybill and Midbill birds to survive. Giant bird numbers increased.

2 Describe what happened to the South Trayland population of birds after they were isolated from North Trayland.

South Trayland birds had less marbles and kidney beans. This meant it was easier for the Babybill and Midbill birds to survive. Therefore their numbers increased.

Conclusion

Use the terms ’natural selection’ and ‘selection pressures’ to explain the type of evolution that occurred between the two species.

The different food types in South Trayland and North Trayland acted as a selection pressure for the birds survival. This caused Natural selection of specific bird types resulting in divergent evolution.

Experiment worksheet answers

2.4 Fossils provide evidence of evolution

Pages 48–51 and 191

Experiment 2.4: Popcorn dating

Discussion

1 What is a half-life?

The time it takes for half the remaining radioactive isotope to become its stable form.

2 How long was the half-life of your popcorn kernels?

Students’ answers will vary according to the power of the microwave.

3 For how long was bag D heated? (Confirm your answer with your teacher.)

Students’ answers will vary.

4 How accurate was your estimate? Provide evidence to support your answer.

Students’ answers will vary.

Conclusion

How does this experiment provide an example of absolute dating methods?

The popcorn will pop in a similar fashion to the half-life of radioactive decay. The remaining un-popped popcorn is an indication of how much time has passed. This is similar to absolute dating methods.

Experiment worksheet answers

2.6 DNA and proteins provide chemical evidence for evolution

Pages 56–57 and 192

Experiment 2.6: Who is my cousin?

DNA sequences

Hippo AGTCCCCAAAGCAAAGGAGACTATCCTTCCTAAGCATAAAGAAATGCCCTTCTCTAAATC

Giraffe AGTCTCCAAATGAAAGGAGACTATGGCTCCTAAGCACAAAGAAATGCCCTTCCCTAAATA

Rhino AGTCCTCCAAA-CTAAGGAGACCATCTTTCCTAAGCTCAAAGTTATGCCCTCCCTTAAATC

Pig AGATTCCAAAGCTAAGGAGACCATTGTTCCCAAGCGTAAAGGAATGCCCTTCCCTAAATC

Cow AGTCCCCAAATGAAAGGAGACTATGGTTCCTAAGCACAAGGAAATGCCCTTCCCTAAATA

Results

Copy and complete the following table to show the number of differences in DNA sequence between each animal.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Hippo | 11 | 0 | 8 | 8 | 13 |
| Cow | 14 | 8 | 0 | 3 | 14 |
| Giraffe | 12 | 8 | 3 | 0 | 13 |
| Rhino | 13 | 13 | 14 | 13 | 0 |
| Pig | 0 | 11 | 14 | 12 | 13 |
|  | Pig | Hippo | Cow | Giraffe | Rhino |

Discussion

1 a Which animal has the least number of differences in DNA sequence when compared to a cow?

Giraffe

b What does this suggest about the evolutionary relationship between these two animals?

They shared a most recent common ancestor compared to the other animals in the table.

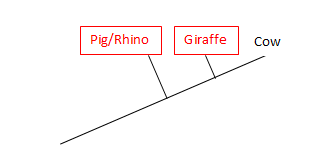
2 a Which animal has the most number of differences in their DNA sequence when compared to a cow?

Pig and Rhino

b What does this suggest about the evolutionary relationship between these two animals?

The pig and cow, and rhino and cow share a distant common ancestor compared to the other animals.

3 Use your answers to questions 1 and 2 to complete the following phylogenetic tree



Conclusion

How do DNA sequences determine the evolutionary relationships between different organisms?

Organisms with similar DNA sequences share a most recent common ancestor.

Experiment worksheet answers

2.7 Humans artificially select traits

Pages 58–59 and 193

Challenge 2.7: Selective breeding of dogs

Discussion

1 Were all three puppies identical? Suggest a reason.

No. Random re-assortment of the traits in each gamete means each puppy inherits different combinations of alleles. This means they will have different phenotypes.

2 Which puppy best suited your original needs?

Students’ answers will vary.

3 If you were to breed the dogs for another generation, which puppies would you select to be parents? Explain your answer.

Students’ answers will vary.

4 Are your puppies a new species? Explain your answer.

No. They are still able to reproduce in natural conditions to produce viable, fertile offspring.

Conclusion

Explain how selective breeding can affect the survival of a species.

Selective breeding often decreases the genetic variation of a species. This means there is less variation if the environment (such as a new disease) changes. This can result in an increased risk of extinction.

Experiment worksheet answers

2.8 Natural selection affects the frequency of alleles

Pages 60–61 and 194

Experiment 2.8: Selecting for sickle cell anaemia

Discussion

1 What trends did you notice for the percentage of ‘H’ (normal) alleles present in the gene pool?

The percentage of H alleles will have decreased.

2 What trends did you notice for the percentage of ‘h’ (sickle cell) alleles present in the gene pool?

The percentage of h alleles will have increased.

3 The hh combination is deadly and people with this are likely to die before reproducing. Why has the ‘h’ allele not been removed from the population completely?

People with heterozygous genotype (Hh) will have a higher chance of survival than people with HH genotype. This increases the percentage of h allele in the gene pool.

4 If people with sickle cell anaemia were able to survive and reproduce, what would you expect to happen to the percentage of people carrying the ‘h’ allele in the population?

The percentage of h allele in the population would increase.

Conclusion

How does malaria select for carriers of sickle cell anaemia?

People with HH are more likely to die of malaria. People with Hh genotype are more likely to survive and reproduce.