

Natural Selection *Essential Questions*

1. What types of questions are addressed by natural selection? What types of questions are not?

- Natural Selection answers...
 - How have organisms _____ over time?
 - How are organisms _____ related?
- Natural Selection does not answer...
 - _____ created us?
 - How did life _____?
 - What is the _____ and _____ of life?

2. Who was Darwin?

- A _____ who came up with the theory of natural selection after a voyage to the _____ Islands on the *HMS* _____.
- He compared the _____ of the same types of birds (finches) living on different islands and found that each beak was suited to eat food from that island.

3. What is the theory of Natural Selection?

- Organisms that have _____ genes make more _____
- Organisms that do not have beneficial genes make less offspring and may go _____
- Nature “_____” which genes will be beneficial and which organisms will survive to _____

4. What is the difference between artificial selection and natural selection?

- In artificial selection, _____ select which traits will _____ and then _____ plants or animals with only those traits
- In natural selection, the environment (_____) selects which traits will _____.

5. What is the survival of the fittest?

- The _____ organisms are the ones that are best suited to _____ and _____ in an environment (not necessarily the most _____)

6. How is natural selection related to genetics?

- NATURE “_____” traits that best allow an organism to _____ and _____ in its environment
- An organism’s _____ are all determined by its _____.

7. Does natural selection act on the genotype (genes) or the phenotype (physical traits) of an organism?

Why?

- Natural selection acts on the _____ of an organism.
- Natural selection cannot change genes, or _____ (only _____ change genes)
- Natural selection can only act on _____ that already _____.

8. What is variation? What is an adaptation? How are variations and adaptations related?

- Variations are differences in the physical _____ of individuals in the same _____.
- Adaptations are _____ that allow an organism to _____ in its environment.
- Adaptations are the _____ of traits that allow an individual to *best* survive and reproduce.

9. What is genetic variation? Why is it important?

- Genetic variation is the amount of _____ in the _____ of a species
- Different copies of genes are called _____
- The more genetic _____ an organism has, the more likely they are to _____ (through natural selection) to _____ in the environment

10. How is genetic variation measured?

- By the amount of different _____ in a _____ pool
 - Alleles are different _____ of the same gene
 - A gene pool is all the combined _____ of all the individuals in a _____
- The **allele** _____ is how _____ an allele is in a population

11. What are the 2 major sources of genetic variation in a gene pool?

- _____ reproduction – crossing over during meiosis produces different combinations of genes
- _____ – mutations in the DNA sequence causes changes in genes

12. What are negative effects of genetic mutations? What are positive effects of genetic mutations?

- Mutations are very _____ in the gene pool
- They can cause _____ disorders (_____)
- They lead to genetic _____ and may lead to traits that are beneficial for survival (_____)

13. Why is genetic variation important?

- Many differences in _____ (different alleles) produce many different _____
- Organisms with many different possible _____ give “_____” more options to “_____” from if environmental conditions _____.

14. What will happen to organisms that DO NOT have much genetic variation?

- These organisms will have very similar _____
- If environmental conditions change, “_____” will not have many traits to “_____” from and the organism may go _____.

15. What is a good example of natural selection seen today?

- Peppered _____ of England
- Peppered moths are either white with spots (_____) or black (_____) in color
- White colored moths _____ in tree bark and were hard for _____ to see
- _____ moths were seen more easily and were _____ by predators
- Local coal plants started producing black _____ that covered bark (_____ CHANGES)
- Now black moths had better _____ and became _____ genotype

16. Why is it important that there are many different types of organisms on Earth?

- Many different organisms increase the _____ that at least some will survive a major environmental _____
- Many organisms increase the “_____” that NATURE “_____” from

17. What is gene flow?

- The movement of _____ from one _____ to another
- Gene flow increases the genetic _____ in the population where alleles are moving
- If genes DO NOT flow between 2 populations of the same species, they may become _____ species.

18. What is genetic drift? How does it affect a population? What are some examples of genetic drift?

- If a small population is _____ (drifts) from a larger one, the new population will have _____ genetic diversity than the original
- This could cause _____ genes to show up much _____ commonly
- Examples are _____ in Amish communities, and handicaps in _____ children

19. What are 2 causes of genetic drift?

- _____ effect – population size greatly _____, and population left over does not have good genes or much variation
- _____ effect – small population _____ a new area, and new population does not have good genes or much variation

20. What is Hardy-Weinberg Equilibrium?

- Genotype frequencies stay the same (equilibrium) if certain _____ are met...
 - Large _____, no _____ flow, no _____, _____ mating, no _____ selection [not possible – just a model]
- The genotype frequencies can be predicted using the H-W equation, $p^2 + 2pq + q^2 = 1$
 - p = freq. of _____ allele
 - q = freq. of _____ allele
 - p^2 = freq. of homozygous _____ genotype
 - q^2 = freq. of homozygous _____ genotype
 - pq = freq. of _____ genotype

21. How are new species of organisms formed?

- An organism is considered a new _____ if it cannot _____ with other organisms that are like it
- If a population is _____ from other populations (of the same species) for long enough, the separated population may develop enough _____ differences to make _____ impossible with the original population

22. What are the 4 major types of isolation that can cause a new species to form?

- _____ isolation – mating dances, calls, or scents (pheromones) change prevent mating
- _____ isolation – mountains, rivers, dried lake beds cause physical barriers that prevent mating
- _____ isolation – reproductive patterns in seasons or time of day may change to prevent mating
- _____ isolation – members of the same species from different populations cannot mate with one another

23. What is the difference between microevolution and macroevolution? How do scientists get evidence for macroevolution?

- _____ is the genetic change observed in a _____ population
- _____ is the _____ -scale change over all time
- Scientists get evidence for macroevolution from _____ of the _____ record

24. What types of evidence does the fossil record provide?

- _____ diversity – the fossil record shows a vast amount of different living things in the history of life
- Mass _____ – the fossil record shows large groups of organisms going extinct right before each new era
- the Precambrian, Paleozoic, Mesozoic, and Cenozoic eras
- Episodic _____ – the fossil record shows that new characteristics in new species (speciation) show up in organisms right after mass extinction events.

25. What are the 5 factors that can lead to evolution?

- Genetic _____ – random changes in allele frequencies cause different species to form
- Gene _____ – movement of alleles to new populations cause changes
- _____ – mutations can cause new alleles, which make new traits for nature to “select”
- _____ selection – traits that improve mating are more likely to get passed on in offspring
- _____ selection – nature “selects” traits that are more likely to lead to survival and reproduction