Speciation

Defined as...

How do we define a species?

The Formation of a new species is called MACROEVOLUTION

Reproductive Isolating Mechanisms:

I) Pre-zygotic (pre-fertilization barriers)

a) Behavioural Isolating Mechanisms-

b) Habitat Isolating Mechanisms-

c) Temporal Isolating Mechanisms-

d) Mechanical Isolating Mechanisms-

e) Gametic Isolating mechanisms-

II) Post-zygotic isolating Mechanisms (post-fertilization barriers)

a) Hybrid Inviablity-

b) Hybrid Sterility-

c) Hybrid Breakdown-

Chapter 7 SELF-ASSESSMENT

Select the letter of the best answer below.

1. (K/U) Which of the following best describes natural selection?
   - **a.** biological change through time in a population
   - **b.** the process by which individuals with advantageous traits survive and/or reproduce more successfully than individuals without advantageous traits
   - **c.** characteristics appear suddenly in organisms in response to the environment and those characteristics are transmitted to offspring
   - **d.** a struggle between males competing for females
   - **e.** a principle by which periodic local disasters eliminate species in an area

2. (K/U) Ptarmigans are grouse-like birds that live in the far North. What adaptation is exhibited by white-coloured alpine ptarmigans that live in a snowy environment?
   - **a.** mechanical barriers
   - **b.** artificial selection
   - **c.** camouflage
   - **d.** mimicry
   - **e.** chemical defence

3. (K/U) Identify the term that involves people using selective breeding techniques to increase the number of animals and plants with desirable traits.
   - **a.** fitness
   - **b.** selective pressure
   - **c.** natural selection
   - **d.** selective advantage
   - **e.** artificial selection

4. (K/U) Within a few weeks of patients using the drug streptomycin for a *Staphylococcus aureus* infection, a patient's *Staphylococcus aureus* population consists primarily of *Staphylococcus aureus*-resistant bacteria. How can this result be explained?
   - **a.** *Staphylococcus aureus* has the ability to resist antibiotics.
   - **b.** The patient must have become reinfected with *Staphylococcus aureus*-resistant bacteria.
   - **c.** In response to the drug, *Staphylococcus aureus* was induced to begin making drug-resistant versions of itself.
   - **d.** Some *Staphylococcus aureus*-resistant bacteria were present at the start of treatment, and those strains reproduced more successfully than non-resistant strains during treatment.
   - **e.** *Staphylococcus aureus*-resistant bacteria reproduce more slowly than non-resistant strains.

5. (K/U) Which of the following statements is true?
   - **a.** Individuals adapted to an environment are more likely to survive.
   - **b.** Natural selection has a direction and purpose.
   - **c.** Mutations cannot be induced by the environment.
   - **d.** The origin of variation is sexual reproduction.
   - **e.** Natural selection can anticipate change in the environment.

6. (K/U) What does "variation is neutral" mean?
   - **a.** Variation has a selective advantage to an organism that inherits this variation.
   - **b.** Variation negatively affects the ability of an organism to survive and/or reproduce in a given environment and time period.
   - **c.** Variation positively affects the ability of an organism to survive and/or reproduce in a given environment and time period.
   - **d.** Variation does not affect the ability of an organism to survive and/or reproduce in a given environment and time period.
   - **e.** Variation positively or negatively affects the ability of an organism to survive and/or reproduce in a given environment and time period.

7. (K/U) Which two factors add to variation in a population?
   - **a.** mutations and natural selection
   - **b.** mutations and sexual reproduction
   - **c.** natural selection and sexual reproduction
   - **d.** mutations and adaptations
   - **e.** adaptations and natural selection

8. (K/U) What is a mutation?
   - **a.** a trait that improves the ability of an organism to survive and/or reproduce
   - **b.** a random change in small, isolated populations
   - **c.** a change in a population over time
   - **d.** selection for favourable variations in a population
   - **e.** a random change in the genetic material of an organism

9. (K/U) Natural selection acts upon which of the following?
   - **a.** a habitat
   - **b.** an ecosystem
   - **c.** the genes of heritable traits
   - **d.** an ecological niche
   - **e.** an individual

10. (K/U) Which of the following best describes selective pressure?

a. a characteristic that improves an organism's chance of survival, usually in a changing environment

b. a process by which individuals with advantageous traits survive and/or reproduce more successfully within their lifetime

c. when environmental conditions select for certain characteristics of individuals and select against other characteristics

d. a trait with no apparent advantage for survival

e. an unusual combination of alleles passed on to the offspring of parents

Use sentences and diagrams as appropriate to answer the questions below.

11. (K/U) What is a physiological adaptation? Include an example in your answer.

12. (K/U) Give an example of a mutation that has a neutral effect on an organism.

13. (A) Explain why puppies from the same litter can have different fur colour and patterns.

14. (K/U) What is the difference between selective pressure and selective advantage?

15. (K/U) How can you most directly measure an organism's fitness?

16. (T/I) Two closely related butterfly species can successfully mate but they produce sterile offspring. Are these species "fit" in terms of natural selection? Explain your answer.

17. (K/U) Name the process that leads to adaptations in populations. Explain your answer.

18. (T/I) A biologist studied a population of moles for 10 years. During that time, the population was never fewer than 20 moles and never more than 50. Her data showed that over half the moles born did not survive to reproduce because of selection factors, such as competition for food and predators. Then, in a single generation, 90 percent of the moles that were born lived to reproduce. The population doubled in size. Why do you think this happened?

19. (K/U) Explain what is meant by the phrase "Natural selection is situational."

20. (C) Use a diagram to illustrate the process of natural selection in a plant population that attracts insect pollinators by petal colour. For example, bees can find red flowers easier than lighter-coloured flowers.

21. (K/U) What kinds of traits might a farmer want to selectively breed for in a fruit crop?

22. (C) In a graphic organizer such as a table or flowchart, summarize similarities and differences between artificial selection and natural selection.

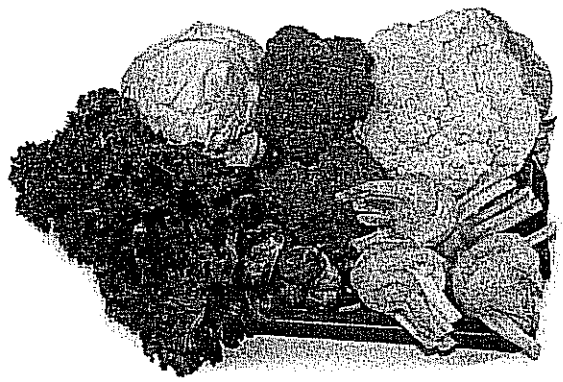
23. (C) Use a graphic organizer to summarize the advantages and disadvantages of selective breeding. Include specific examples.

24. (T/I) The wild mustard species *Brassica oleracea* has been modified in many ways using artificial selection to produce the plants shown below.

- Brussels sprouts are a domesticated variety of wild *Brassica* that were artificially selected for large bud size.
- Broccoli was bred from *Brassica* by selecting for large flower stalks.

a. Suggest a breeding program using artificial selection to develop a strain of *Brassica* that selects for large leaves.

b. Suggest potential problems with the new variety.



25. (T/I) Does natural selection lead to organisms becoming progressively better with each generation? Explain your thinking.

Self-Check

If you missed question...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Review section(s)...	7.2	7.1	7.2	7.1	7.2	7.1	7.1	7.1	7.2	7.2	7.1	7.1	7.1	7.2	7.2	7.2	7.1	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2

Chapter 8 SELF-ASSESSMENT

Select the letter of the best answer below.

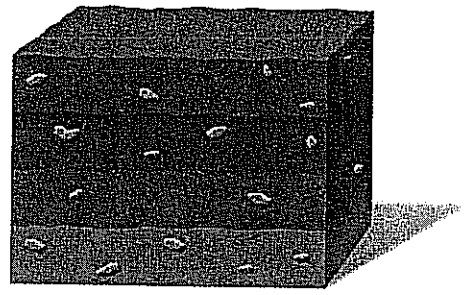
1. (K/U) Why was Lamarck's work important to Darwin's development of his theory of evolution by natural selection?
   - **a.** He supported a fixed, static view of life.
   - **b.** He established the principle of uniformitarianism.
   - **c.** He emphasized organisms adapting to their environment.
   - **d.** He wrote about unchecked human population growth.
   - **e.** He suggested a longer time period on Earth for evolution to occur.
2. (K/U) How did Lyell's work contribute to evolutionary thought?
   - **a.** He devised a classification system that is still used today.
   - **b.** He suggested that constant geological processes have shaped Earth over a long period of time.
   - **c.** He proposed that species are related by descent from a common ancestor.
   - **d.** He proposed the theory of acquired characteristics and the idea of "use and disuse."
   - **e.** He viewed nature as fixed along a progressive scale.
3. (K/U) What is evolution?
   - **a.** Organisms adapt to their environment.
   - **b.** Species go extinct and thus are no longer on Earth.
   - **c.** Populations vary in their traits.
   - **d.** Organisms produce more offspring than can survive.
   - **e.** Genetic changes in characteristics of species over time.
4. (K/U) How does the idea of catastrophism relate directly to observations in the fossil record?
   - **a.** Species suddenly disappear, while new species appear, in the fossil record.
   - **b.** There are transitional species that link different groups of organisms.
   - **c.** Older species are found in lower strata of the fossil record.
   - **d.** Recently evolved species are found in the most recent layers of the fossil record.
   - **e.** Fossils are very similar throughout the fossil record.
5. (K/U) Which scientist developed a theory of evolution by natural selection at the same time as Darwin?
   - **a.** Malthus
   - **b.** Lyell
   - **c.** Buffon
   - **d.** Cuvier
   - **e.** Wallace
6. (K/U) What was the widely accepted view about life on Earth prior to Darwin's publication of *The Origin of Species* in 1859?
   - **a.** Earth is 6000 years old, and the natural world does not change.
   - **b.** Earth is 6000 years old, and populations change over time.
   - **c.** Earth is millions of years old, and populations rapidly change.
   - **d.** Earth is billions of years old, and populations are unchanging.
   - **e.** Earth is millions of years old, and the natural world gradually changes.
7. (K/U) Which of the following is an intermediate fossil illustrating the evolution of whales?
   - **a.** *Pakicetus*
   - **b.** *Archaeopteryx*
   - **c.** *Atrociraptor*
   - **d.** Gondwana
   - **e.** Pikaia
8. (K/U) Which of these conditions favours the evolution of traits in a population according to Darwin's theory of natural selection?
   - **a.** Some of the variation between individuals is heritable.
   - **b.** Organisms produce only a few offspring in each generation.
   - **c.** Resources are unlimited in the population, and there is no competition for those resources.
   - **d.** The population lives in a habitat where there is no competition for resources.
   - **e.** Individuals acquire traits from the environment and pass on those acquired traits to offspring.
9. (K/U) Which is an idea that Darwin used from the work of Malthus?
   - **a.** Populations do not change and life is static.
   - **b.** Populations produce far more offspring than can survive.
   - **c.** Earth has changed through a series of catastrophic revolutions.
   - **d.** The fittest individuals survive due to favourable adaptations.
   - **e.** Earth is more than 6000 years old, and life forms are unchanging.

10. K/U Which is a plausible question that came from Darwin's observations during the voyage of the *Beagle*?
   a. Are organisms becoming perfect over time?
   b. Why do living species and fossilized organisms look so different within the same country in South America?
   c. Why is there so much species diversity on small, isolated islands?
   d. Could all species have been created at the same time?
   e. Why did the Galapagos finch species look just like the European finches?

Use sentences and diagrams as appropriate to answer the questions below.

11. K/U What is a homologous structure? Include an example in your answer.

12. T/I Use the diagram below to answer the following questions.



   a. Which layer of rock contains the youngest fossils?
   b. Which layer of rock contains fossils most similar to species alive today?
   c. In which layer are the oldest fossils found?

13. C Design a brochure to explain to Grade 5 students two sources of evidence for evolution. Be sure to use visuals in your brochure.

14. K/U If you teach children to look both ways before they cross the street, this action will help them survive.
   a. How would Lamarck intrepret this behaviour?
   b. Do you agree with this interpretation? Explain your answer.

15. K/U What was important about the discovery of the transitional fossil *Archaeopteryx*?

16. T/I Explain Lamarck's idea of the inheritance of acquired traits. Explain why the idea is not a theory and why it is incorrect.

17. K/U How can embryo development reveal clues about evolutionary history?

18. T/I You are doing research on birds and you discover that certain birds possess reptile-like scales on the lower parts of their legs and feet. Another research lab you are working with reports that these "scales" are chemically identical to feathers.
   a. How do you interpret this finding?
   b. Assuming reptiles are older than birds in the fossil record, what does this tell you about the origin of feathers?

19. K/U Would Darwin support the statement "No species is really more primitive or advanced than any other"? Explain your answer.

20. A When entering Canada from abroad, you are asked if you are bringing in any live specimens. Why do countries try to avoid non-indegenous species being brought in?

21. T/I Infer how a functionless gene could be considered a vestigial trait.

22. C Use a graphic organizer such as a Venn diagram to compare and contrast homologous structures, analogous structures, and vestigial structures. Go to Using Graphic Organizers in Appendix A to learn more about Venn diagrams.

23. C Use a graphic organizer to summarize the similarities and differences between catastrophism and uniformitarianism. Go to Using Graphic Organizers in Appendix A to learn more about which graphic organizer to choose.

24. K/U What important contribution did Charles Lyell make to science?

25. K/U Define *biogeography* in your own words. In your definition, include an example.

Self-Check

ou missed question...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Review section(s)...	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.2	8.1	8.1	8.2	8.2	8.1	8.1	8.2