

Important Concepts . . .

Preview Review



Science

Grade 9 TEACHER KEY

W3 - Lesson 1: Variation

Important Concepts of Grade 9 Science

W1 - Lesson 1	Electrical Principles
W1 - Lesson 2	Electrical Circuits
W1 - Lesson 3A	Energy Consumption
W1 - Lesson 3B	The Distribution of Matter in Space
W1 - Lesson 4	Objects in Space
W1 - Lesson 5	Optical and Radio Telescopes
W1- Quiz	
W2 - Lesson 1	Physical and Chemical Properties of Materials
W2 - Lesson 2	Chemical Reactions
W2 - Lesson 3	Using the Periodic Table
W2 - Lesson 4	Naming Chemical Compounds
W2 - Lesson 5	Writing Chemical Equations
W2 - Quiz	
W3 - Lesson 1	Variation
W3 - Lesson 2	Reproduction and Patterns of Inheritance
W3 - Lesson 3A	Genes and Cell Division
W3 - Lesson 3B	Organisms and Matter in their Environment
W3 - Lesson 4	Biological and Chemical Monitoring/Acids and Bases
W3 - Lesson 5	Transfer of Materials through the Air, Ground, and Water/Biological Impacts of Hazardous Chemicals
W3 - Quiz	

Materials Required

Textbook:
Science in Action 9

Science Grade 9

Version 5

Preview/Review W3 - Lesson 1 TEACHER KEY

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Preview/Review Concepts for Grade Nine Science

TEACHER KEY



*W3 - Lesson 1:
Variation*

OUTLINE

By the end of this lesson, you should

- identify variation among and within species
- define a niche and explain why variation is important
- explain heritable and non-heritable characteristics
- give examples of natural and artificial selection and explain the difference

GLOSSARY

biological diversity - the variety of species and ecosystems on Earth and the ecological processes of which they are a part; ecosystem diversity, community diversity, and genetic diversity

natural selection - the process in which the environment *selects* which individuals will survive and reproduce

population - a group of individuals of the same species living in an area

variability - variations within a species

Introductory Information for Teachers

Preview/Review courses are aimed mainly at students who have complete the regular course but who need to review before beginning the next grade. Other students may find Preview/Review courses useful in preparing for the new materials they will study in their next grade. No Preview/Review course is intended to replace the regular course because all cover only some important concepts from the Program of Studies for each grade.

Preview/Review materials are intended for use by teachers in one-subject and one-grade classrooms.

This Preview/Review course contains fifteen lessons in three sections. Each section has five lessons with homework. A short quiz is provided at the end of each section to test students' knowledge of the material studied. In a classroom, the course will likely be completed in three weeks.

Students may attend one, two, or all three sections. Because Science has five units per grade and does not divide into three sections, Sections 1 and 2 cover two units each and Section 3 covers the final unit.

In Science, textbooks are central to Preview/Review. That is, the textbook must be read and used to complete the activities proficiently.

Textbooks required:

- Grade 7: *Science in Action 7*
- Grade 8: *Science in Action 8*
- Grade 9: *Science in Action 9*

W3 - Lesson 1: Variation

Did you know that the technical name for humans is *Homo sapiens*? This is part of a classification system for all organisms on Earth. The word *Homo* is the Latin name representing the genus, and *sapiens* is the species name. You will learn what a species is and why variation is necessary for a species to survive.



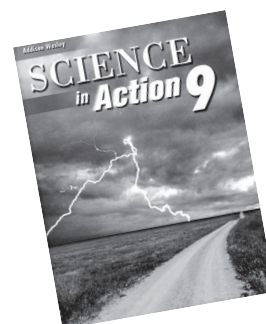
The boreal forest **ecosystem** in Northern Alberta contains a variety of plant and animal populations. An **ecosystem** refers to the interaction of living organisms (biotic factors) with their environment (abiotic factors – non-living components such as air, water, and sunlight). The two most common abiotic factors that define an ecosystem are the amounts of sunlight and water it receives. The populations that live in the boreal forest are well suited (adapted) to their environment. They include evergreen trees, wolves, coyotes, and deer. A **population** is defined as a group of individuals of the same species that live in a certain area at a certain time. A **community** is a collective group of populations that live in an area.

A **species** is a group of organisms with the same basic structure that are able to reproduce successfully. An example of a species is the population of woodland caribou shown on Figure 1.1, page 9 of *Science in Action 9*.



Many differences are found within the woodland caribou or any other species. They might differ in their height or the length of their feet. These slight differences are variations within a species. The greater the variations within a species, the higher chance it has for survival.

Read pages 8-11 of *Science in Action 9*.



1. First, some questions about species diversity:

- a. Where on the map of Earth is the highest number of species?



***The highest number of species is found at the
equator of Earth (for example, Central America).***

- b. What abiotic factors contribute to this high number of species?

***High amounts of sunshine and high amounts of
rainfall***

2. Explain a population and a community and give an example of each.

***A population is a group of individuals of the same
species that are able to reproduce.***

E.g., A lynx population

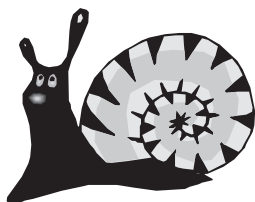
A community is a group of populations.

***E.g., A boreal forest community (made of populations of
lynx, snowshoe hare, evergreen trees)***

3. Give two examples of variation within the banded snail species.

Colour of shell (yellow – brown)

Bands on shell (no bands – bands covering whole shell)



Niches

Do you have a favorite place at school where you like to hang out and eat lunch? This location is part of your niche. A **niche** is the role of an organism within the ecosystem: where it lives, what it eats, its habitat, its nesting site, and its effect on the populations around it and on its environment.

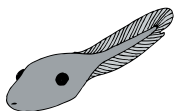


Each species on Earth occupies its own niche. Sometimes similar species compete for the same food source (**interspecies competition**). Because the goal of a species is to survive and reproduce, sharing of food resources occurs. This is known as **resource partitioning**.

Read pages 18-19 of *Science in Action 9*.

- Look at figure 1.13 on page 19 of *Science in Action 9*. Explain how these three species of warblers (small songbirds) can survive although they eat the same food (spruce bud worms).

The different warbler species feed on spruce bud worms found in different areas of the spruce tree (resource partitioning).



- Describe the niches of a tadpole and of an adult frog.

A tadpole lives in an aquatic environment and consumes plant material. An adult frog lives in both aquatic and terrestrial environments and consumes bugs and insects (carnivorous).



- Give a definition and example of interspecies competition.

Two or more species compete for the same food resource. E.g., mule deer and moose eating vegetation

Heritable and Non-Heritable Characteristics

Have you ever wondered why you have the eye colour you do? Eye colour is a heritable trait that has been passed to you from your biological parents. The goal of every species is to survive and pass its traits to its offspring. Other heritable traits include hair colour and skin colour.



Non-heritable traits are characteristics that are acquired or caused by the environment and are not passed along. A scar on a man's face or a woman's broken finger will not be passed to their children. Another example of a non-heritable trait is knowing a foreign language. Also the colour of a person's skin can be affected by exposure to the sun's ultraviolet rays.

Read pages 28-29 of *Science in Action 9*.

7. Identify whether the following traits are heritable or non-heritable.

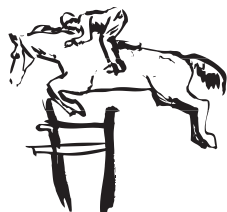
- | | |
|-----------------------------------|-----------------------------|
| a. a burn mark on the skin | <u><i>non-heritable</i></u> |
| b. curly hair | <u><i>heritable</i></u> |
| c. dyed hair color | <u><i>non-heritable</i></u> |
| d. the ability to ride a bike | <u><i>non-heritable</i></u> |
| e. length of a person's eyelashes | <u><i>heritable</i></u> |
| f. foot size | <u><i>heritable</i></u> |

8. Give an example not previously mentioned of how the environment can affect heritable traits.



Height is a heritable characteristic, but it can be
affected by diet. If people who have the genes to be
tall don't eat properly, they will not grow as tall as
they could.

Natural versus Artificial Selection

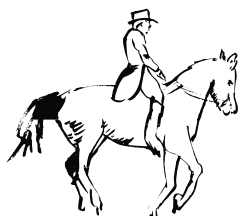


One of the reasons variability is important for a species is **natural selection**. This is a process by which the **environment** *selects* which individuals will survive and reproduce. Climatic change, disease, and lack of food sources are environmental factors that can cause natural selection. The broader the range of conditions a species can live in, the better are its chances of survival.



Artificial selection is a process by which **humans** select individuals to reproduce based on certain characteristics or traits. Race horses and rodeo bulls undergo artificial selection. Breeders of race horses want to breed only fast horses. The genetic tree of a race horse can probably be traced many generations and include many major race winners.

One problem that occurs with artificial selection is a lack of variability in the species. Disease can easily destroy a species if its individuals are too similar. Also, certain species breeds can have physical problems that occur more often. Siamese cats are prone to having bladder problems, for example.



Read pages 24 and 66 of *Science in Action 9*.

9. In the example of natural selection of the cliff swallows, for what reasons did the scientists think some birds died while others survived?



The survivors were larger birds with bigger beaks and legs, and they were symmetrical. The larger birds were able to store fat and the symmetry allowed them to forage for food without losing energy. The smaller birds died.

10. How is artificial selection different from natural selection?



People choose which organisms will breed in artificial selection. In natural selection, the environment determines which organisms survive and reproduce.

11. What trait would a stock breeder want rodeo bulls to inherit?

To be aggressive and buck a lot

12. Identify at least two other organisms not previously mentioned that undergo artificial selection.

Cows, sheep, pigs, dogs, cats, birds, guinea pigs,

hamsters, various food crops

Internet Websites

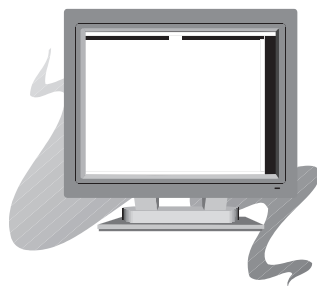
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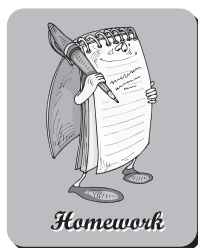
<http://www.bbc.co.uk/beasts/evolution/flashholder.shtml>

http://www.rainforest-alliance.org/kids_teachers/kids/frog-pond/index.html

<http://www.worldwildlife.org/wildworld>

<http://www.darwinfoundation.org>





Homework

13. Where are the Galapagos islands? What is the relationship between different species of finches and Charles Darwin?

The Galapagos islands are off the northwest coast of South America. Charles Darwin was a naturalist who traveled and visited different parts of the world. After viewing the different species of finches (wide variations in size, beaks, and height), Darwin formulated his Theory of Natural Selection – The Origin of Species.

14. Look at some heritable characteristics that you have (hairline, tongue movement, earlobe shape, and thumb flexibility). ***Answers will vary depending on individual characteristics.***

- a. Do you have a widow's peak? (Hold back your hair to see if your hairline has a distinctive point in the center of your forehead.)
-

- b. Can you roll your tongue? _____

- c. Are your earlobes attached or free? _____

- d. Do you have a hitchhiker's thumb? (Can you bend your thumb back to a 45 degree angle?)
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- e. Compare your traits to your biological parents or siblings, or contrast your traits with those of a friend.
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