

Important Concepts . . .

Preview Review



Science

Grade 9 TEACHER KEY

***W3 - Lesson 2: Reproduction and
Patterns of Inheritance***

Important Concepts of Grade 9 Science

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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
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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 2 TEACHER KEY

Publisher: Alberta Distance Learning Centre

Author: Nicole Bondarchuk

In-House Reviewer: Barb Philips

Project Coordinator: Dennis McCarthy

Preview/Review Publishing Coordinating Team: Nina Johnson,

Laura Renkema, and Donna Silgard



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Preview/Review Concepts for Grade Nine Science

TEACHER KEY



***W3 - Lesson 2:
Reproduction and
Patterns of Inheritance***

OUTLINE

By the end of this lesson, you should

- explain sexual reproduction and give an example
- explain asexual reproduction and give an example
- identify advantages and disadvantages of each type of reproduction
- explain the difference between discrete and continuous variation
- realize how offspring inherit characteristics from their parents

GLOSSARY

allele - a version of a particular gene

asexual reproduction - reproduction without the fusion of sex cells, resulting in offspring identical to the parent

gene - a specific segment of DNA that controls a specific trait

hybrid - an individual produced by crossing two purebred parents that differ in a trait such as hair color

purebred - refers to a plant or animal that has ancestors with the same form of a trait

sexual reproduction - reproduction involving the exchange of genetic material between two individuals, resulting in offspring genetically different from the parents.

trait - a characteristic of an organism (e.g., height, eye colour)

W3 - Lesson 2: Reproduction and Patterns of Inheritance

When you get antibiotics to help cure a bacterial infection, the doctor and pharmacist tell you to make sure you finish all your prescription. This ensures that all the bacteria are killed. One of the ways that species such as bacteria ensure their survival is through reproduction. Reproduction occurs by producing identical copies of the individual or by producing sex cells that result in genetically different individuals. You will also study patterns of inheritance and how certain traits can be passed from parents to offspring.

Reproduction has two forms: sexual and asexual. Different organisms reproduce in different ways.

Asexual Reproduction

One of the ways an individual can reproduce is by producing identical copies of itself.

Binary fission occurs in single-celled organisms such as bacteria. The cell splits exactly into two new cells.

Budding occurs in yeast cells. A new organism develops from an outgrowth or bud on the parent.

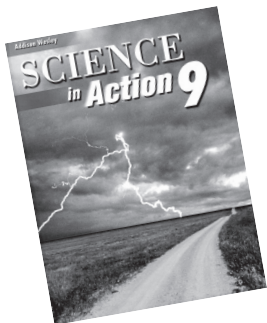
Fungi and ferns reproduce through **spore production**. A spore is produced by the division of cells of one individual. Each spore can produce a whole new individual. The spores will not germinate until the environmental conditions are favourable.

Most plants reproduce by **vegetative reproduction**. A strawberry plant produces a **runner** that implants in the soil and produces a new plant genetically identical to the parent. Plants also have other methods of vegetative reproduction.



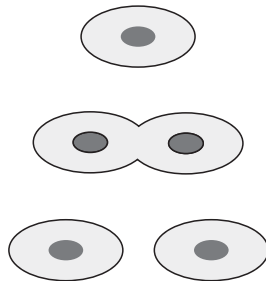
One advantage of asexual reproduction is that these species produce large numbers of individuals quickly.

One disadvantage of asexual reproduction is that if conditions become unfavorable, the whole population can be destroyed due to a lack of genetic variation.

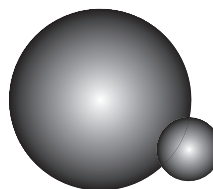


Read pages 30–31 and 35 of *Science in Action 9*.

1. Identify the type of asexual reproduction shown in each diagram.



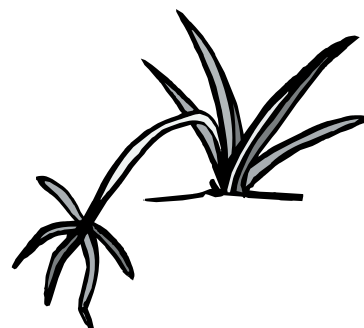
binary fission



budding



spore production



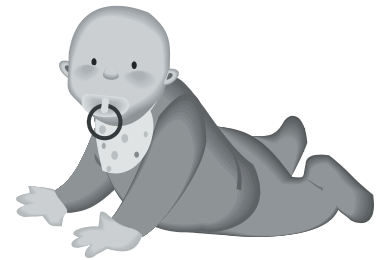
vegetative

2. What is one major difference between spore production and binary fission?

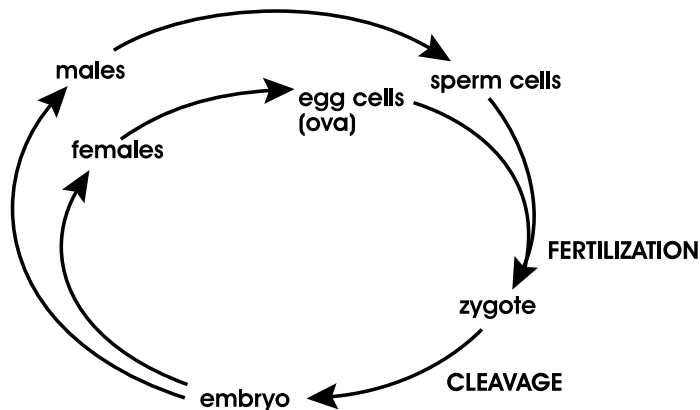
Binary fission immediately produces new offspring.
Spores will not germinate until conditions are favorable.

Sexual Reproduction

Sexual reproduction involves the exchange of genetic material between two individuals. The result is offspring that are genetically different from the parents. Male and female gametes are produced and combine to form a new individual.



In animals, sexual reproduction occurs in the following way:



Fertilization is the union of egg and sperm cells. **Cleavage** occurs when the single-celled zygote begins to divide into a multi-celled organism.

In plants, sexual reproduction involves the production of pollen (male gamete) by the stamen of the plant and then the process of pollination. **Pollination** occurs when the pollen of a plant is carried to the stigma (female organ) of a plant by wind, water, or animals. (See figure 2.11 on page 33 of *Science in Action 9*.)

The pollen produces a long tube that grows from the stigma down the style of the plant to enter the ovary. A pollen grain joins with an ovule to produce a zygote. The zygote produces an embryo which is enclosed in a **seed**. The seed will produce a new plant when conditions are favorable for growing.

One advantage of sexual reproduction is that it produces a variety of genetically different individuals that can survive a variety of environmental changes.

Two disadvantages of sexual reproduction are that much energy is required to produce offspring and two parents are needed.

Read pages 32-35 of *Science in Action 9*.

3. How is the process of sexual reproduction different in animals than in plants?

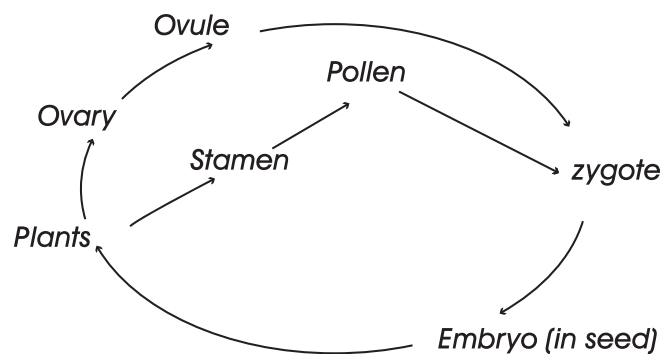
Plants can have both male and female organs and can often fertilize themselves. Most animals have only one set of reproductive organs. If they have both male and female sex organs, they cannot fertilize themselves.

4. A fictional organism named a Morph lives in an environment that undergoes extreme changes. Which type of reproduction would allow Morph to survive best under these conditions? Explain your answer.



Sexual reproduction would allow Morphs to survive best. This would produce wide variations of Morph so that some of them could survive while the others die.

5. Draw a diagram to illustrate sexual reproduction in plants.



Discrete Versus Continuous Variation

The first thing you need to remember about variation is that it basically means *differences*. **Discrete variation** refers to differences that have a specific form (either the organism has the variation or it does not). An example of discrete variation is whether an individual has blue eyes or does not have blue eyes.



Continuous variation refers to differences in characteristics that have a range of forms. An example of continuous variation is the range of lengths a teenager's foot can be. Some teenagers might have a shoe size of 8 or 9, whereas others can have a shoe size of 13.

Read page 28 of *Science in Action 9*.

6. Give examples of a discrete variation and of a continuous variation that have not been previously mentioned.

Discrete variation – attached or not attached earlobes

(free earlobes)

Continuous variation – adult height

(range of 1.2 m to 2.1 m)

7. A scientist wants to complete a study to investigate the effect of caffeine on a person's heart rate. Identify two traits the scientist might study, and explain whether the traits would be discrete or continuous.

Resting heart rate – continuous variation

Heart rate after caffeine – continuous variation

Person's weight – continuous variation

Patterns of Inheritance

Early scientists made discoveries about inheritance through the observation of traits in parents and offspring. One of the most important scientists, who is also referred to as the Father of Genetics, was a monk named Gregor Mendel. He studied and bred pea plants.



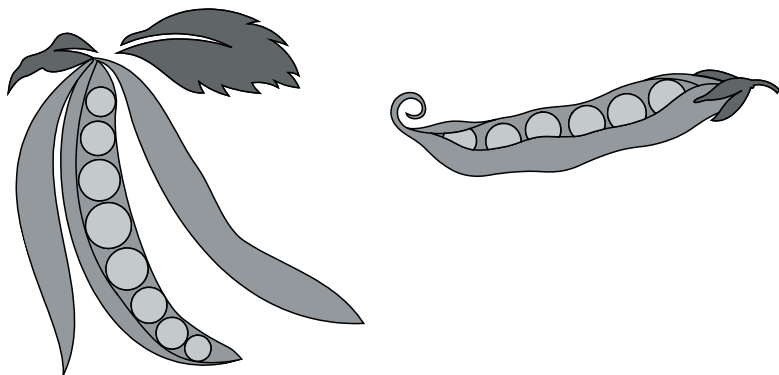
Pea plants vary in a number of traits, but each trait has only two versions. One trait Gregor Mendel studied was the height of pea plants. They can be tall or short. A tall pea plant that carries genes for only tall offspring is referred to as a **purebred**. Each plant carries two copies of the gene that controls the height. The copies may both be the same allele or two different alleles. For example, a plant might have two *tall* alleles, two *short* alleles, or one *tall* and one *short* allele.

A **hybrid** is genetically different from each of its parents. A hybrid is produced if a purebred tall plant is crossed with a purebred short plant.

Tall height in pea plants is a **dominant trait**. This means that even if one tall allele is present in the plant, the plant will be tall.

Short height in pea plants is a **recessive trait**. This means that for a short plant to be produced, two recessive alleles of the gene must be present.

Another pattern of inheritance is **incomplete dominance**. In this case, there are three possible characteristics of a trait. Purebred four o'clock flowers can be either red or white. The hybrid plants produce pink flowers (a combination of the red and white alleles).



Read pages 50 - 53 of *Science in Action 9*.

8. Using your textbook, identify the dominant and recessive traits for coat colour in cats.

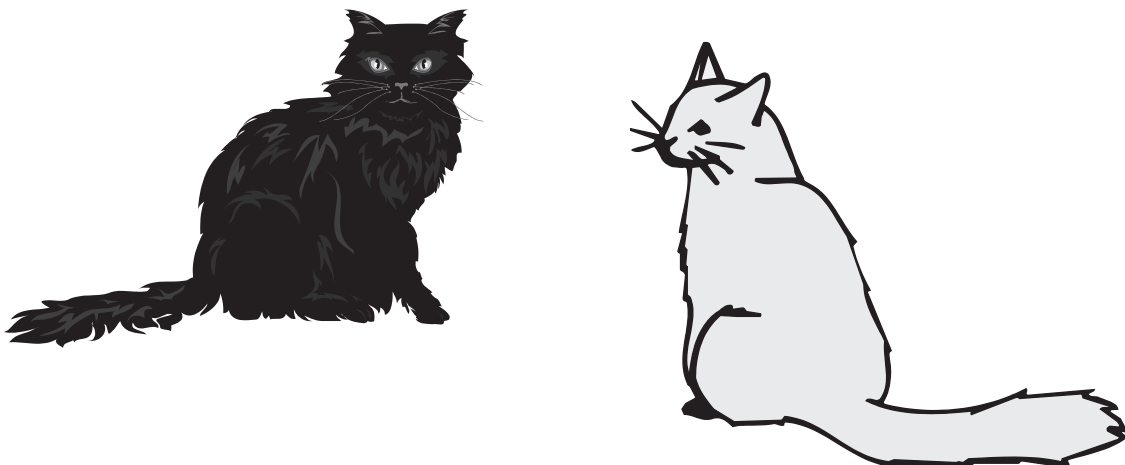
Black coat colour is a dominant trait whereas white coat colour is a recessive trait.

9. Is a white cat a purebred or a hybrid? Explain your answer.

A white cat could be considered a purebred. For the white coat colour to be expressed, the cat must to have two of the same recessive alleles.

10. In cattle, a white cow crossed with a red bull produces a roan calf (where at least part of its body has an intermingling of coloured and white hair). What type of inheritance is this an example of? Is the roan calf a purebred or a hybrid?

Incomplete dominance. The roan calf is a hybrid because it carries both a dominant and recessive allele.



Internet Websites



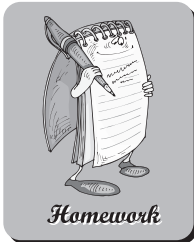
The addresses for the websites below were valid at the time of printing.

<http://www.kidsolr.com/science/page9.html>

<http://biology.about.com/library/weekly/aa090700a.htm>

<http://genetics.gsk.com/kids/heredity01.htm>

Homework



11. Sit down and clasp your hands together. Is your right thumb or left thumb on top? Record the results. Clasp your hands the opposite way. How does this feel? Do you think that this is discrete or continuous variation?

Discrete variation – You either clasp your right thumb on top or you do not.

12. Try to make a new plant by taking a cutting from a mature plant. Place the cutting in a jar of water until it roots and then plant it in soil. (Try a cutting from a spider plant or an African violet.) This is a long-term project; be patient!

13. Research and draw the life cycle of your favorite animal. Find out the length of its gestation period and how many offspring are usually produced.

Answers will vary depending on the animal chosen.