

# Unit A – Biological Diversity

## Focusing Questions:

1. What is biological diversity?
2. How do organisms pass on their traits to future generations?
3. What impact does human activity have on biological diversity?

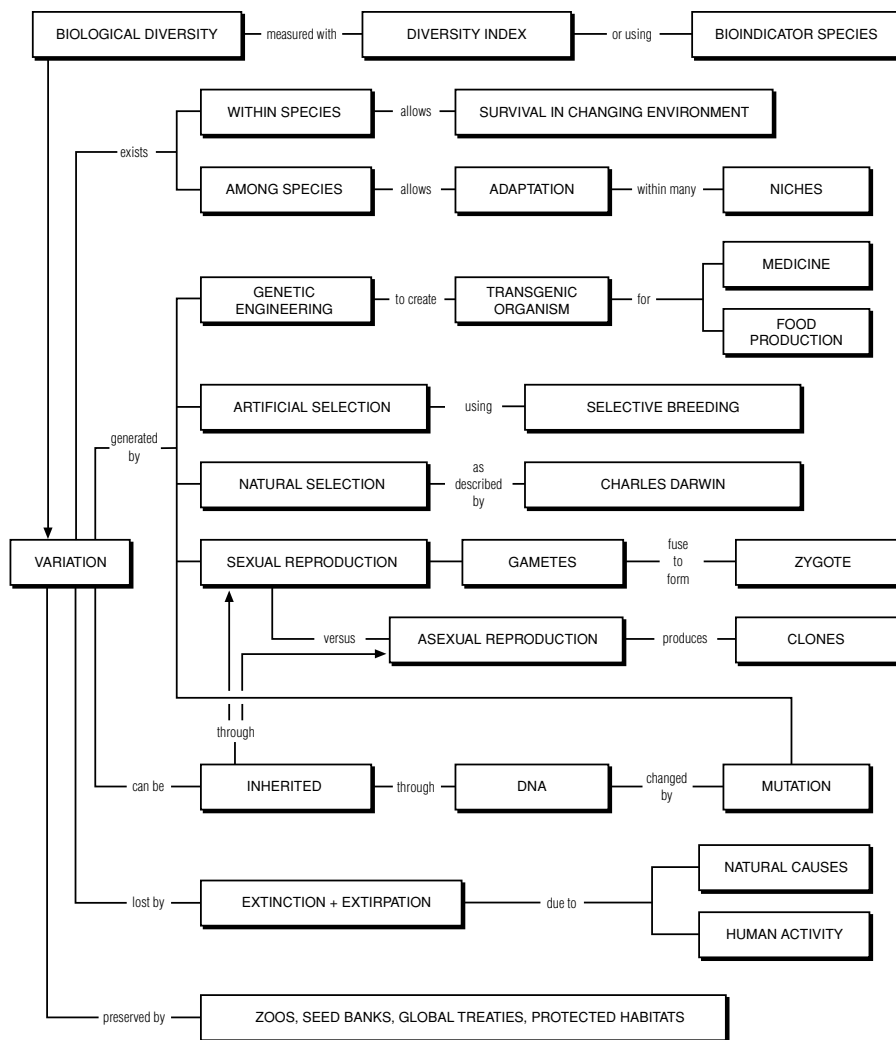
## Key concepts:

- biological diversity
- species
- diversity within species
- habitat diversity
- niches
- populations
- asexual and sexual reproduction
- inheritance
- chromosomes, genes and DNA (introductory treatment)
- cell division—includes binary fission and formation of sex cells
- natural and artificial selection of genetic characteristics

## Learning outcomes:

1. Describe the relative abundance of species on Earth and in different environments.
2. Describe examples of variation between species and within species.
3. Explain the role variation plays in survival.
4. Identify examples of niches and describe how closely related living things can survive in the same ecosystem.
5. Explain how the survival of one species may be dependent on another species.
6. Identify examples of natural selection.
7. Distinguish between asexual and sexual reproduction and describe examples of each type of reproduction.
8. Describe types of variations found within a species and describe whether they are discrete or continuous.
9. Distinguish between heritable and non-heritable characteristics.
10. Describe the relationship among chromosomes, genes, and DNA, and their role in storing genetic information.
11. Distinguish between cell division during asexual reproduction and cell division during sexual reproduction.

12. Investigate the transmission of characteristics from parents to offspring, and identify examples of different patterns of inheritance.
13. Identify examples of dominant and recessive characteristics.
14. Distinguish between artificial and natural selection.
15. Describe the effects of extinction and extirpation on biological diversity.
16. Evaluate the success and limitations of local and global strategies in minimizing loss of species diversity.
17. Describe new technologies for recombining genetic material.
18. Describe the use biotechnology in various fields.



## Science 7/8 Prerequisite knowledge:

*Biotic vs. Abiotic:*

*Autotroph vs. Heterotroph:*

*Herbivore vs. Carnivore vs. Omnivore:*

*Food chain vs. Food web:*

**Species:**

*What's a tigrion (liger)? Why are they not common?*

**Population:**

**Community:**

**Ecosystem:**

## Topic 1 - Biological Diversity and Survival



Why do zebras have stripes?

What does biological diversity look like?

How can we prevent a loss of biological diversity on Earth?

How do zebras pass on their traits?

If only one female zebra were left on this planet, does it mean the end of that species?

## **“Bill Nye: Biodiversity” Questions**

1. For a(n) \_\_\_\_\_ to be successful and healthy, it has to have lots of different kinds of plants and animals.
2. *Name four types of ecosystems from those listed in the video.*
3. *All living things depend on:*
4. What determines how successful an ecosystem will be?
5. Name four extinct species.
6. *The best way to wipe out a species is to:*
7. *The largest ecosystem in the world is the \_\_\_\_\_.*
8. \_\_\_\_\_% of the world is covered by water and \_\_\_\_\_ of all the species in the world live in the ocean.
9. List five things you can do to increase biodiversity.
10. *For people, mold can be positive or negative. Explain.*

### **Variation:**

### **Biological Diversity (biodiversity):**

Provide two reasons why many tropical ecosystems have high biodiversity.

Read "A Wealth of Diversity" on page 7. Give two reasons why biodiversity should be preserved.

## Classifying Biological Diversity (p. 438)

**Aristotle:**

**Linnaeus:**

Ex.

Scientists (Taxonomists) have further divided the Linnaean system into:

<b>Divisions:</b>	<b>Wolf:</b>
	Animalia
	Chordata
	Mammalia
	Carnivora
	Canidae
	<i>Canis</i>
	<i>Canis lupus</i>

You can use sayings to remember these 7 divisions (KPCOFGS):

Ex.

Which two of the following three animals are the most related?

red squirrel (*Tamiasciurus hudsonicus*)

short-tail weasel (*Mustela ermine*)

mink (*Mustela vison*)

*We presently have 6 kingdoms but the textbook believes there are only 5. Use p. 439 to identify and briefly describe each of the "5" kingdoms.*

## **Variation within Species (Genetic Diversity)**

Most of us in this room are the same species but if you look around we can also look quite different from one another. Provide 5 examples of these differences.

Pick another species and come up with 3 differences within that species.

Is there an advantage to having these differences within a species?

## **Variation between Species (Species Diversity)**

**Speciation:**

What can cause speciation?

Explain why the different species of Galapagos Finches exhibit so much diversity.

Is there an advantage to having these differences between species?

# Adaptations

## Adaptations:

Type of Adaptation	Description	Example(s)
<b>Structural</b>		1. 2. 3.
<b>Behavioural</b>		1. 2. 3.

Classify each of the following as a structural adaptation or a behavioural adaptation.

- a. An owl can turn its head almost 180° in either direction.
- b. An owl's feathers are soft and fluffy to allow for silent flight.
- c. Owls are usually active at night.

# Putting a Value on Diversity

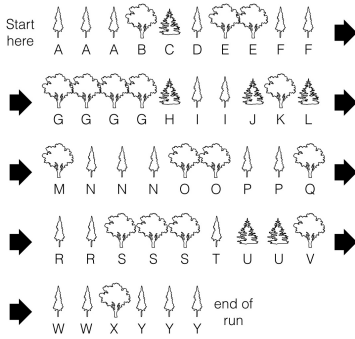
What is the advantage (value) of diversity in an ecosystem?

## Diversity Index:

How is it calculated?

Sample data of tree biodiversity in two local parks are presented here. Follow the suggested steps to calculate the diversity index of this area. The order of the trees observed in each run is drawn from left to right.

Observations for park 1

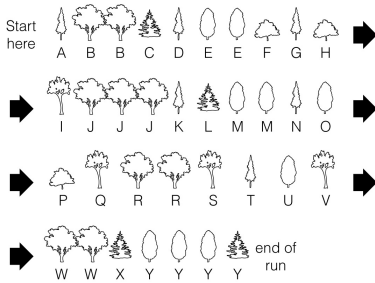


Number of Runs =

Number of Specimens =

$$\text{Diversity Index} = \frac{\text{Number of Runs}}{\text{Number of Specimens}} =$$

Observations for park 2



Number of Runs =

Number of Specimens =

$$\text{Diversity Index} = \frac{\text{Number of Runs}}{\text{Number of Specimens}} =$$

The greater the index value, the \_\_\_\_\_ the diversity.

Which of the two sites had more tree diversity?



## Topic 2 – Habitat and Lifestyle

**Habitat:**

**Niche:**

An organism's habitat and activities (interaction) make up its niche. In fact, organisms can fill more than one niche. Describe the niches of two organisms in Alberta.

Type of Niche	Description
Broad	
Narrow	

The more two niches overlap, the \_\_\_\_\_ the competition between the two species.

### Population Interactions (Interdependencies)

#### 1. Competition:

**Intraspecific competition:**

**Interspecific competition:**

Explain how competition can affect the diversity of species that live in an area.

If two species occupy a similar niche, how can competition between species be reduced or avoided?

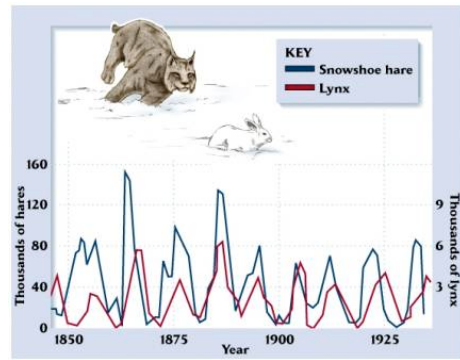
Differentiate between **generalists** and **specialists**. Explain why it is dangerous for an organism or species to be over specialized.

How may the introduction of an **exotic species** into an area affect the existing species?

**2. Predator-prey relationships:**

Ex. willow shrubs → elk → wolves

Ex.



**3. Symbiotic relationships (Symbiosis):**

There are three *general* types:

<i>Relationship:</i>	<i>Explanation:</i>	<i>Examples:</i>
<b>Parasitism</b>		1. 2.
<b>Commensalism</b>		1. 2.
<b>Mutualism</b>		1. 2.

Classify the following symbiotic relationships under mutualism (M), commensalism (C), or parasitism (P).

- \_\_\_\_\_ 1. *E. coli* bacteria in the human large intestine produce vitamin K. The large intestine provides a place to live and nourishment for the bacteria.
- \_\_\_\_\_ 2. A person is infected with tapeworm from eating raw pork. The tapeworm absorbs nutrients from the small intestine and the person becomes sick.
- \_\_\_\_\_ 3. The yucca moth lays eggs in the ovary of the yucca flower. At the same time, the moth pollinates the flower.
- \_\_\_\_\_ 4. One type of algae lives inside reef-building coral. The algae cause the coral to grow faster and the coral provide nutrients that the algae can use.
- \_\_\_\_\_ 5. Small plants called epiphytes grow on the branches of rain forest trees without harming the trees. Up in the branches, the epiphytes can get enough light and water, and nutrients from the tree.
- \_\_\_\_\_ 6. Lichens are made up of algae and fungi living together. The fungus relies on food provided by the algae. The algae are “housed” and protected from drying out by the fungus.
- \_\_\_\_\_ 7. Crown gall disease weakens plants and slows their growth. The bacterium that causes the infection obtains nutrients from the plants.

## Topics 1 -2 Review

A. Define each term:

1. biological diversity:
2. behavioural adaptation:
3. competition:
4. narrow niche:
5. symbiotic relationship:

B. In the space provided, indicate whether each statement is true (T) or false (F). If the statement is false, rewrite it to make it true.

6. \_\_\_ Scientists have identified all plant species.
7. \_\_\_ All individuals of a single species are identical.
8. \_\_\_ Much of Earth's biological diversity is due to speciation.
9. \_\_\_ A specialist can easily survive extreme changes in its environment.
10. \_\_\_ The relationship between mycorrhizal fungi and tree roots is symbiotic.
11. \_\_\_ Life has been found at temperatures as high as 110°C.

C. Multiple Choice

12. Biological diversity is important for the following reason(s):
  - (a) many medicines come from biological sources
  - (b) the survival of one species is sometimes closely linked to the survival of another
  - (c) biological diversity may promote the health and survival of natural communities
  - (d) all of the above
13. In general, organisms of a single species:
  - (a) share similar characteristics
  - (b) are able to interbreed and produce fertile offspring
  - (c) will show some amount of variation
  - (d) all of the above
14. Which kind of graph should be used to display the frequency of students' heights?
  - (a) line graph
  - (b) bar graph
  - (c) histogram
  - (d) none of the above

15. Which organism would be considered a specialist?
- wolf
  - lion-tailed macaque
  - Arctic hare
  - polar bear
16. Snow alga has variations that allow it to:
- survive in cold temperatures
  - form a symbiotic relationship with plants
  - survive intense sunlight
  - both (a) and (c) above
  - both (a) and (b) above
17. A poplar tree's niche includes its habitat and activities such as:
- removing carbon dioxide from the air and releasing oxygen to the air
  - removing water and nutrients from the soil
  - providing food and shelter for a wide variety of organisms
  - all of the above
18. One niche can be described in this way: It breaks down the organic matter and dead things in the soil. In breaking down, organic matter releases nutrients for other organisms. Which of the following organisms fills this niche?
- algae
  - dragonflies
  - fungi
  - hawks

D. Short Answer

19. Name one organism and give an example of one of its structural adaptations.
20. Give an example of two or more closely related species.
21. Give one reason why the different warbler species that live in spruce trees do not occupy the same niche.
22. Which forest would be more likely to survive disease: a forest made up of one type of tree, or a forest made up of many types of trees? Explain your answer.
23. Parasitism, mutualism, and commensalism are types of symbiotic relationships. What type of symbiotic relationship exists in the following situations?
- Epiphytes are small plants that grow high up on the branches of trees in the rain forest. The epiphytes obtain nutrients from the trees but do not harm them. The epiphytes can obtain enough light and water because they are perched on the tree branches
  - Lichens look like a type of organism. But lichens are actually made up of algae and fungi living together. The algae provide food for the fungi. The fungi provide protection for the algae. This protection keeps the algae from drying out.

E. Use the following list of terms or expressions to answer a. to f. in this question.

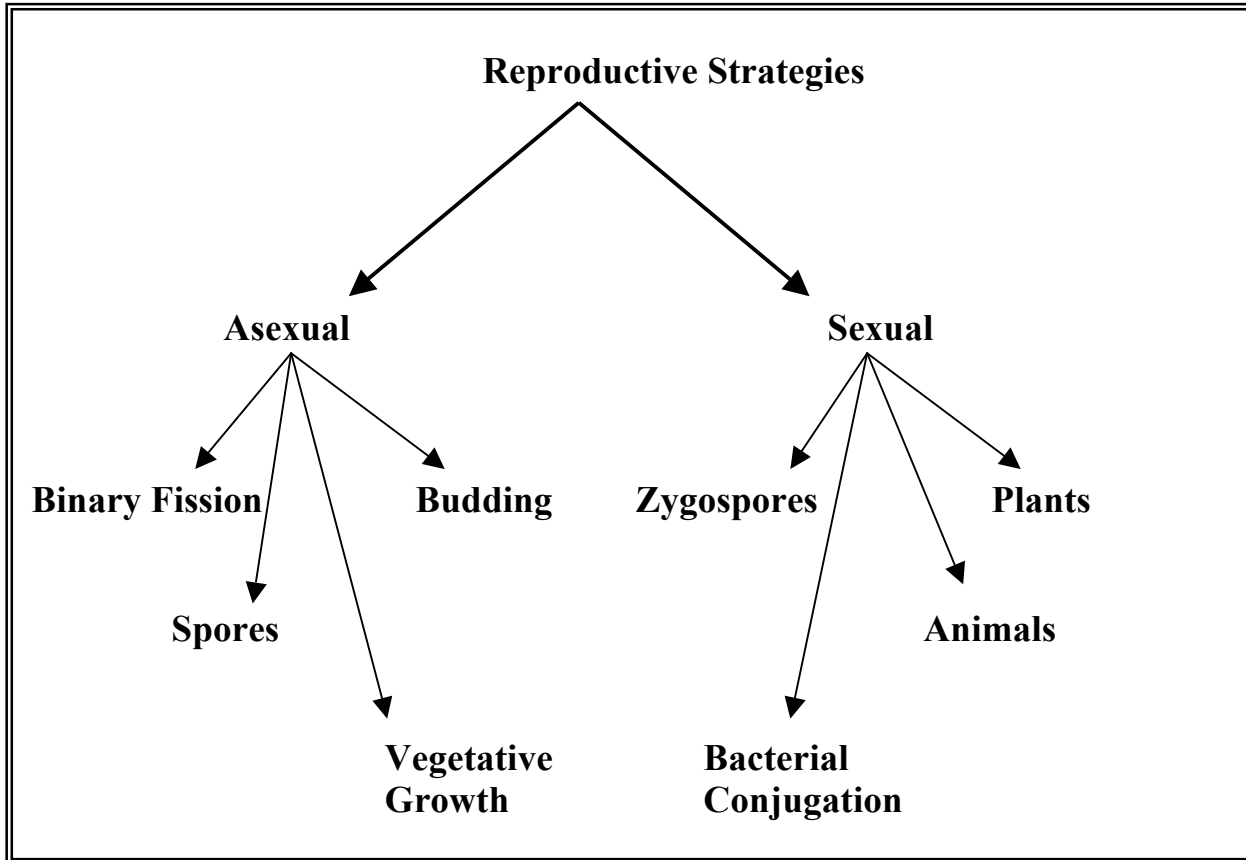
broad	kingdom	share many traits
commensalism	low	specialist
community	narrow	speciation
generalist	parasitism	species
high	share few traits	speculation

24. The desert spadefoot frog (on page 23 of the textbook) is a \_\_\_\_\_ because it occupies a \_\_\_\_\_ niche.
25. The small remora fish live on and around sharks. They eat stray bits of food left by the shark. The shark is not affected much by the presence of these fish. The relationship between the remora and the shark is an example of \_\_\_\_\_.
26. Deer, aspen trees, grasses, mice, and coyotes are interdependent groups of organisms that form a(n) \_\_\_\_\_.
27. Competition for the same resources likely caused much of the \_\_\_\_\_ leading to wolves, coyotes, and foxes.
29. Suppose a healthy ecosystem in a particularly harsh environment consists of only 17 different plants and animals. This ecosystem has a \_\_\_\_\_ biological diversity compared to a tropical rain forest.
29. Look at the two organisms. Assume they have the same structures and reproduce in nature. These two fanciful organisms are likely the same \_\_\_\_\_.



## Topic 3 – Passing it On

Heritable traits:

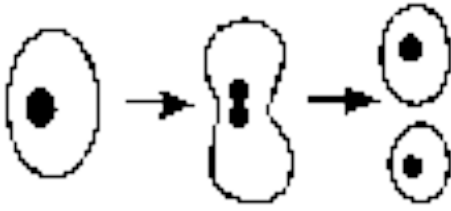


Note: some organisms like sponges, molds and plants can reproduce both sexually and asexually

### 1. Asexual Reproduction:

- the offspring are often referred to as \_\_\_\_\_ because they are exact duplicates of the parent
- advantages:
- disadvantages:

a. **Binary fission:**



Ex. Amoeba, bacteria, some algae

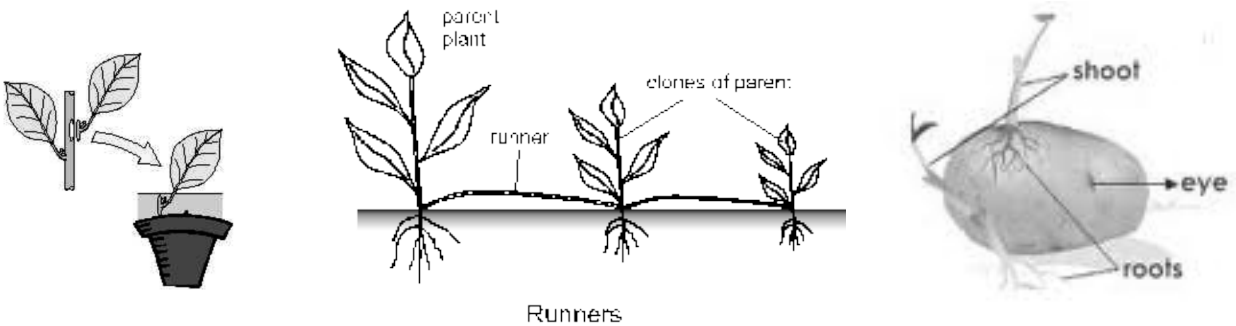
b. **Spores:**



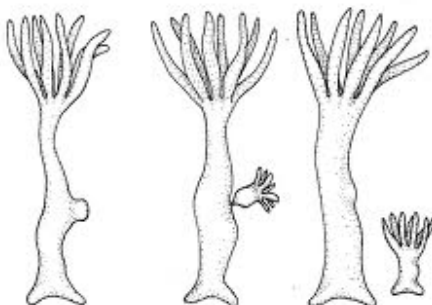
Ex. Mushrooms (fungi), moulds, ferns, some algae

**Zoospores** differ from regular spores in that they move using a tail-like \_\_\_\_\_

c. **Vegetative growth:** plant “cuttings”, bulbs (tulips), shoots (spider plant), runners (strawberries) and tubers (potatoes) can generate entire plants identical to the parent if the tissue contains cells called \_\_\_\_\_ (an area of cell division of unspecialized cells in the growing \_\_\_\_\_ of roots and stems)



d. **Budding:**



Ex. Hydra, yeast, sponges, coral

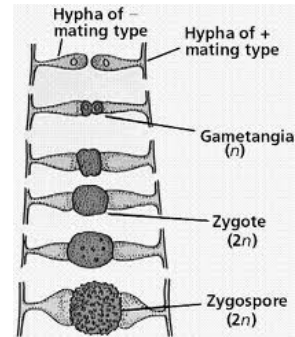


## 2. Sexual Reproduction:

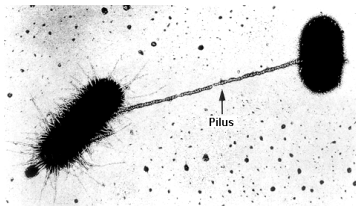
- advantages:
- disadvantages:

### a. Zygosporangia:

Ex. Fungi and mould



### b. Bacterial Conjugation:

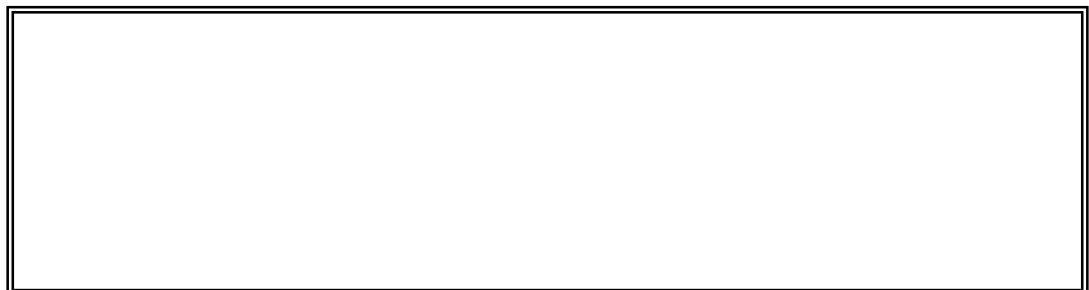


Ex. Bacteria

Conjugation increases variation but not numbers (binary fission will do that). May lead to antibiotic resistance!

- c. **Animals:** sexual reproduction may result from \_\_\_\_\_ fertilization (frogs, fish etc.) or \_\_\_\_\_ fertilization (humans, deer etc.). What are the benefits of internal fertilization over external?

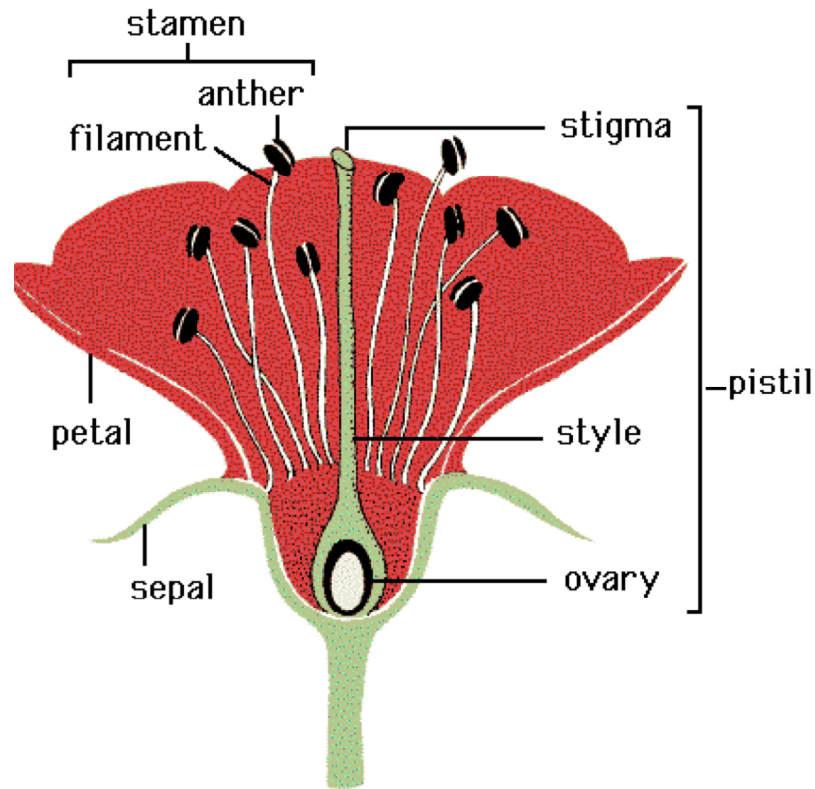
The adults (parents) produce \_\_\_\_\_ (sex cells, sperm and eggs) that unite at \_\_\_\_\_ to form a \_\_\_\_\_, which undergoes cell division to develop into a multicellular \_\_\_\_\_ which will eventually develop into an adult.



- d. **Plants:** plants can reproduce asexually (meristem cells, bulbs, shoots, runners, tubers etc.) or sexually by forming seeds (flowers, cones etc.)

Seed plants can be classified as \_\_\_\_\_, which produce cones or \_\_\_\_\_, which produce flowers.

Flowering plants typically have 4 kinds of flower parts: protective sepals, petals, male stamens and female pistils.



The male **stamen** (**filament, anther**) produces the \_\_\_\_\_ grains (sperm) and the female **pistil** (**ovary, style, stigma**) contains the \_\_\_\_\_ (eggs). These cells (sperm and eggs) are called \_\_\_\_\_.

How does **pollination** (fertilization) occur?

Differentiate between **self-** and **cross-pollination**.

What is the advantage of cross-fertilization to the species?

## Reproductive Strategies Review

Matching: Use a straight line to match and join the correct term in column B with the description in column A.

A	B
1. an asexual reproductive structure of flowering plants	spore
2. unspecialized cells in the tips of roots and stems	zoospore
3. reproductive cell found in mould	clone
4. method of asexual reproduction used by bacteria	meristem
5. how yeast reproduces	bulb
6. identical offspring produced from a single cell or tissue	binary fission
7. female reproductive structure of a flower	budding
8. asexual spores produced by the alga <i>Chlamydomonas</i>	pistil

9. Complete each statement with the correct term.

(a) Traits that are passed on from one generation to the next are said to be \_\_\_\_\_.

(b) Bread mould can reproduce sexually by forming structures called \_\_\_\_\_.

(c) Frogs reproduce by \_\_\_\_\_ fertilization, and deer reproduce by \_\_\_\_\_ fertilization.

(d) One bacterial cell transfers genetic material to another bacterial cell in a process called \_\_\_\_\_.

(e) An advantage of \_\_\_\_\_ reproduction is that the offspring inherit a combination of traits from two parents.

10. Match the following parts of a flower on the left with the appropriate descriptions on the right. There is one extra description.

___ embryo	A. contains egg
___ fruit	B. develops from wall of ovary
___ ovary	C. female reproductive organ of flower
___ ovule	D. first cell of growing plant
___ pistil	E. male reproductive organ of flower
___ stamen	F. multicellular organism during early development
___ stigma	G. part of pistil that receives pollen grains
___ zygote	H. structure of flowers in which ovule is produced
	I. first leaf or more of first pair of leaves developed by embryo

11. Provide one differences between spores and zoospores.

12. Provide one differences between spores and zygospores.

13. Label the parts of a lily flower in the following photograph.



## Topic 4 – Wearing Your Genes

### Genetics:

Our **traits** (characteristics) are controlled by sections of DNA called \_\_\_\_\_, which *usually* come in pairs, one from mom and one from dad. Different forms of each gene are called \_\_\_\_\_. For example, ear lobes can appear attached or unattached to our faces depending on which alleles you inherited.

Differentiate between **heritable** and **non-heritable characteristics**. Provide examples.

Differentiate between **continuous** and **discrete variations**. Provide examples.

Differentiate between **pure bred** (RR, rr) and **hybrid** (Rr).

**Complete dominance** (dominant and recessive alleles):

**Incomplete dominance:**

**Punnett Squares:** a diagram that is used to predict the outcome of a particular cross or breeding experiment.

1. Attached ear lobes (e) are recessive to unattached or free lobes (E). A woman with attached lobes marries a man who is purebred for free lobes. Predict the outcomes for their children.
2. Having dimples (D) is dominant to not having dimples (d). If a couple both have dimples and their first child does not, what is the chance that their second child will have dimples?
3. Normal skin pigmentation (A) is dominant to albinism (a). If a man with no family history of albinism marries a normal pigmented woman whose mother was an albino. What is the probability of them producing an albino child?
4. The ability to roll your tongue is dominant (T) to not being able to roll your tongue (t). Both Mr. and Mrs. Ferrige can roll their tongue but one of their daughters cannot. Determine the alleles of Mr. and Mrs. Ferrige.
5. Snapdragon flowers can be red (FF), pink (Ff) or white (ff). If two pink snapdragon plants are cross-pollinated, what would be the colors of the offspring and in what proportions?

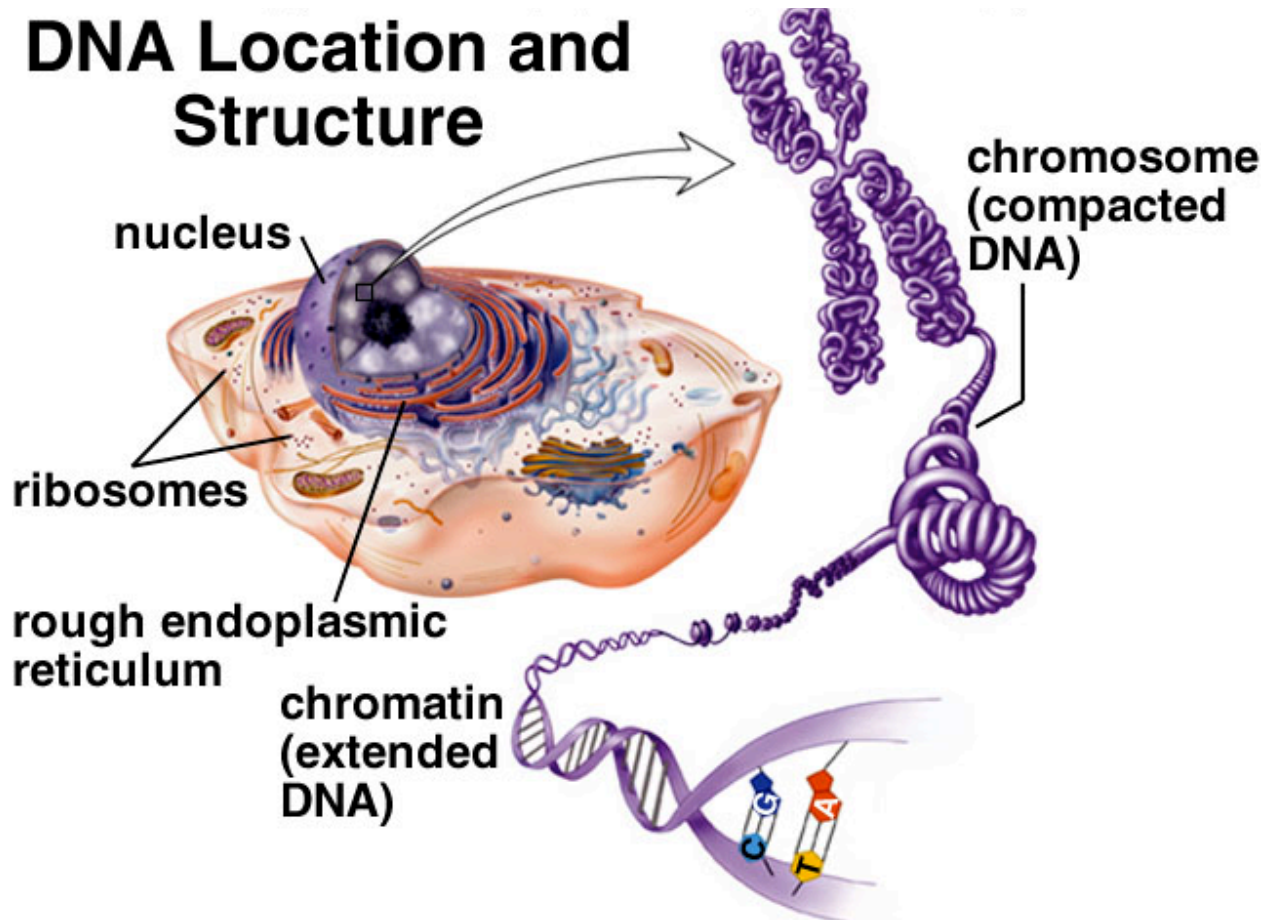
Note: the dominant trait is not always the most common trait. For example, the majority of Swedes are blue-eyed and blonde. Polydactyl (6 fingers) is a dominant trait but not that common.

Note: genetics influence behavioural traits (characteristics).

Our traits are not always a matter of genetics. Some variations in individual organisms result from interactions with the environment. Provide three examples of how nurture (the environment) affects nature (heredity):

\_\_\_\_\_ are changes to our genetic information caused by \_\_\_\_\_ (X rays, ultraviolet light, chemicals etc.). These changes are not always negative. In order for you to pass one of these changes onto your children, it must be present in your \_\_\_\_\_.

### Topic 5 - When Plans Change

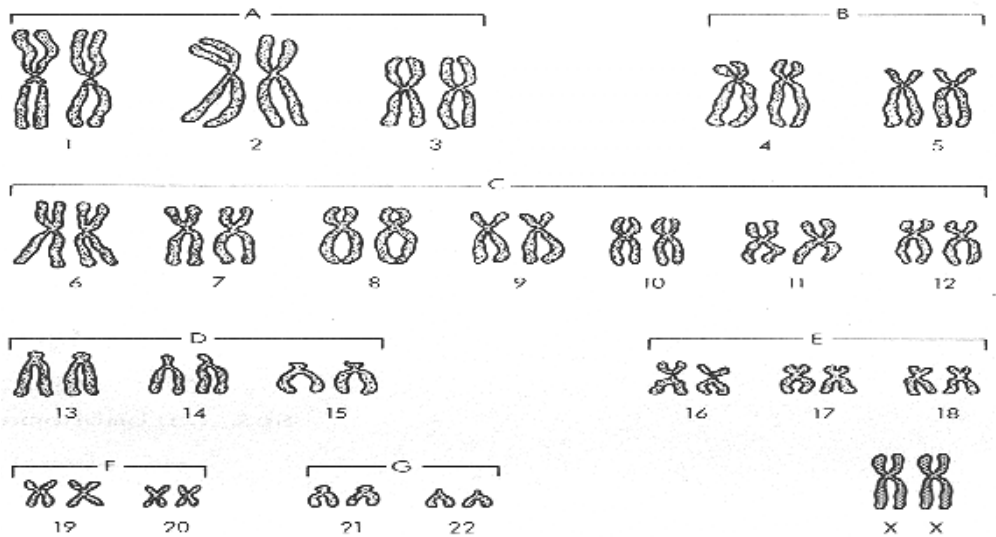


Our traits are encoded in our DNA, which is located in the \_\_\_\_\_ (control center) of the cell.

# Chromosomes > Genes > DNA

## Chromosomes:

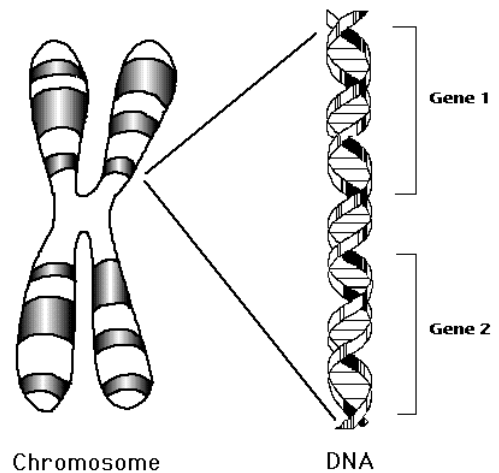
Human body cells (**somatic cells**) each have \_\_\_\_\_ chromosomes that come in pairs (one from mom and one from dad).



Our **gametes** have \_\_\_\_\_ chromosomes because we pass on one chromosome from each pair.

Sometimes mistakes happen and we pass on a different number!

## Genes:



## DNA:



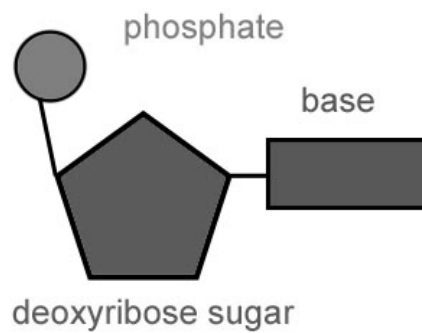
### **Movie: Cracking the Code**

1. In terms of genetics, how do you compare with a banana?
2. What contains the secret of life?
3. In terms of genes, how do you compare to a fruit fly?
4. What and how many molecules make up the steps of a DNA ladder?
5. What 4 letters compose the DNA code?
6. How do you compare in terms of DNA with the person next to you?
7. What is the purpose of the Human Genome Project (HGP)?
8. What percent of your DNA are actually active genes?
9. What increased the speed of the HGP?
10. In the geneticist's analogy of a parts list, what do we have and what are we missing?
11. What was the young boy Hayden suffering from and what does it do to the brain?
12. What is the cause of Hayden's disorder?
13. How is this disorder passed on to children?
14. What does the HGP hope to offer to parents like Haydens?

## The Structure of DNA

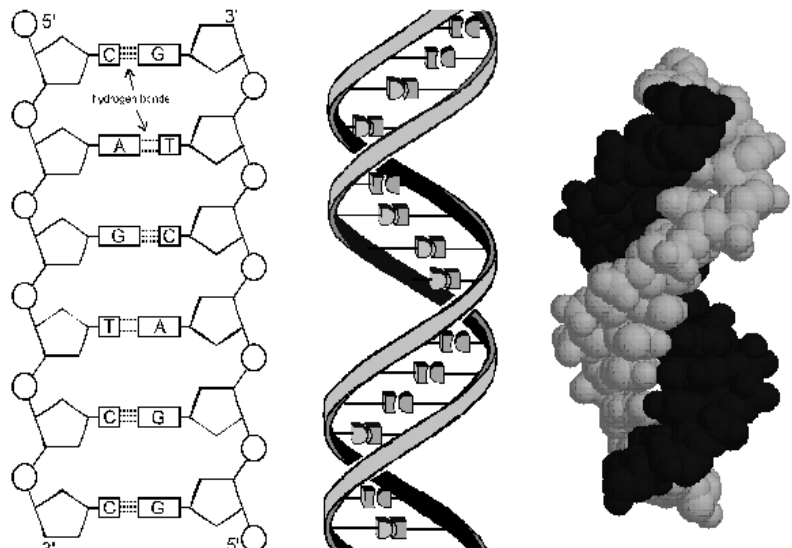
The basic building block of DNA is called a \_\_\_\_\_ which is composed of:

- 1.
- 2.
- 3.



Determined by James Watson and Francis Crick, the structure of DNA can be compared to a twisted ladder:

- 1.
- 2.
- 3.



**Base Pairing Rule:** nitrogen bases always pair in complementary pairs; adenine (A) always pairs with thymine (T) and guanine (G) always pairs with cytosine (C).

ex. Determine the complementary strand of DNA:

A T G C A G C A T G C

## DNA Extraction Lab

Objective: To extract DNA from a banana.

Procedure: quite informal – just listen for your step-by-step instructions.

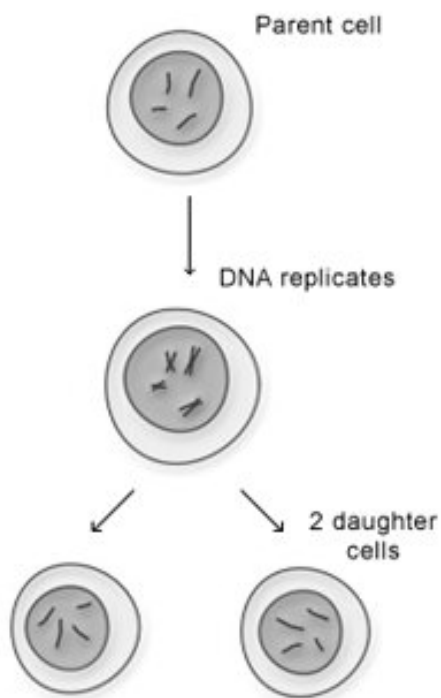
Laboratory Application Questions:

1. Why did the material need to be ground up?
2. Why was the dishwashing detergent added?
3. What does the alcohol do? Why does the DNA rise to the top after adding alcohol?
4. Why can't you see the double helix?
5. What part of the cell did the DNA come from?

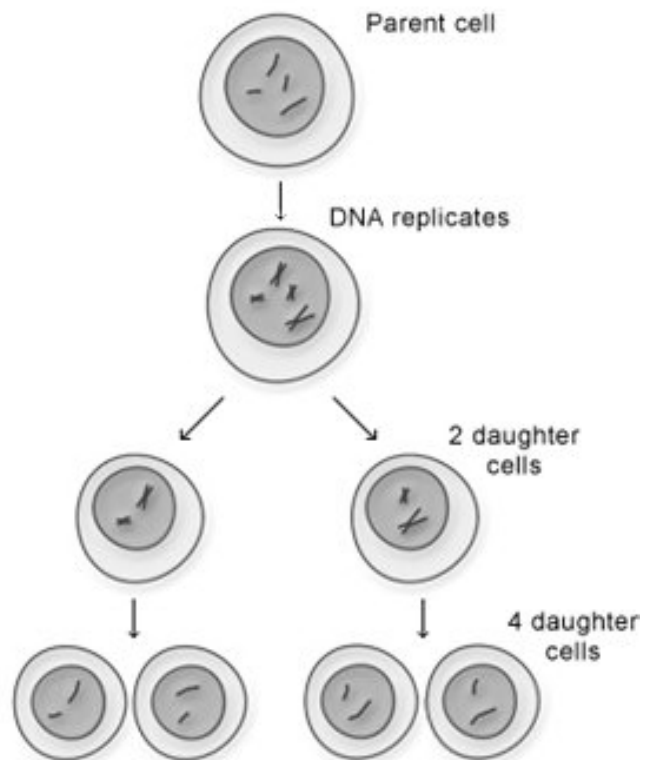
## Cell Division

When cells reproduce, so must the chromosomes. There are two basic types of cell division in our bodies.

### 1. Mitosis

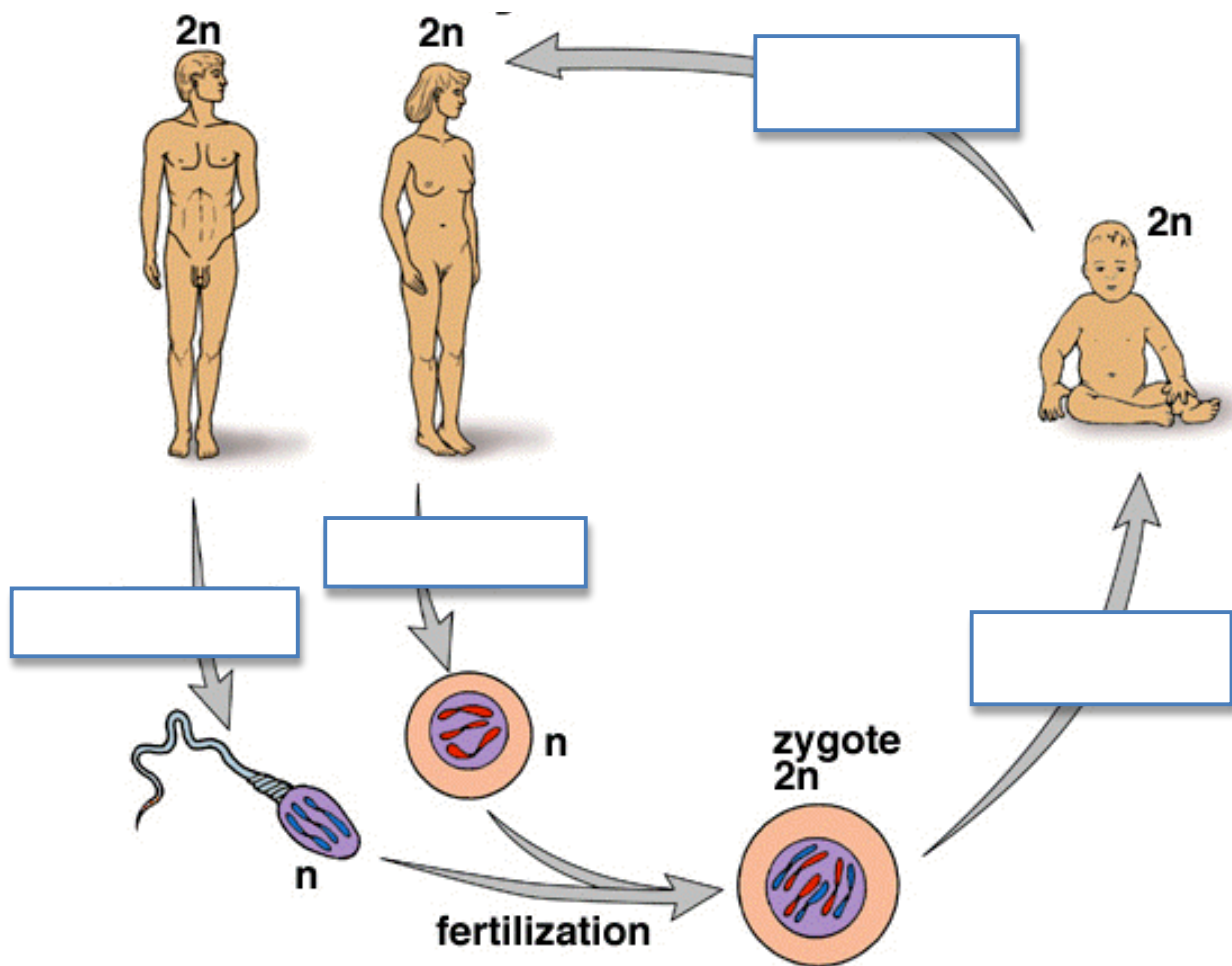


### 2. Meiosis



Type of cell division	<b>Mitosis</b>	<b>Meiosis</b>
Purpose		
Type of cells involved		
Number of divisions		
Number of chromosomes in daughter cell		
How does the daughter cell compare to the mother cell?		
General diagram of process		

Indicate mitosis and meiosis on the following diagram:



Males have the sex chromosomes \_\_\_\_ and females have \_\_\_\_, therefore it is the \_\_\_\_\_ who determines the sex of the child.

Explain how sexual reproduction promotes variation.

What are the benefits of this variation?

## Technology and Variation

### Genetic Engineering:

### Biotechnology:

Provide examples of biotechnology in medicine:

Provide examples of biotechnology in food production:

Note: Native peoples practiced an *early* form of biotechnology when they gathered seeds from the biggest and healthiest corn plants.

### Transgenic (GM):

## Topics 3–5 Review

### Definitions

1. clone
2. discrete variation
3. mutagen
4. genetic engineering

### True or False

_____	5. Binary fission is a primitive form of sexual reproduction.
_____	6. Flowering plants can reproduce sexually and asexually.
_____	7. Tongue rolling is an example of continuous variation.
_____	8. Genetic mutations are always passed on to the next generation.
_____	9. A human gamete has twice the number of chromosomes of a human body cell.
_____	10. Sexual reproduction requires more energy than asexual reproduction.
_____	11. In general, blue eyes are dominant to brown eyes.

### Fill in the Blanks

12. Complete each statement with the correct term.
- (a) Angiosperms differ from other seed plants because they produce \_\_\_\_\_ inside \_\_\_\_\_.
  - (b) In animals, the \_\_\_\_\_ and egg join to form a \_\_\_\_\_ in a process known as \_\_\_\_\_.
  - (c) When mixed with a dominant trait, a \_\_\_\_\_ trait does not show up in the offspring.
  - (d) Changes to the DNA, the genetic material, are called \_\_\_\_\_.

## Multiple Choice

13. In angiosperms, the gametes are carried in the:
- (a) ovary, anther, and style
  - (b) ovary, anther
  - (c) filaments, anthers, pistils
  - (d) pollen grains, ovules
14. Two requirements must be met in order for sexual reproduction to succeed:
- (a) both the male and female gametes must arrive at the same place at the same time
  - (b) the zygote must receive enough food and moisture
  - (c) the offspring must be clones of the parents
  - (d) both (a) and (b) above
15. Which of the following types of human traits is influenced by both “nature” and “nurture”?
- (a) ABO blood group
  - (b) body weight
  - (c) attached or unattached earlobes
  - (d) bent-back thumb or straight thumb
16. Which of the following human traits cannot be inherited?
- (a) certain behaviours
  - (b) scars
  - (c) blue eye colour
  - (d) pointed hairline
17. In the formation of the gametes, cell division
- (a) occurs once
  - (b) occurs twice
  - (c) occurs four times
  - (d) occurs before the DNA is replicated
18. Transgenic mammals are used to produce human proteins because
- (a) transgenic animals cannot pass on the genes for human proteins to their offspring
  - (b) the proteins can be collected in the animal’s milk
  - (c) animals can produce large, complex proteins
  - (d) both (b) and (c) above

## Short Answer

19. Indicate whether the following methods of reproduction are asexual (A) or sexual (S).
- \_\_\_ (a) budding
  - \_\_\_ (b) vegetative growth in plants
  - \_\_\_ (c) conjugation in bread mould to form zygospores
  - \_\_\_ (d) seed formation
  - \_\_\_ (e) binary fission



20. Describe one way in which genetic engineering is used in food production.
21. Explain why cross-pollination produces more genetic variation in the offspring than self-pollination produces.
22. Why might internal fertilization be a useful adaptation for life on land?
23. Why might scientists use clones to learn about inherited traits?
24. Describe two advantages and one disadvantage of asexual reproduction using at least one type of organism as an example.
25. What are nucleotides composed of?



## **Topic 6 - The Best Selection**

Who or what decides which organisms gets to live (and reproduce) in an ever-changing environment?

### **1. Artificial Selection:**

Provide specific example of selective breeding in agriculture.

Artificial selection can be sped up using “high-tech” biotechnologies such as cloning, artificial insemination, in vitro fertilization, and genetic engineering.

### **2. Natural Selection:**

The diversity found within the Galapagos Islands led Charles Darwin to develop his theories on natural selection which are based on 5 criteria:

#### **1. Overproduction:**

#### **2. Competition:**

#### **3. Variation:**

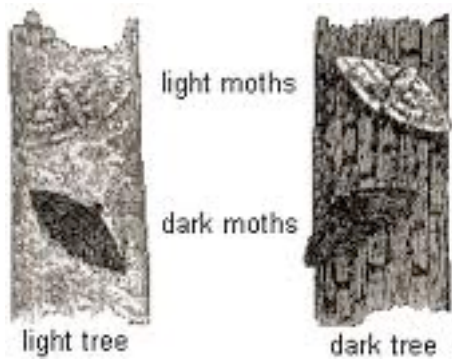
#### **4. Survival of the fittest:**

#### **5. Speciation:**

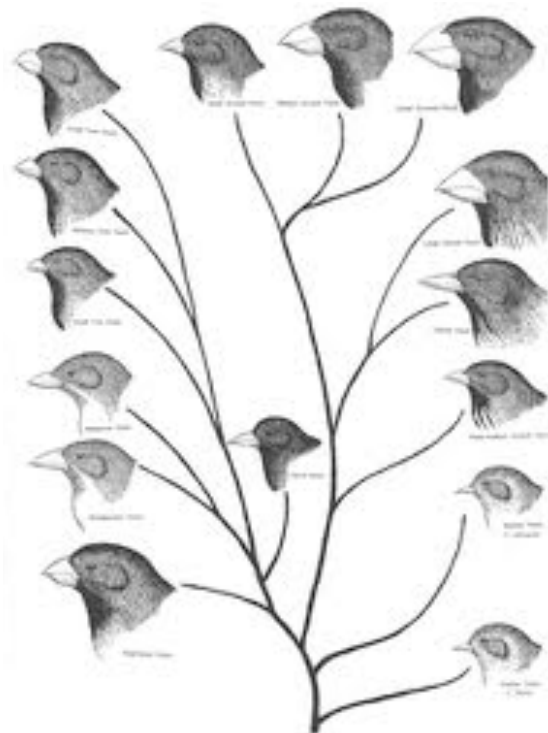
Explain the following “classic” examples of natural selection:

a. Pesticide resistance insects:

b. Peppered moth:



c. Galapagos finches:



## Topic 7: The Sixth Extinction

**Endangered:**

**Extinction:**

**Extirpation:**

In addition to being an excellent example of extirpated species, the grizzly bear may also be considered an example of a **bioindicator species**. What does this mean?

Natural causes of extinction and extirpation:

Human causes of extinction and extirpation:

EXTINCTION/EXTIRPATION = LOSS OF \_\_\_\_\_

## Topic 8 – Pains and Gains

Identify four objectives that a zoo may have:

- 
- 
- 
- 

Other methods of preserving and conserving biodiversity include:

Seed banks:

Ex.

Global treaties:

Ex.

Protected areas:

Ex.

Restoration of ecosystems and species:

Controlling the introduction and spread of exotic species:

## Topics 6–8 Review

### Fill in the Blanks

Complete each sentence with the correct term.

1. Distinctive dog breeds have been produced through a technique known as \_\_\_\_\_.
2. Darwin's theory of \_\_\_\_\_ explains how species evolve.
3. The disappearance of the grizzly from all of Mexico and most of the United States is an example of \_\_\_\_\_.
4. \_\_\_\_\_ species may be used to monitor the effect of human activities on an environment.
5. In order to preserve the genetic diversity of plants, the Royal Botanic Gardens in London, England runs a \_\_\_\_\_.

### True or False

In the space provided, indicate whether each statement is true (T) or false (F). If the sentence is false, rewrite it to make it true.

- \_\_\_\_\_ 6. All organisms produce fewer offspring than can possibly survive.

\_\_\_\_\_

- \_\_\_\_\_ 7. Purebred dogs are usually healthier than mutts or mongrels.

\_\_\_\_\_

- \_\_\_\_\_ 8. There are more birds than any other type of animal.

\_\_\_\_\_

- \_\_\_\_\_ 9. Scientists estimate that 99% of all species in the history of Earth no longer exist.

\_\_\_\_\_

- \_\_\_\_\_ 10. People can influence natural selection by causing changes in the environment.

\_\_\_\_\_

### Short Answers

Answer the following questions using complete sentences.

11. Describe the role of human activities in the extinction of one animal species since the 1600s.

\_\_\_\_\_  
\_\_\_\_\_

12. (a) Identify a major concern about captive breeding programs to preserve endangered species.

\_\_\_\_\_  
\_\_\_\_\_

(b) Why is this a concern?

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(c) Describe a solution to the problem.

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13. How can we conserve plant and animal species in the wild?

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14. Describe how researchers have developed special wheat varieties.

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Long Answers

15. How does genetic variation within a species allow natural selection to occur?

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16. During Earth's history, many species have evolved and adapted to changing environments. Why might some species have difficulty adapting to changes in the environment caused by human activities?

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17. Describe how the human population explosion is affecting biological diversity.

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## Unit A Review – I Can Statements

### I can: (Topic 1)

- ☐ Define species, population, community, and ecosystem
- ☐ Define biodiversity and explain why tropical areas like those near the equator have more
- ☐ Describe how scientists classify organisms
- ☐ Give examples of variation within a species
- ☐ Give examples of variation between species
- ☐ Describe structural and behavioral adaptations and provide examples of each
- ☐ Explain the value of biodiversity

### I can: (Topic 2)

- ☐ Define niche and provide examples of both broad and narrow niches
- ☐ Explain the difference between a generalist and a specialist and provide an example of each
- ☐ Identify the advantages and disadvantages to being a specialist or a generalist
- ☐ Explain population interdependencies such as inter-specific competition, mutualism, commensalism and parasitism and provide examples of each
- ☐ Describe how an organism can avoid competition in an ecosystem

### I can: (Topic 3)

- ☐ Explain the general difference between the processes of asexual and sexual reproduction
- ☐ Provide advantages and disadvantages for both asexual and sexual reproduction
- ☐ Describe binary fission and give an example
- ☐ Use an example to describe how spore production is a type of asexual reproduction
- ☐ Describe vegetative growth in plants using the term meristem and give an example
- ☐ Describe budding and give an example
- ☐ Use an example to describe how zygospore production is a type of sexual reproduction
- ☐ Describe how bacterial conjugation promotes variation
- ☐ Describe sexual reproduction in animals using the terms gametes, fertilization (internal and external), zygotes, embryo and adults
- ☐ Describe sexual reproduction in plants using the terms stamen (filament and anther), pistil (stigma, style, and ovary), pollen, ovule, pollination, and pollen tube and zygote
- ☐ Differentiate between self and cross-pollination
- ☐ Give an example of organisms that show both sexual and asexual reproduction

I can: (Topic 4)

- Differentiate between genes and alleles and provide examples of each
- Differentiate between heritable and non-heritable characteristics provide examples of each
- Differentiate between continuous and discrete variations and provide examples of each
- Differentiate between purebreds and hybrids and provide examples of each
- Differentiate between complete and incomplete patterns of inheritance and provide examples of each
- Differentiate between dominant and recessive traits
- Explain how an offspring may or may not express traits from parents (Punnett squares)
- Provide examples of how the environment can influence genetic traits (nature vs. nurture)

I can: (Topic 5)

- Define chromosomes, genes and DNA
- Explain how chromosomes, genes and DNA are related
- Differentiate between a human somatic cell and a gamete and identify the number of chromosomes each
- Explain the Watson and Crick model of DNA
- Explain the process of mitosis
- Explain the process of meiosis
- Describe the process of biotechnology and provide examples

I can: (Topic 6)

- Define artificial selection and provide an example
- Define natural selection and explain Darwin's theory of natural selection

I can: (Topic 7)

- Differentiate between extirpation and extinction
- Identify natural causes of extirpation and extinction
- Identify man-made causes of extirpation and extinction

I can: (Topic 8)

- Identify advantages and disadvantages of ways we can locally and globally stop the decrease of biological diversity: zoo's, seed banks, protected areas, global treaties