

Science Nine

Module One:

Biological Diversity

Name:

Date Received:

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Grade:

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Biological Diversity

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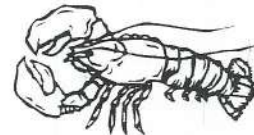
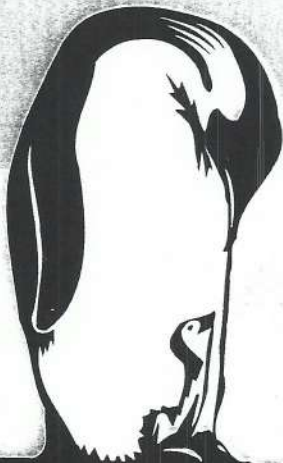
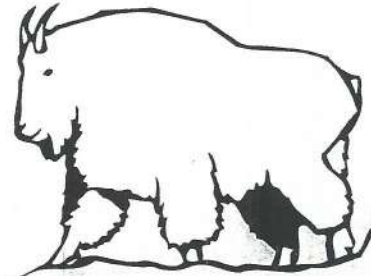
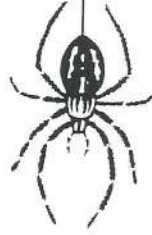
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UNIT A

NAME

Lacombe Outreach School



Part A: What is Biodiversity?

Biodiversity comes from the words "biological" (meaning *about living things*) and "diversity" (meaning *variety*). Scientists study biodiversity by looking at two main things:

Diversity Between Species

Diversity *between* species means how different groups (species) of plants and animals are different.

Diversity Within Species

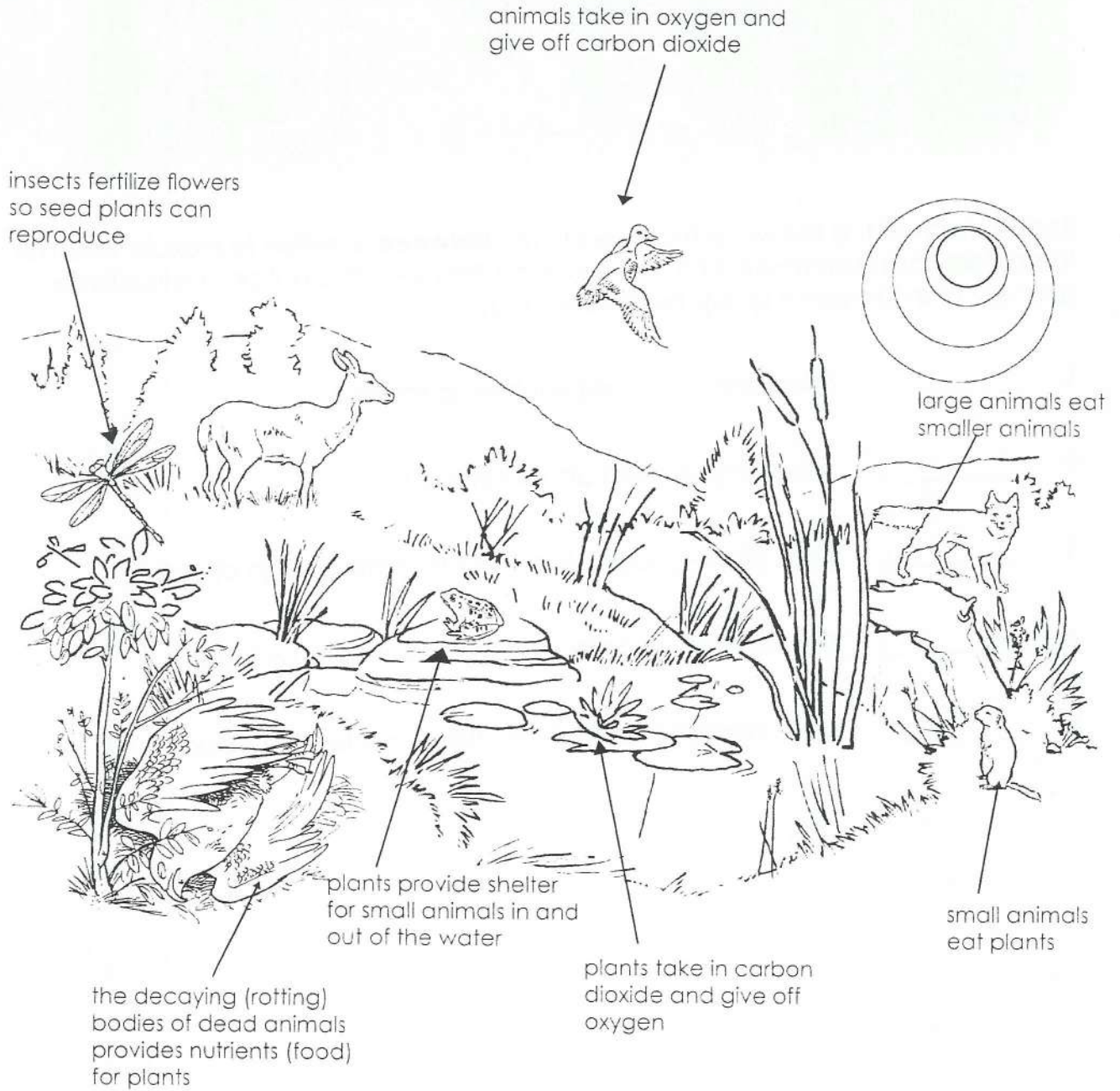
Diversity *within* species means how individuals in one group (species) are different.

Beside each of the following examples, write **between** or **within** to explain whether the differences described are between living things in different groups (between species) or in the same group (within species).

1. _____ Mice are usually smaller than gophers.
2. _____ Some dogs have ears that stand up.
3. _____ Lillies (flowers) can be red, white, pink, orange or yellow.
4. _____ Fish lay eggs in water and turtles lay eggs on land.
5. _____ Male ducks have bright feathers and female ducks don't.

Part B: How do species live together in an ecosystem?

Study the scene and then use the words on the next page to complete the passage in a way that makes sense.



Use the words in the box to fill in the blanks in the passage in a way that makes sense.

balance
fertilizing
take
shelter

plants
ecosystem
give

shelter
interdependently
animals

oxygen
same
food

food
nutrients
survive

Ecosystems are filled with _____¹_____ and _____²_____ that live together
_____³_____ (they depend on one another). Plants
keep the animals alive by providing _____⁴_____, _____⁵_____ and
_____⁶_____. Animals keep the plants alive by providing _____⁷_____ (food)
that go into the soil when they die and by _____⁸_____ plants so
they can reproduce. Not all animals eat the _____⁹_____ things, so the
_____¹⁰_____ doesn't get emptied out of those things. In this way,
ecosystems are a delicate (easily hurt) _____¹¹_____ of living things that
_____¹²_____ from one another and _____¹³_____ back to each other. Ecosystems can
only _____¹⁴_____ like this because the living things are all using different parts
of the environment for _____¹⁵_____ and _____¹⁶_____.

Part C: How are similar things different?

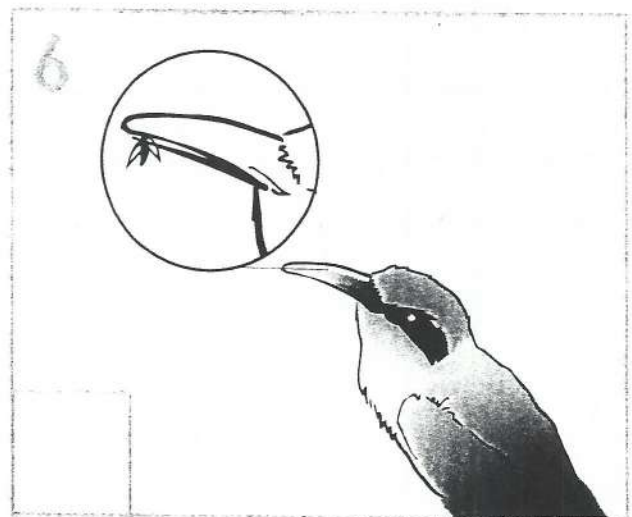
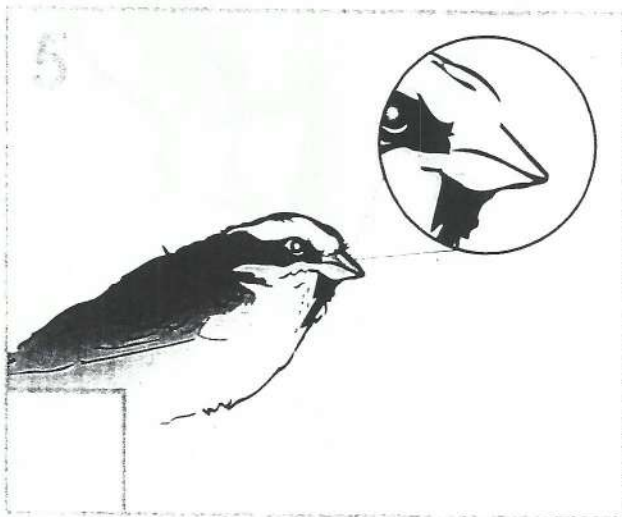
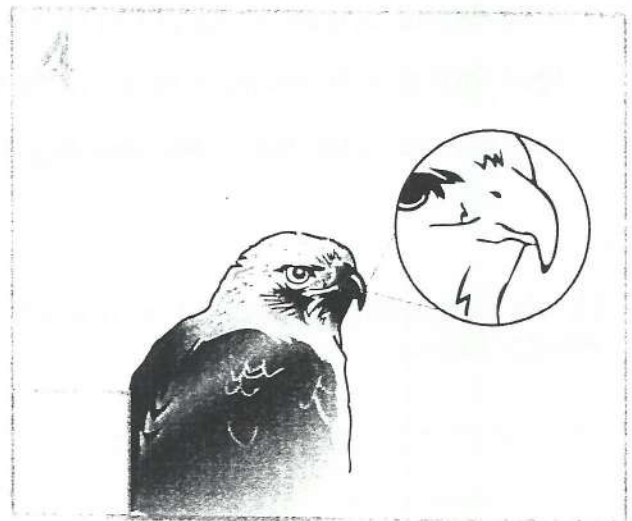
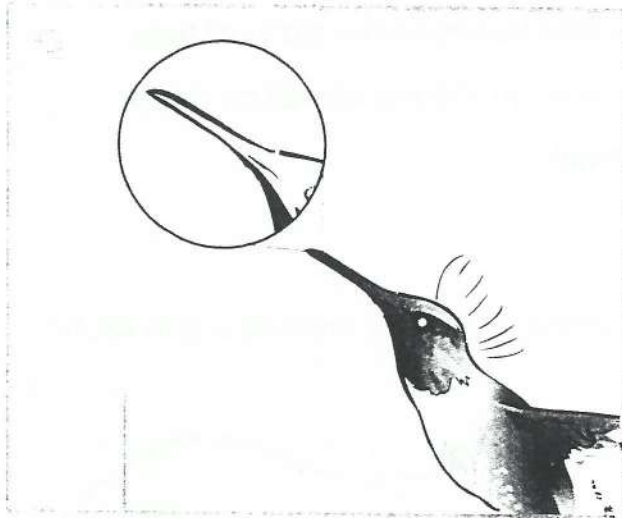
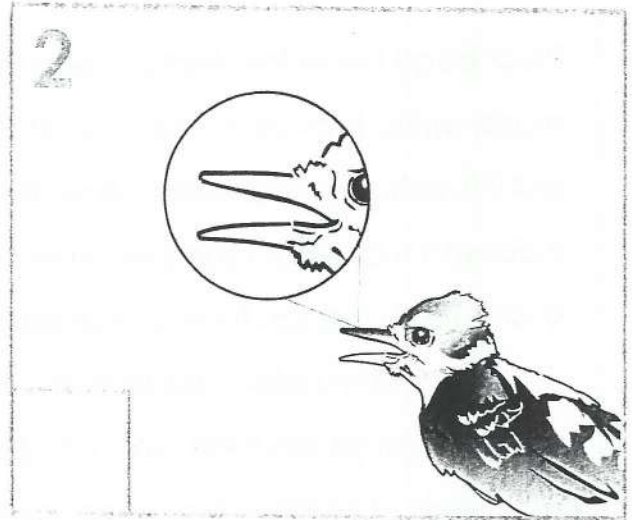
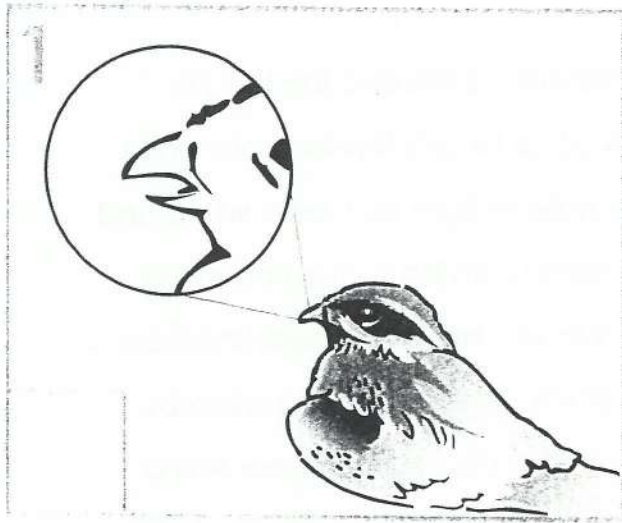
Variation is a word used to describe the small differences between living things.

For example, if you were to study the bird life in a local park, you would notice that there are many different kinds of birds all living in the same area. These birds have probably all developed different ways of getting food and building shelters that make it possible to live in the same small area and not run out of the things they need to survive.

Read the following descriptions of bird beaks and then use them to help you identify the birds on the next page.

- A Birds that drink nectar (sweet syrup) from inside flowers usually have beaks that curve downwards and are needle-like (very thin).
- B Larger, carnivorous (meat-eating) birds have beaks that look like hooks and are serrated (jagged) so they can tear apart flesh.
- C Birds that eat insects out of the air usually have wide, slightly flat beaks that can open wide for scooping.
- D Birds that snatch insects from the ground and from plants usually have beaks shaped like tweezers that are good at "pinching."
- E Birds that eat seeds and nuts usually have short, thick, strong beaks to crack open the shells.
- F Birds that dig insects out of the trunks of trees usually have medium-length, sharp, strong beaks.

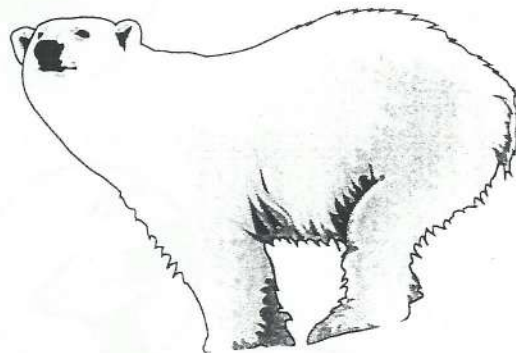
Write letters (in the boxes) from the beak descriptions on page five that match each of the birds below.



Polar Bears

Polar bears live in the Arctic where the weather is cold and the land is mostly white (covered in snow and ice). A polar bear's top fur looks white but it is actually clear and hollow. The hair reflects light so it looks white and it doesn't mat (stick together) so ice and water can be shaken off easily. Underneath the top fur is a thick coat of "woolly" hair that keeps the bear warm. The skin under a polar bear's fur is black. The dark colour absorbs light and keeps the bear warm. Underneath the skin, a polar bear has a thick layer of blubber that keeps it warm on land and when it swims in the cold Arctic ocean. Polar bears have thick hair between the pads of their feet that stop them from freezing as they walk on the ice as well as sharp, curved claws to stop them slipping on the ice.

List **six** adaptations polar bears have that make it easier for them to live in Arctic environments.



Part D: How do living things reproduce?

Reproduction is a word used to explain how living things make more of themselves (have babies!). There are two main kinds of reproduction:

Sexual

The key to sexual reproduction is that it "takes two." Sexual reproduction usually involves a male and a female of the same species.

Asexual

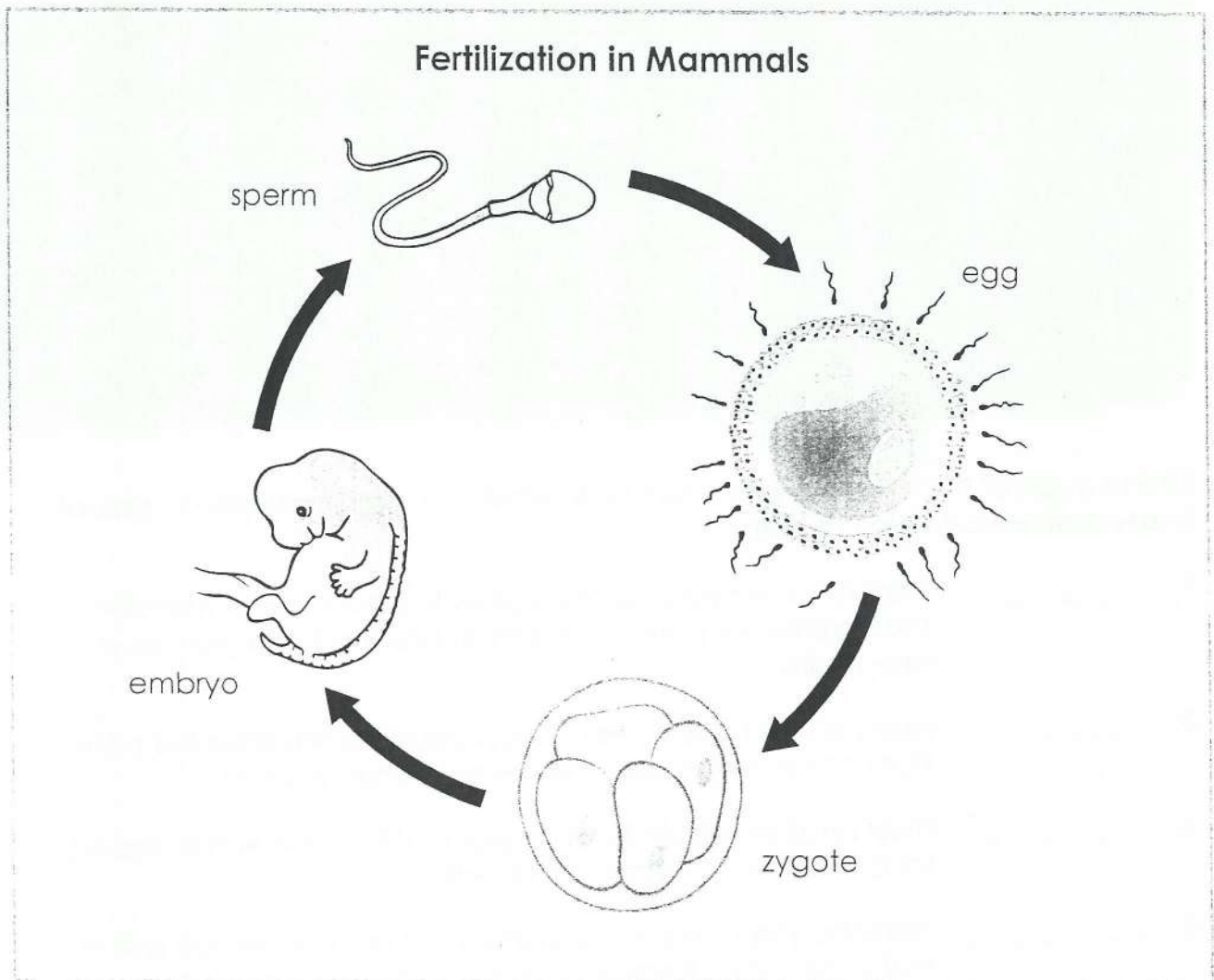
The key to asexual reproduction is that it can be done alone. Living things that reproduce asexually don't usually have a male and female in the species because they are able to reproduce by themselves without the help of another plant or animal of the same species.

Some rare plants and animals are able to reproduce both sexually and asexually. This gives the species a greater chance of surviving even if environmental conditions change.

Beside each of the following examples, write whether it is an example of **sexual** or **asexual** reproduction or **both**.

1. _____ most kinds of hydra (jellyfish) grow tiny buds out of their skin that eventually (after a long time) break off and grow as a new hydra
2. _____ many plants have flowers that produce seeds after the pollen from one plant fertilizes the flower in another plant
3. _____ most kinds of female fish lay eggs that lie in the water waiting for a male fish to swim by and fertilize
4. _____ amoeba (one-celled organisms that live in the water) split in half exactly and then grow as two separate organisms
5. _____ mushrooms produce spores and release them into the air to float away and grow as new mushrooms
6. _____ many trees grow suckers (long arms) under the ground that poke up to sprout a new tree
7. _____ female mammals carry eggs inside that must be fertilized by the sperm of a male mammal of the same species in order to grow into a new animal
8. _____ some plants are able to produce seeds when their flowers are fertilized or runners (long arms) that grow along the ground sprout new plants

Study the diagram and then complete the passage below in a way that makes sense.



The female has 1 inside that are fertilized by 2 from the male of the species. Once the sperm penetrates (sticks into) the egg, a 3 is formed. The cells in the 4 duplicate by splitting in half to make exact copies. Soon, an 5 grows that is a tiny version of the parent organisms.

Part E: How do living things start to vary (become different)?

Differences in living things in the same group (species) fit into two different categories:

Discrete Variations

Differences where a living thing can be described as being one way or another

Continuous Variations

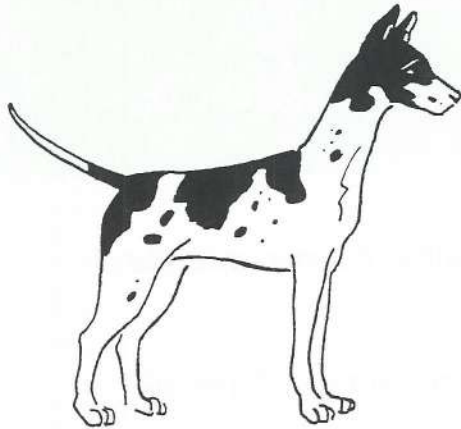
Differences where a living thing can be described as having any one of a range of possible characteristics

Beside each of the following examples, write whether it shows **discrete** or **continuous** variation.

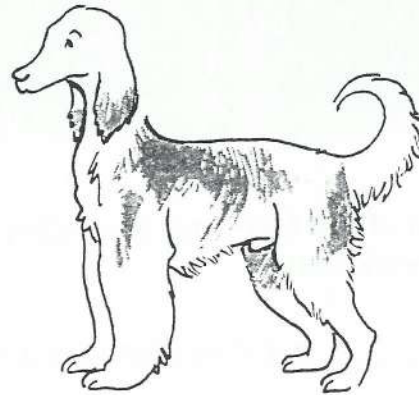
1. _____ Adult humans grow to between 1.2m and 2.1m tall.
2. _____ Humans have earlobes that are either attached at the bottom or not.
3. _____ Most humans have blue, brown, green or hazel coloured eyes.
4. _____ Humans have eyebrows that either grow together or grow separately.
5. _____ Humans naturally clasp (put together) their hands with either the right or left thumb on top.
6. _____ Humans get their molars (back teeth) anywhere between the ages of 6 and 25.
7. _____ Humans have between 90,000 and 140,000 hairs on their head.

Part F: How do living things pass on their characteristics?

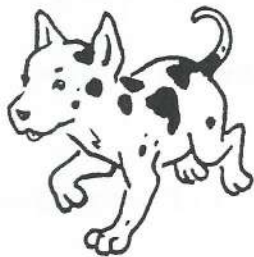
Look carefully at the characteristics of the "parent" dogs compared to their puppies, then complete the activity on the next page.



Mom



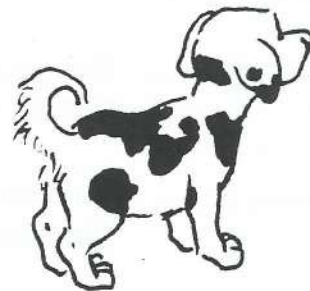
Dad



Rex



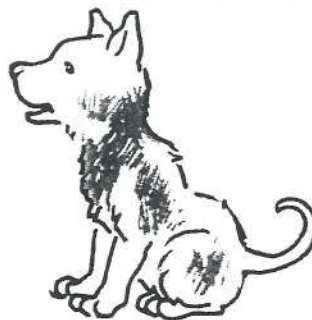
Daisy



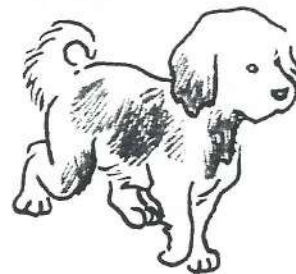
Hank



Buddy



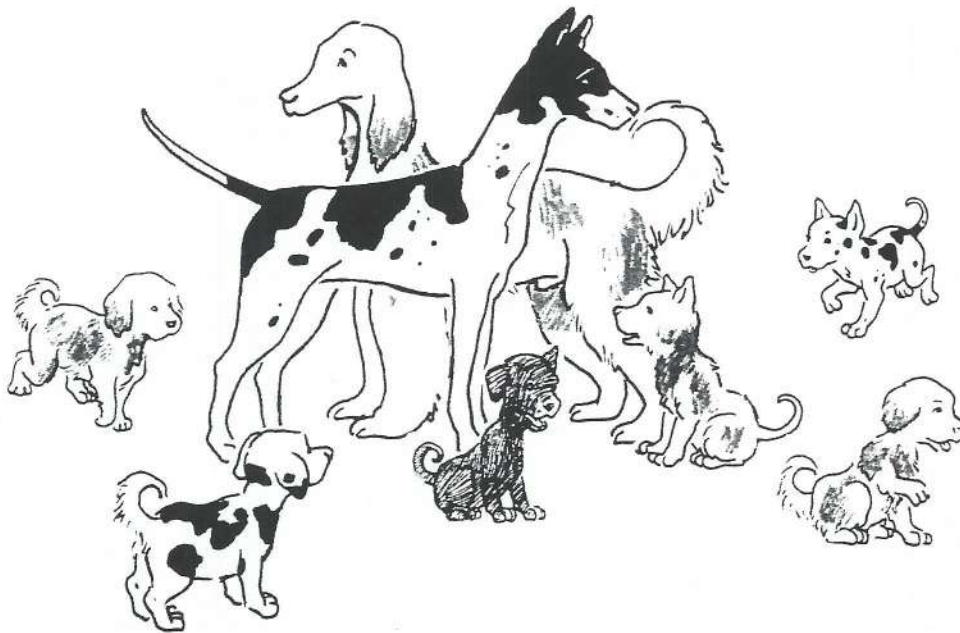
Max



Molly

Complete each of the following sentences by writing in the name of a puppy from page 10 that best fits the description of which parent they inherited their ears, fur and tail from.

1. _____ inherited all of the mother's characteristics but none of the father's.
2. _____ inherited all of the father's characteristics but none of the mother's.
3. _____ inherited an equal amount of each parent's characteristics.
4. _____ inherited some of each parent's characteristics but more of the father's than the mother's.
5. _____ inherited some of each parent's characteristics but more of the mother's than the father's.
6. _____ didn't obviously inherit either parent's features.



The Nature vs. Nurture Debate

Some characteristics can be inherited (copied from one or both parents) but other characteristics are a result of what happens to us in life. There is often a lot of debate (difference of opinion) about whether certain characteristics or behaviours are a result of nature (heredity) or nurture (environment or experience).

Complete the following chart to show where you think many of your characteristics came from—either parent, or from the environment you live in or the experiences you have had. You can also complete this activity by interviewing someone else about their characteristics if you prefer.

From mother...	From father...	From environment or experiences...

Part G: How does heredity work?

Heredity (her-eh-di-tee)

Heredity is the passing on of characteristics from one generation (set of parents) to another (their offspring or kids).

Genes (jeens)

Genes are the tiny sections (parts) that make up chromosomes. Genes are responsible for passing on a specific characteristic from one generation to the next.

Chromosomes (kroh-ma-zohmz)

Chromosomes are the tiny strips of material stored in the nucleus of every cell that contain genes.

DNA

DNA stands for deoxyribonucleic acid and it is what genes and chromosomes are made of.

Use the information above to help you draw a diagram to show how genetic material (things related to heredity) are related. For example, what makes up what, what does what, etc.

Identify the advantages (good things) and disadvantages (bad things) about sexual and asexual reproduction by sorting the ideas from page 14 into the chart below. Add one idea of your own to each box.

Advantages of Sexual Reproduction

Disadvantages of Sexual Reproduction

Advantages of Asexual Reproduction

Disadvantages of Asexual Reproduction

Did You Know?
Genes can be either dominant or recessive. Dominant genes (the "stronger" ones) win out against the recessive genes (the "weaker" ones). Recessive genes only "win" when both parents pass along a recessive gene.

Independent Research
Learn more about dominant and recessive genes by researching how our parents' genes determine (decide) the colour of our hair or eyes. For example, blue eyes and blonde hair.

Part H: How do humans get involved with genetics?

You learned earlier in this unit about variation (changes) in species. There are two main ways that variation happens.

Natural Selection

When the characteristics of an organism changes (usually improves) over time to better fit with its environment (mutation).

Artificial Selection

When human beings use science and technology to help them control how organisms reproduce or the characteristics the offspring will have.

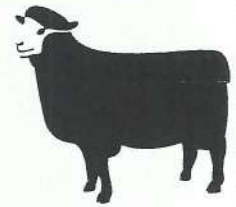
For the five statements below, indicate which is an example of natural selection; (N) and, which is an example of artificial selection (A).

1. _____ Birds' beaks grow to be better-shaped to catch or collect the food they eat.
2. _____ Different species of fish are cross-bred to try to produce offspring with new and unusual characteristics.
3. _____ Champion race horses are mated (helped to reproduce) in the hopes that the offspring will be another good runner.
4. _____ Only the fittest (strongest) of a species survives (without getting killed by predators) in the wild to later reproduce.
5. _____ Dogs have been bred (helped to reproduce) to create new species that are handsome and have good personalities.

Read each of the following passages and then write a personal response (your own opinions and feelings on the topics) on the next page.

Dolly the Sheep

Dolly the sheep was unlike any other mammal that has ever lived. She was an identical copy of her mother and had no father. She was a clone (exact copy of another creature) created by a group of scientists in Scotland. The scientists did this by performing surgery on sex cells (the kind that usually have only half of the necessary genetic material) so that the sex cells had a complete set that was exactly the same as the mother's. Once the surgery was complete, the egg cells contained a whole set of genes, just as they would if they had been fertilized normally. The eggs were then grown in a laboratory for a while before being implanted (put into the womb) into sheep that carried them to term, one of which ended in the successful birth of a lamb. The lamb was, as expected, an exact genetic copy, or clone, of the mother sheep. It took many tries and many animal deaths and deformities for the experiment to work and Dolly only lived a short life after all of that trouble.



Stem Cell Research

In the human body, different cells are specialized (have unique characteristics) to do different jobs. When cells first start to divide, a zygote grows into an embryo (see Part D), they are undifferentiated primitive cells (this means they are all the same and very basic). Stem cells have the unique ability to multiply (reproduce) and differentiate (change) into specialized cells. Using stem cells, researchers have been trying to grow specialized cells or tissues (groups of cells) that could be used to treat injuries or disease. Stem cell research is controversial (people think it's good and bad) because the best source of stem cells is human fetal tissue (the cells of unborn babies). Getting the stem cells destroys the embryo (prevents the unborn baby from living), which many see as morally wrong. Supporters of stem cell research feel that the possibility of a renewable source of replacement cells and tissues to treat things like Parkinson's and Alzheimer's diseases, spinal cord injury, stroke, burns, heart disease, diabetes, osteoarthritis, and rheumatoid arthritis makes the payoff (what we get out of it) worth the sacrifice (what we lose).

Seed Banks

Seed banks have been created for two main reasons:

- to try to preserve (keep) the biological diversity of plants, seeds from plants that are threatened with extinction (likely to die out) are collected and carefully stored
- to provide specific seeds to gardeners and farmers who want to grow unusual plants in specialized environments



One of the largest seed banks in the world is at the Royal Botanic Gardens in England. They only have samples of 10% of the world's plants that reproduce with seeds. Just imagine how many different species of plants must be out there!

Independent Project

Research and find out more about one of the following topics and present your findings to your class in a speech, poster, report or Web page.

1. Zoos originated as a form of entertainment. People loved to see and get close to exotic and dangerous animals. Over time, however, the purpose of zoos has changed. Many of today's zoos are dedicated to preventing species of animals from becoming extinct by helping them to reproduce and providing a habitat (somewhere for the animals to live).
2. Wildlife sanctuaries have been created on nearly every continent. They provide a natural space for animals to live and reproduce while being protected from hunters and other human threats (like pollution).
3. As natural habitat is destroyed by humans looking for more land to build homes, factories, etc., many animals are forced out of their homes. Many environmental organizations and environmentally-conscious companies have come up with strategies (detailed plans) and policies for making sure that human developments don't threaten the environment as much as they have done in the past.
4. Because of the warm, wet climate, tropical rainforests have more different varieties (kinds) of plants and animals than any other environment on Earth (the worse the weather, the fewer living things can survive in an area). New plants and animals are being discovered in the rainforests all the time—yet the rainforests are also being reduced (cut down) more every day.
5. Global treaties have been written and signed to protect endangered plants and animals. Five hundred species are identified for protection by CITES (Convention on International Trade of Endangered Species) and 180 countries have signed the Convention on Biodiversity.
6. Conduct further research into one of the topics on page 17.

Topic 1 - Biological Diversity and Survival

What does the term **biological diversity** refer to?

What are the main **components** of biological diversity?

Explain the difference between **structural and behavioral adaptations** with examples of each.

Explain why it is important to preserve the species of the **Pacific Yew Tree**.



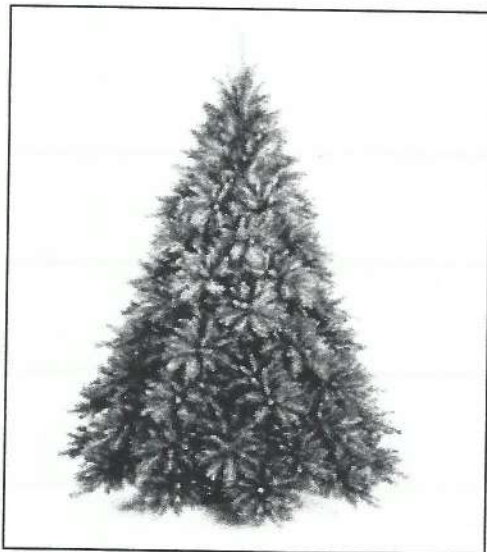
What is the value of **variation**?

Describe how biological diversity is **measured** within a specific area (ecosystem).

Topic 2 - Habitat and Lifestyle

Explain what is included in an organism's **niche**.

Illustrate **resource partitioning** in the spruce tree illustration and briefly explain what warbler populations would be affected directly, if lightning hit the top part of the tree. (p. 18)



Why is there **little diversity and large populations** in Northern Canada and **high diversity with small populations** in Central and South America?

Explain the difference between the **type of niche** specialists and generalists have.

Specialists _____

Generalists _____

Give an example of each type of **symbiotic relationship**.

Commensalism _____

Mutualism _____

Parasitism _____

Interspecies competition _____

Explain how different species can survive in each of the **extreme environment** samples below.

Ocean Floor

High Arctic

Desert

Topic 3 - Passing It On

Briefly describe the difference reproductive processes that can occur asexually.

Binary Fission

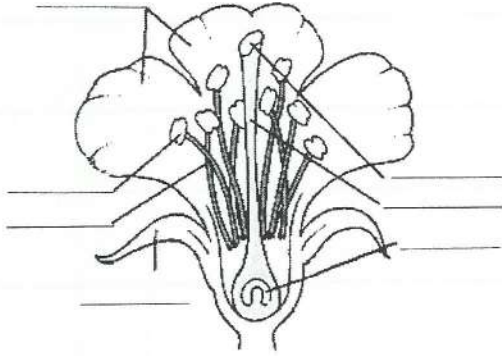
Asexual Spore Production

Cuttings

Budding

In what other ways can **asexual reproduction** occur?

Explain the process of **sexual reproduction** in plants and label the **parts of the flower**.



Explain the process of **sexual reproduction** in animals.

Explain the process of **conjugation** in bacteria.

Topic 4 - Wearing Your Genes

Explain the difference between the 2 different kinds of inherited variation.

Give 2 examples of **dominant traits** and 2 examples of **recessive traits**.

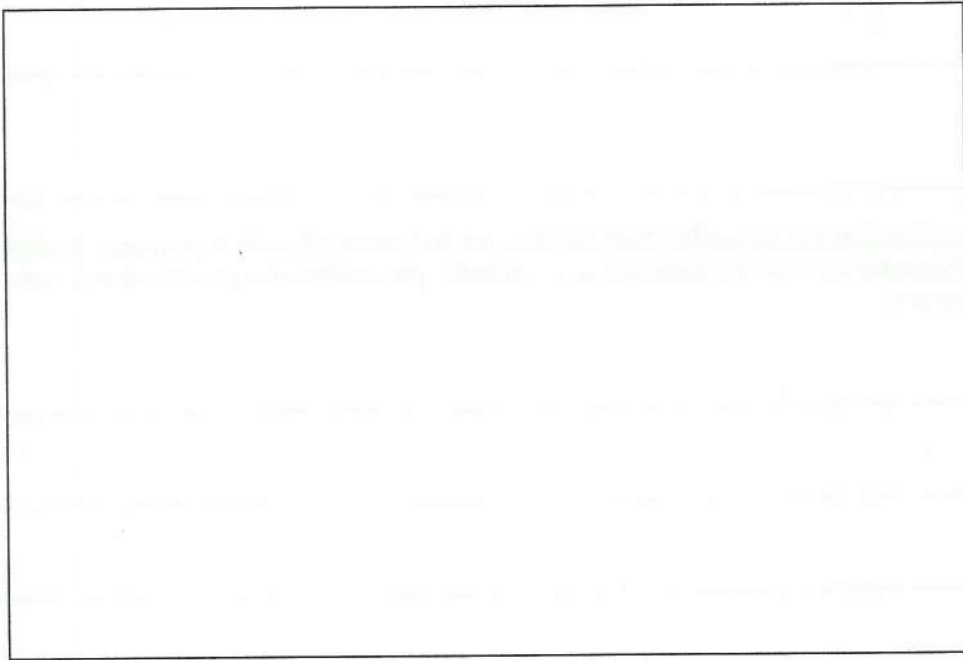
Certain characteristics are **non-inherited** and depend on factors other than genetics. Explain how these characteristics can be identified in a particular population of organisms living in the same environment.

Explain what **mutations** are and what can cause them.

Topic 5 - When Plans Change

Outline how **DNA** was discovered.

Illustrate the **chemical structure of DNA** that was modeled by James Watson and Francis Crick.



What is the **genetic code**?

What enables **DNA** to have so many variations with only 4 chemicals?
