Name: _____ Period: _____ Date: _____

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

## *Seedless Nonvascular Plants*

**Seedless nonvascular plants**, such as mosses, liverworts, and hornworts, are plants that lack vascular tissue known as xylem and phloem.

## *Sexual Reproduction*

Mosses produce two kinds of gamete cells: **egg** and **sperm**. Bryophyte gametes are surrounded by a jacket of sterile cells that keep the gametes from drying out.

Eggs are large, immobile, and contain more cytoplasm than sperm. In order for fertilization to occur, flagellated sperm must swim to the egg by following the egg's chemical trail through water droplets.

Moss gametes form in separate reproductive structures on the gametophyte: **Archegonia** containing one egg and **Antheridia** containing many sperm.

Moss **sporophytes** (stalks) and **gametophytes** (greenery)

After fertilization, a **zygote** forms, undergoes mitosis, and becomes a sporophyte. Cells inside the mature sporophyte undergo meiosis and form haploid spores that germinate into juvenile plants called **protonema**. Protonema begin the gametophyte stage.

## *Asexual Reproduction*

**Gemmae** are masses of cells or cups of tissue on gametophytes. Raindrops separate gemmae from the parent plant so they can break away and form new gametophytes.

Another method of asexual reproduction in mosses may occur by pieces of a gametophyte **fragmenting** and forming new moss plants.

## *Hepatophyta*

**Hepatophytes** are seedless nonvascular plants commonly known as **liverworts**.

Liverworts reproduce sexually by way of the **alternation of generations** and asexually by way of **gemmae**.

Liverworts grow on moist soil and rocks and require an abundance of water in order to complete their life cycle.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

## *Anthocerophyta*

**Anthocerophytes** are seedless nonvascular plants commonly known as **hornworts**.

During sexual reproduction, zygotes develop into long, horn-shaped sporophytes. Since these sporophytes are capable of **photosynthesis**, Anthocerophytes are not completely dependent on the gametophyte phase of the alternation of generations.

## *Seedless Vascular Plants*

Club mosses, whisk ferns, horsetails, and ferns are examples of **seedless vascular plants**.

Vascular plants have **xylem** and **phloem**, specialized tissues that transport water and food.

In seedless vascular plants, the **sporophyte** phase is dominant over the gametophyte phase.

## *Psilophyta*

Psilophytes, commonly known as **whisk ferns**, have **aerial stems** that fork repeatedly to form a small, twiggy bush. These plants anchor themselves by way of **rhizoids** and have horizontal, underground stems called **rhizomes**.

Whisk ferns are aided by mycorrhizae fungi living in its rhizomes.

## *Lycophyta*

Lycophytes, commonly known as **club mosses**, are low growing plants with rhizomes and cone-shaped spore producing structures known as **strobili**.

Club mosses reproduce sexually by way of spores. These spores are highly flammable.

- Example: Lycopodium powder is a flash powder that is made up of dried club moss spores.

Club moss displaying **strobili**

### *Sphenophyta*

Sphenophytes, commonly known as **horsetails**, also have aerial stems and underground rhizomes. Horsetails reproduce by means of spores made in strobili at the tip of its stems. Horsetail branches contain silica and were once used to scrub pots.

### *Pterophyta*

Pterophytes, commonly known as **ferns**, make up the largest group of living seedless vascular plants. Ferns live in moist habitats and produce spores on the underside of its leaves in clusters of sporangia called **sori**. These leaves are called **fronds** and are attached by a stem-like **petiole**.

### *Fern Characteristics*

Prothalli are heart-shaped gametophyte structures that only live a short time until the sporophyte fronds mature. Newly forming fronds are called **fiddleheads**. Fiddleheads unfurl into larger fronds as they develop. Ferns have a horizontal root structure called a **rhizome**.

### *Fern Life Cycle*

1. **Gametophyte phase:** Spores undergo meiosis, disperse in the wind, and germinate on moist soil to form a prothallus (gametophyte).
2. **Sporophyte phase:** Male antheridia and female archegonia grow on the prothallus and produce gametes. Sperm fertilize the egg, developing an embryo (sporophyte).

| Plant Type | Phylum | Common Name |
|---|---|---|
| **Nonvascular** | Bryophyta<br>Hepatophyta<br>Anthocerophyta | Mosses<br>Liverworts<br>Hornworts |
| **Vascular, seedless** | Psilophyta<br>Lycophyta<br>Sphenophyta<br>Pterophyta | Whisk Ferns<br>Club Mosses<br>Horsetails<br>Ferns |
| **Vascular, seed** (Gymnosperms) | Cycadophyta<br>Ginkgophyta<br>Coniferophyta<br>Gnetophyta | Cycads<br>Ginkgoes<br>Conifers<br>Gnetophytes |
| **Vascular, seed** (Angiosperms) | Anthophyta | Flowering Plants |

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

### *Terrestrial Evolution*

Plants probably evolved from **green algae**. Both algae and plants store energy as starch, have chlorophyll, and have cell walls made of cellulose.

The first terrestrial plants had to develop adaptations to the scarcity of water and climate variability on land. Moving onto land allowed for more sunlight, nutrient, and $CO_2$ availability for photosynthesis.

### *Vascular Adaptations*

Plants with vascular tissue are known as **Tracheophytes**. Vascular tissue was an evolutionary breakthrough as plants colonized the land.

1. **Xylem**: Vascular tissue that carries water and inorganic nutrients obtained by the roots.
2. **Phloem**: Vascular tissue that carries sugars produced in the leaves.

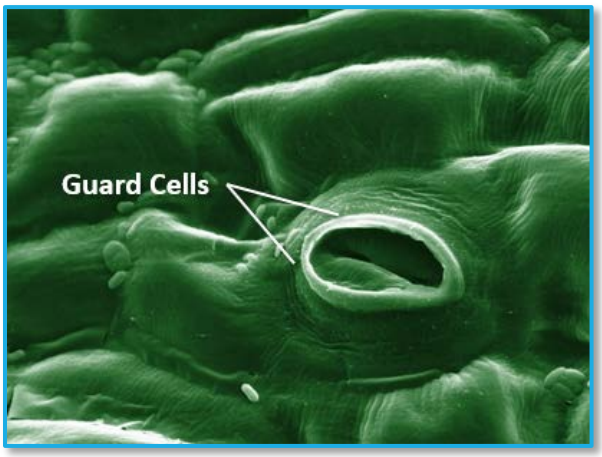
### *Structural Adaptations*

Some plants formed **woody tissue** from xylem for extra support, while herbaceous plants kept a flexible, non-woody stem.

As plants evolved on land, they experienced a greater amount of **transpiration**, the loss of water by evaporation. In order to slow transpiration, plants developed a waxy covering known as a **cuticle**.

Openings in the cuticle, called **stomata**, allow the movement of gases in and out of the plant.

Two **guard cells** on each end of a stoma help regulate its opening and closing. When guard cells lose water and shrink, the stoma closes and prevents water loss in the rest of the plant.




A **stoma** surrounded by two **guard cells**.

### *Reproductive Adaptations*

To be successful on land, plants had to develop protective seeds for their embryos. Seeds are composed of 3 main parts:

1. **Embryo:** The components of an undeveloped multicellular organism.
2. **Seed Coat:** A tough, protective exterior.
3. **Endosperm:** Stored food primarily composed of starches.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

The protective covering and stored food within seeds increase the reproductive success of seed plants.

Seeds remain **dormant** when conditions are unfavorable and **germinate** or sprout when exposed to moisture and warm temperatures. Young plant embryos use the endosperm as energy during germination.

## *Vascular Seed Plants*

Vascular plants that reproduce by way of seeds are divided into 2 groups:

1. **Gymnosperms:** Plants with "naked" seeds that are usually protected by cones. Some types of gymnosperms include: pines, cedars, spruces, and firs.
2. **Angiosperms:** Flowering plants whose seeds are produced and protected within fruit.

## *Gymnosperms*

All gymnosperms have vascular tissue that produce woody tissue and conduct food, water, and mineral transport. Gymnosperms produce 2 types of cones:

1. **Pollen cones:** Small cones that produce pollen containing the male gametophyte.
2. **Seed cones:** Large cones that contain eggs on scales that form seeds when fertilized.

## *Cycadophyta*

Cycads are gymnosperms that dominated earth when dinosaurs lived. Today, cycads are endangered with only 100 species currently alive.

Most cycads are slow-growing, palm-like plants found in tropical regions. All cycads are either male or female and bear cones made up of seed-bearing leaves called **sporophylls**.

**Cycad**

## *Ginkgophyta*

Ginkgoes are gymnosperms that were common in the Mesozoic Era, a period of time also called the Age of Reptiles.

Only one species of ginkgo remains alive today. Ginkgo trees are **deciduous**, have distinctive fan-shaped leaves, and have plum-shaped, fleshy, foul-smelling seeds. Ginkgo trees are either male or female.

### *Coniferophyta*

Conifers, the largest group of gymnosperms, are abundant in temperate climates.

Many conifers are **evergreen** trees with leaves that are characteristically needle-like. Almost all conifers produce male and female cones.

### *Gnetophyta*

Gnetophytes are gymnosperms that consist of 3 loosely-related genera:

1. **Ephedra:** The largest gnetophyte group consisting of plants resembling horsetails that grow in deserts.
2. **Welwitschia:** Plants with long leaves that only grow in the desert of south western Africa.
3. **Gnetum:** Plants with long, woody vines that climb high into tropical trees.

### *Anthophyta*

Anthophytes, commonly known as **angiosperms**, are made up of all flowering plants on earth. Angiosperms are highly diverse, live in almost all habitats, and are the most successful group of plants alive today.

All flowering plants produce both **flowers** and **fruit**, a ripened ovary containing seeds.

### *Angiosperm Characteristics*

Angiosperms may be **herbaceous** like grasses and daisies or **woody** like oak trees and grape vines.

Flowering plants are divided into 2 classes based on the number of **cotyledons**, or seed leaves, in the plant embryo:

1. **Monocots:** A single seed leaf with parallel venation.
2. **Dicots:** Double seed leaves with net-like venation.

### *Monocots*

Monocots are usually **herbaceous**. Most important food crops are monocots. Some types of monocots include: grasses, wheat, corn, and rice.

Monocot flowers tend to have petals that occur in **multiples of 3** and vascular bundles that are scattered throughout the stem.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

### *Dicots*

Dicots are usually **woody**. Most flowering plants are dicots. Some types of dicots include: maple, oak, and magnolia trees.

Dicot flowers tend to have 4 to 5 petals and vascular bundles that are arranged in a ring within the stem.

Dicot sprout with **double seed leaves**

### *Plant Organs*

All seed plants have 3 principal organs:

1. **Roots** that anchor the plant into the ground and absorb water and dissolved nutrients from the soil.
2. **Stems** that provide a support system for the plant body, a transport system that carries nutrients, and a defensive system that protects the plant.
3. **Leaves** that conduct photosynthesis and exchange gases with the air.

### *Tissue Systems*

Plants are composed of 4 different types of tissue:

1. **Dermal tissue** is the protective outer covering of a plant. In young plants, dermal tissue consists of a single layer of cells called the **epidermis**.
2. A **waxy cuticle** often covers the epidermis and protects against water loss. In older plants, dermal tissue may be many cell layers underneath bark.
3. **Vascular tissue** supports the plant body and transports water and nutrients.
   A) **Xylem** is a water-conducting tissue that contains cells called **tracheids**. Tracheid cell walls contain **lignin**, a water-resistant molecule that gives wood much of its strength.
   B) **Phloem** is a tissue that carries dissolved nutrients and contains **sieve tube elements**.
4. **Ground tissue** produces and stores sugars and helps provide structural support. Ground tissue is composed of 3 cell types:
   A) **Parenchyma:** Cells that have a thin cell wall and a large central vacuole.
   B) **Collenchyma:** Cells that have strong, flexible cell walls that help support plant organs.
   C) **Sclerenchyma:** Cells that have extremely thick, rigid cell walls that make ground tissue tough and strong.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

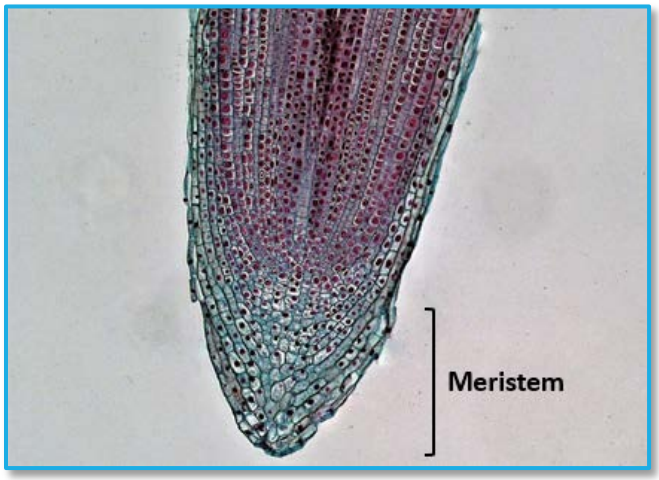
### *Root Structure*

The center of a plant root is known as the **vascular cylinder**, a core of vascular tissue surrounded by a layer of ground tissue and a layer of dermal tissue. A hydrophobic barrier called the **Casparian strip** keeps water and nutrients from leaking out of the vascular cylinder.

### *Meristems*

**Meristems**, sometimes referred to as **growing tips**, are an essential part of plant growth.

Located at the tips of roots, stem nodes, and new shoots, meristematic cells generate plant organs and maintain plant growth.




### *Stem Growth*

There are 2 main types of stem growth:

1. **Primary growth** takes place in all seed plants and is the result of the elongation of cells produced in meristems.
2. **Secondary growth** is an increase in the thickness of stems and roots. Secondary growth is common among dicots and gymnosperms, but rare in monocots.

In conifers and dicots, secondary growth takes place in tissue called the **vascular cambium** and **cork cambium**. The vascular cambium produces vascular tissue and increases the thickness of stems over time. The cork cambium produces the outer covering of stems.

### *Types of Reproduction*

Plants are divided into 2 main groups based on their method of reproduction:

1. Seed-bearing plants
2. Spore-bearing plants

Seed plants are further divided into 2 classes:

1. Flowering plants known as **angiosperms**
2. Cone-bearing plants known as **gymnosperms**

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

## *Seed Plants*

Seed plants have special structures where male and female gametes are produced and fertilized.

After fertilization, embryos are formed inside of seeds that provide energy and protection. Once fertilization has taken place, the parent plant releases the seed. If the seed lands in favorable conditions, the embryo germinates and grows into a new plant.

## *Angiosperm Reproduction*

Flowers are reproductive organs that contain male and female reproductive structures. In some plants, male and female reproductive parts are contained in separate flowers.

Pollen is carried from male reproductive structures to female reproductive structures by wind, insects, or other animals in a process called **pollination**:

1. Male pollen fertilizes female ovules.
2. Ovules develop into seeds contained in ripened ovaries known as fruit.

## *Gymnosperm Reproduction*

Gymnosperms are seed plants that contain their seeds inside of cones. Most trees are gymnosperms.

Smaller male cones produce pollen, which is carried to larger female cones by the wind.

After female gametes are fertilized by male gametes, female cones produce seeds that are dispersed by wind or animals.

## *Shared Characteristics*

Although there are many structural differences throughout the Animal Kingdom, there are shared characteristics that are common to many organisms.

1. Levels of Organization
2. Organ System Patterns
3. Body Symmetry
4. Germ Layers
5. Body Cavities
6. Segmentation
7. Notochords

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

## *Organ System Patterns*

Organ systems in different groups of animals exhibit various patterns of complexity. Two patterns of digestive systems can be seen in animals: complete and incomplete. Animals with **complete digestive systems** have two openings on the outside of the body, a mouth and an anus.

- Example: Most complex animals, such as mammals, have complete digestive systems.

Animals with **incomplete digestive systems** have one opening on the outside of the body that serves as both the mouth and the anus.

- Example: Many simple animals, such as jellyfish and sponges, often have incomplete digestive systems.

Two patterns of circulatory systems can be seen in animals: open and closed. In animals with **open circulatory systems**, cells and tissues are bathed in blood that is pumped out of the heart.

- Example: Most insects and crustaceans have open circulatory systems.

In animals with **closed circulatory systems**, blood is circulated through a series of vessels: arteries, veins, and capillaries. Since vessels transport blood more rapidly, closed circulatory systems are more efficient than open circulatory systems.

- Example: All vertebrates have closed circulatory systems.

## *Body Symmetry*

Animals can be categorized based on their type of body symmetry. Animals with **asymmetrical** body symmetry cannot be divided into identical halves along any plane passing through their central axis.

- Example: Most sponges are asymmetrical. If you draw an imaginary line across the center point of a sponge, the halves will never be identical.

Animals with **radial** symmetry can be divided into identical halves when any plane passes through their central axis.

- Example: Sea anemones have radial symmetry. If you draw an imaginary line across the center of a sea anemone from any direction, the halves will always be identical.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

Animals with **bilateral** symmetry can be divided into identical right and left halves.

- Example: Moths have bilateral symmetry. If you draw an imaginary line in between the right and left half of a moth, the two halves will always mirror each other.

## *Germ Layers*

Animals can be categorized based on the arrangement of cell layers during early embryonic development.

**Diploblastic** animals have cells that are arranged in two germ layers: ectoderm and endoderm.

- Example: Jellyfish are diploblastic animals.

**Triploblastic** animals have cells that are arranged in three germ layers: ectoderm, mesoderm, and endoderm.

- Example: All complex animals are triploblastic.

## *Body Cavities*

When classifying animals, the presence or absence of coelom, the cavity between an organism's body wall and gut, is an important differentiating characteristic.

**Acoelomates** are animals without coelom. All diploblastic animals are acoelomates.

- Example: Acoelomates, such as flatworms, have no body cavity at all.

**Pseudocoelomates** are animals with coelom that is not lined by the mesoderm.

- Example: Pseudocoelomates, such as nematodes, have fluid-filled body cavities.

**Coelomates** are animals with coelom that is lined by the mesoderm.

- Example: Coelomates, such as vertebrates, have organ-filled body cavities.

## *Segmentation*

In some animals, the body is segmented externally and internally with serial organ repetition. This phenomenon is known as **metamerism**, and the segmented body pattern is known as **metameric segmentation**.

- Example: Earthworms have segmented bodies.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

### *Notochords*

During embryonic development, a mesodermally derived rod-like structure is formed on the dorsal side of some animals. This structure is known as a **notochord**. Notochords are evolutionary precursors to spinal cords.

Animals with a notochord are known as **chordates**.

- Example: All vertebrates are chordates.

Animals without a notochord are known as **non-chordates**.

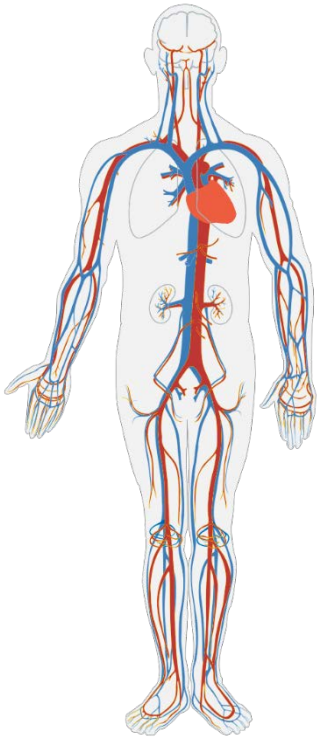
- Example: All invertebrates are non-chordates.

### *Human Complexity*

With 11 sophisticated organ systems, modern humans are a prime example of complexity within the Animal Kingdom.

Like most complex animals, humans are **triploblastic coelomates**. As vertebrates, humans are classified as **chordates**.

### *Circulatory and Respiratory Systems*



Humans have **closed circulatory systems** that circulate blood through a network of specialized vessels:

- **Arteries** carry blood away from the heart.
- **Veins** carry blood to the heart.
- **Capillaries** carry blood to cells.

The human respiratory system brings oxygen into the body and expels carbon dioxide.

As blood is pumped through the lungs, carbon dioxide is released and oxygen is picked up for transport to the rest of the body.

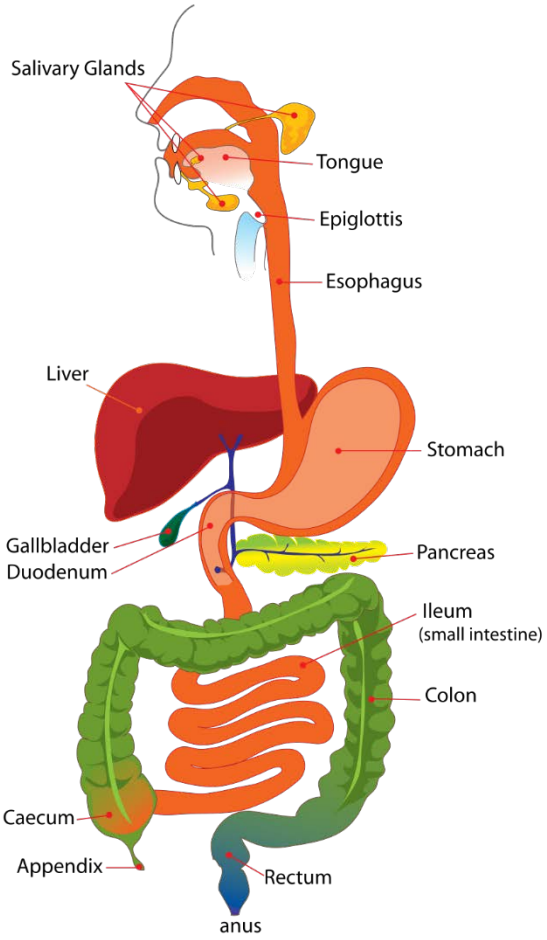
# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

### *Digestive System*

Humans have **complete digestive systems** that mechanically and chemically break down food.




### *Excretory System*

Sometimes called the **urinary system**, the human excretory system filters waste products from the blood.

After filtration, waste products are eliminated from the body in the form of urine.

### *Endocrine System*

The human endocrine system is made up of **glands** that produce hormones. **Hormones** are chemical communicators that help regulate bodily functions

- Example: Thyroxine, a hormone produced by the thyroid gland, helps regulate the body's metabolism.

### *Integumentary and Exocrine Systems*

The human integumentary system is made up of hair, skin, and nails. Although only a few millimeters thick, the skin is the largest organ in the human body.

The human exocrine system secretes substances, such as oil, sweat, and mucus. Exterior exocrine glands, such as sweat glands, are located in the skin.

### *Muscular and Skeletal Systems*

Collectively referred to as the **musculoskeletal system**, human muscles and bones work together to enable body movement, provide structural support, and provide organ protection.

Adult human bodies contain about 700 named skeletal muscles and 206 bones.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

### *Nervous System*

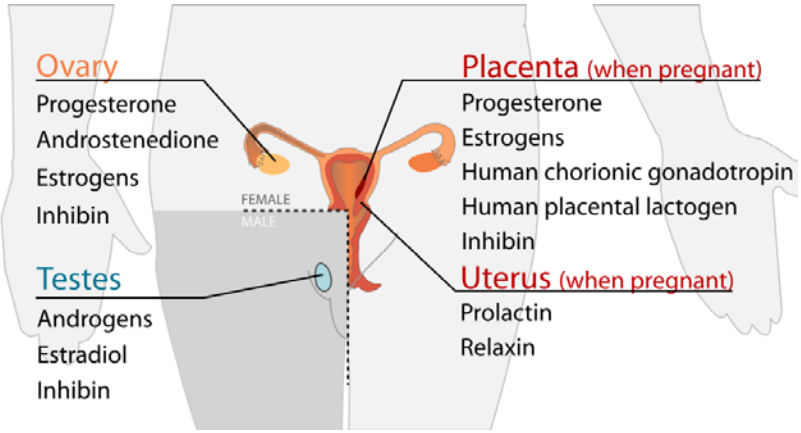
The human nervous system is the **command center** of the body.

All sensory organs contain nerves, information receptors that send sensory data to the brain. As the brain processes data, it passes on vital instructions to the rest of the body.

### *Reproductive System*

The human reproductive system is composed of specialized reproductive structures, such as **ovaries** in females and **testes** in males.

These organs release specific hormones that help regulate male and female reproductive functions.




### *Ecology*

**Ecology** is the study of the interactions between biotic and abiotic factors within a habitat.

**Biotic factors** are living organisms, such as plants, animals, fungi, and microorganisms.

**Abiotic factors** are nonliving elements, such as climate, soil, temperature, water, air, sunlight, humidity, pH, and atmospheric gases.

A **habitat** is the place an organism lives, while its **niche** is its total way of life.

### *Levels of Organization*

Life is organized into six levels:

1. **Organism**: Any single living thing.
2. **Population**: Members of the same species living in one place.
3. **Community**: All of the populations living in an area.
4. **Ecosystem**: Communities living in a similar habitat, such as a forest.
5. **Biome**: Ecosystems covering wide areas with similar climates and organisms.
6. **Biosphere**: All the living and nonliving things on earth.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

## *Ecosystem Energy*

**Producers**, such as plants and algal protists, make their own food through photosynthesis or chemosynthesis.

**Consumers** are organisms that can't make their own food. They may be herbivores, carnivores, or omnivores.

**Decomposers**, such as fungi and bacteria, break down dead organic matter and recycle nutrients.

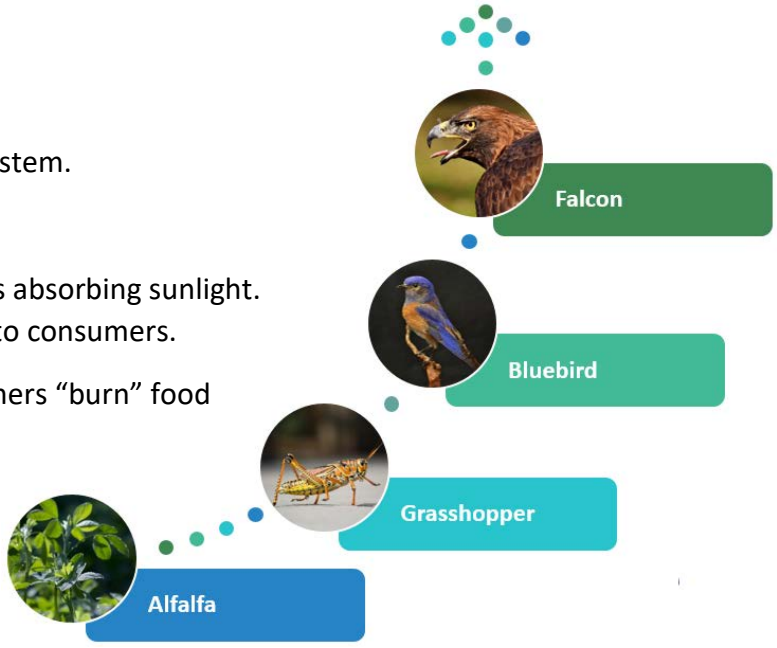
## *Food Chains and Webs*

**Food chains** show who eats whom within an ecosystem.

**Food webs** are made up of several food chains.

Food chains and webs always begin with producers absorbing sunlight. Stored energy within producers is then passed on to consumers.

Some energy is lost at each trophic level as consumers "burn" food energy during cellular respiration.




## *Three Main Elements*

There are three main elements that are necessary for life in an ecosystem:

1. **Water** plays a vital role in metabolic processes, the makeup of cells, and the prevention of desiccation in terrestrial organisms.
2. **Carbon** plays a vital role in photosynthesis and cellular respiration.
3. **Nitrogen** plays a vital role in the production of proteins and nucleic acids.

## *Water Cycle*

1. **Evaporation** and **Transpiration**, sometimes referred to as **Evapotranspiration**: Water loss from lakes, rivers, oceans, and plant leaves in the form of vapor.
2. **Condensation**: Water vapor forms clouds.
3. **Precipitation**: Water returns to earth in the form of sleet, rain, or snow.
4. **Surface Runoff**: Water is returned to bodies of water or to groundwater.

# Study Guide, part 2

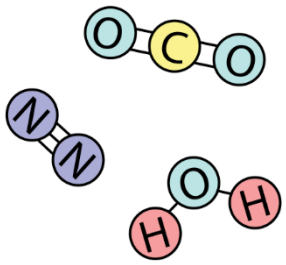
Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

### *Carbon Cycle*

1. **Carbon dioxide** enters the air by way of cellular respiration and combustion.
2. **Producers** absorb carbon dioxide during photosynthesis.
3. **Consumers** feed on producers and pass carbon throughout the food chain.
4. **Decomposers** feed on dead organic matter and release carbon dioxide back into the atmosphere.

### *Nitrogen Cycle*




1. **Cyanobacteria** and **Rhizobia** fix nitrogen from the air.
2. **Nitrogen-fixing prokaryotes** convert nitrogen to ammonia.
3. **Nitrifying bacteria** in the soil change ammonia into nitrates.
4. **Plants** use nitrates to produce proteins.
5. **Consumers** eat protein-rich plants.
6. **Decomposers** break down dead organic matter and return nitrogen to the air.
7. **Denitrifying bacteria** in the soil release nitrogen from nitrates into the air.

### *Types of Ecosystems*

There are three main types of ecosystems:

1. **Terrestrial**: Jungles, savannas, deserts, grasslands, deciduous forests, coniferous forests, and tundra.
2. **Freshwater**: Rivers, ponds, and lakes.
3. **Marine**: Oceans and seas.

### *Tundra*

Tundra, such as the **Arctic**, is cold and dark most of the year with a low annual rainfall of about 20 cm.

Tundra is defined by the presence of **permafrost**, frozen soil that only thaws in the summer.

Because plant roots can't penetrate frozen soil, only sedges, grasses, mosses, and lichens can be found growing in a tundra.

Aside from migratory animals, there are very few year-round animal residents.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

## *Taiga*

**Taigas** are coniferous forests with an annual rainfall of about 60 cm.

Extending across northern Eurasia and North America, **conifers** and **evergreens** with needle-like leaves can be seen growing in taigas.

Bear, deer, moose, wolves, and mountain lions are animals typically found in coniferous forests.

## *Temperate Deciduous Forest*

**Temperate deciduous forests** can be found south of taigas in North America, Eastern Asia, and Europe.

These forests have moderate temperatures, well-defined seasons, and high annual rainfall of about 75-150 cm.

Songbirds, deer, rabbits, foxes, squires, frogs, toads, and lizards can be seen living in temperate deciduous forests.

## *Tropical Rainforest*

**Tropical rainforests**, sometimes called **jungles**, can be found near the equator.

These forests have a warm climate and an annual rainfall of about 190 cm.

Jungles contain the greatest diversity of plants and animals of all terrestrial biomes.

Brightly colored insects, monkeys, apes, snakes, tropical birds, and leopards can be found living in jungles.

## *Grassland*

**Grasslands**, also called **prairies**, mainly contain grasses and few trees.

With an annual rainfall of about 50 – 90 cm, grasslands have moderate climates and soil that is well-suited for agriculture.

Grazing animals are the most common types of animals seen in grasslands.

# Study Guide, part 2

Second Semester Review, part 2

Penguin Bay Biology
- Biology Class, Simplified -

### *Savanna*

**Savannas** are tropical grasslands with a warm climate and a rainy season. The annual rainfall is about 50 – 127 cm.

Savannas often suffer from floods and droughts.

Antelope, zebras, lions, wildebeests, hyenas, and elephants reside in savannas.

### *Desert*

**Deserts** are characterized by a low annual rainfall of about 25 cm.

Deserts are subject to strong winds, hot days, and cold nights.

Most desert plants are succulents, such as cacti and other water-storing plants.

Lizards, snakes, roadrunners, insects, tarantulas, hawks, rodents, and coyotes, are commonly found in deserts.

### *Lakes and Rivers*

Lakes and rivers are freshwater biomes.

**Oligotrophic** lakes are nutrient poor and contain catfish and carp. **Eutrophic** lakes are nutrient rich and contain trout and bass.

Deep lakes have layers or strata where different plants and animals live. Phototropic organisms live in upper strata.

Estuaries at the mouth of rivers can contain brackish water.

### *Ocean Zones*

Oceans are saltwater biomes that are divided into three zones:

1. **Intertidal zone**
2. **Neritic zone**
3. **Oceanic zone**