UNIT 1

Tissues, Organs, and Systems of Living Things

Chapter 1: Cells and More Cells

Chapter 2: Plants: From Cells to Systems

Chapter 3: Animals: From Cells to Systems
In this chapter you will investigate the:

• similarities and differences between plant and animal cells
• stages of mitosis and its importance for growth and repair
• stages of the cell cycle and how it relates to cancer
• process of cell division in normal and abnormal cells
The development of the microscope in the 1660s increased our understanding of the human body and led to the discovery of cells.

**Cell** – the smallest unit that can perform the functions of life

**Microscopy** – the science of using microscopes to view samples or objects
Microscopy Review

• the parts of a microscope and their functions
• microscope use
• slide preparation
• how to determine the field of view and magnification
• how to draw to scale and label scientific diagrams of specimens

Microscope Animation

A Eyepiece (or Ocular Lens)
You look through the eyepiece. It has a lens that magnifies the object, usually by 10 times (10x). The magnifying power is engraved on the side of the eyepiece.

B Tube
The tube holds the eyepiece and the objective lenses at the proper working distance from each other.

C Revolving Nosepiece
This rotating disk holds two or more objective lenses. Turn it to change lenses. Each lens clicks into place.

D Objective Lenses
The objective lenses magnify the object. Each lens has a different power of magnification, such as 4x, 10x, and 40x. (Your microscope may instead have 10x, 40x, and 100x objective lenses.) The objective lenses are referred to as low, medium, and high power. The magnifying power is engraved on the side of each objective lens. Be sure you can identify each lens.

E Arm
The arm connects the base and the tube. Use the arm for carrying the microscope.

F Coarse-adjustment Knob
The coarse-adjustment knob moves the tube up and down to bring the object into focus. Use it only with the low-power objective lens.

G Fine-adjustment Knob
Use the fine-adjustment knob with medium- and high-power magnification to bring the object into sharper focus.

H Stage
The stage supports the microscope slide. Stage clips hold the slide in position. An opening in the centre of the stage allows light from the light source to pass through the slide.

I Condenser Lens
The condenser lens directs light to the object being viewed.

J Diaphragm
The diaphragm controls the amount of light reaching the object being viewed.

K Light Source
Shining a light through the object being viewed makes it easier to see the details. If your microscope has a mirror instead of a light, adjust the mirror to direct light through the lenses. CAUTION: Use an electric light, not sunlight, as the light source for focussing your mirror.
Types of Microscopes

- Bright field/ Dark field
- Phase-contrast
- Fluorescence
- Transmission Electron
- Scanning Electron
- Leeuwenhoek
• One of the first structures to be seen clearly through a microscope was the **nucleus**.

• The **nucleus** is the **organelle** that controls the cell’s activities.
  • **Organelles** are specialized structures within a cell.
The Cell Theory was proposed by German scientists in the late 1830s. **Theodor Schwann** and **Matthias Schleiden** used their studies of plants and animals to formulate the first two ideas. In 1855 **Rudolph Virchow** added the final one. The theory states that:

1. All living organisms are made of one or more cells.
2. The cell is the basic organizational unit of life.
3. All cells come from pre-existing cells.
Animal and Plant Cell Organelles

Animal Cells

- The cytosol (the fluid material between the cell membrane and the nucleus) is filled with many specialized organelles.

- There are some important differences between the organelles found in plant and animal cells.
Click the “Start” button to review the various **organelles** in **animal** and **plant cells** and their functions.
Cellular Respiration – a process that releases energy from organic molecules, especially carbohydrates such as glucose, in the presence of oxygen

Mitochondria – the site in animal and plant cells where cellular respiration takes place
Concepts to be reviewed:

- types of microscopes and their use
- cell structure
- The Cell Theory
- similarities and differences between plant and animal cells
- cellular respiration
Chromosome – a thread-like structure made mostly of DNA, found in the nucleus of a cell

DNA (deoxyribonucleic acid) – material found in the cell nucleus that contains genetic information

Gene – a segment of DNA that controls protein production
Genes Direct Protein Production

Genes contain instructions for making proteins.

Proteins act alone or in complexes to perform many cellular functions.

U.S. DEPARTMENT OF ENERGY
From Chromosomes to Proteins
 Courtesy U.S. Department of Energy Human Genome Program
In 1953 scientists James Watson and Francis Crick created this model of DNA (the twisted ladder design is sometimes called a “double helix”).
A karyotype is a micrograph of the chromosomes in a person’s cells. Individual chromosomes from the karyotype can be mapped and then be examined for any irregularities.

http://www.genome.gov/Pages/Hyperion//DIR/VIP/Glossary/Illustration/karyotype.shtml

http://genomics.energy.gov
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DNA testing can reveal genetic disorders (such as Down Syndrome, PKU, Huntington Disease) and can help determine how susceptible a person might be to ailments such as cancers and heart disease.

The controversy related to genetic testing revolves around a variety of social issues.

Social Issues

- Genetic information is personal
- Powerful
- Potentially predictive
- Pedigree (family) - sensitive
- Permanent
- Prejudicial

Genome Management Information System, Oak Ridge National Laboratory
http://genomics.energy.gov
Transgenic Organism – an organism whose genetic information has been altered with the insertion of genes from another species. These organisms are considered to be genetically modified organisms (GMOs).

Possible Uses For GMOs
• Production of non-allergenic human proteins
• Development of pest resistant crops
• Increased growth of crops and livestock

Concerns
• Spread of disease from GMOs
• Negative effects on ecosystems
• Allergic reactions from eating GMOs
Cloning – the process of creating identical genetic copies of an organism

Pros and Cons of Cloning

- **Pro**: Copies are made of “superior” animals. (increased milk & meat production)
- **Con**: Clones may be less disease resistant
Click the “Start” button to discover the details involved in cloning.

The isolated DNA is purified and then fragmented with a restriction enzyme. Restriction enzymes used in cloning produce staggered cuts in specific sequences in the DNA, generating fragments with cohesive ends.
**Mutation** – a change in the DNA of an organism

**Mutagen** – a substance or factor that can cause a mutation in DNA. Examples: radiation (X-Rays, UV radiation), mercury, cigarette tar
Concepts to be reviewed:

• genetic material in the nucleus: DNA, chromosomes, and genes

• the structure of DNA

• DNA screening and related issues

• issues related to altering genes

• transgenic organisms

• cloning

• mutations
Cell Reproduction – the process by which new cells are formed

Cells can be produced either **asexually** (from one parent cell) or **sexually** (from two parent cells).
Most single celled organisms reproduce by splitting in two (binary fission), producing two new cells, called daughter cells.

In multicellular organisms (such as humans), all body cells (cells produced for growth and repair / replacement) are also produced through this process of splitting in two (binary fission), producing two new cells, called daughter cells.
Cell Division

Click the “Start” button to review cell division.

Producing New Cells
the process by which new cells are formed

Cell Division
and reproduction in single-celled organisms

• single-celled organism
e.g. “paramecium”

Asexual Reproduction
produces two new cells - daughter cells

Most single-celled organisms reproduce by splitting in two (binary fission), producing two new cells, called daughter cells. These daughter cells are genetically identical to each other and to the parent cell from which they were produced.

Cell Division
of body cells in multicellular organisms

• multi-celled organism
e.g. male and female “human” body cells

Cellular Reproduction
The production of sex cells (sperm or eggs) in multicellular organisms involves a process that results in the production of daughter cells with half the genetic material found in the parent cells. This process is called meiosis.
**Diffusion** – the movement of molecules from areas of higher concentration to areas of lower concentration.

Click the “Start” button to review diffusion.
**Osmosis** – the diffusion of water across a **selectively permeable membrane**

**Selectively Permeable Membrane** – a membrane through which not all materials can pass; some are kept in and some are kept out.

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**Click the “Start” button to review osmosis.**
Cell Growth & Limiting Cell Size

- A major factor limiting cell size is its dependence on diffusion for raw materials and waste removal.
- The speed of diffusion depends on the difference in concentration between the inside and outside of the cell (the concentration gradient).

The ratio of cell membrane surface area (SA) to cell volume (V) is a factor that limits cell size. **AS CELLS INCREASE IN SIZE, THE SA/V RATIO DECREASES**
The **nucleus** of a cell divides through a process called **mitosis**, while the **cytoplasm** divides by a different process called **cytokinesis**.

**Mitosis** – the process by which the duplicated contents of the cell’s nucleus divide into two equal parts.

Prior to **mitosis** the **DNA** in the nucleus must be replicated.
DNA Replication – during DNA replication each chromosome is duplicated (creating sister chromatids) with the chromatids remaining attached to each other at the centromere.

Click the “Start” button to review DNA Replication.
Stages of Mitosis

1. Prophase
   - Chromatids condense and chromosomes become visible

2. Metaphase
   - Chromosomes align in the middle of the cell.

3. Anaphase
   - Centromere splits and chromatids are pulled to each side of the cell.
   - Two daughter nuclei are formed.

4. Telophase
   - Spindle fibres begin to disappear
   - Nuclear membrane re-forms

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Cytokinesis completes the process of cell division.

**In Animal Cells**

In animal cells, the middle of the cell contracts, pinching the cell membrane, and the cell is divided.

**In Plant Cells**

In plant cells, a cell plate forms in the middle of the cell, eventually becoming a cell wall that divides the cytoplasm in two.
Click the “Start” button to review mitosis and cytokinesis.

Mitosis is a process of nuclear division by which replicated copies of a cell’s DNA are organized into chromosomes. The identical copies of the DNA are then divided equally between two daughter cells.
Concepts to be reviewed:

• the process of cell division
• diffusion and osmosis of substances into a cell
• factors limiting cell size
• DNA replication
• the stages of mitosis
• cytokinesis in animal and plant cells
Cells within the human body have finite life spans. The cell cycle controls the production (through **interphase**, **mitosis**, and **cytokinesis**) of new cells of a variety of different types.

### Table 1.3 Average Life Span of Various Human Body Cells

<table>
<thead>
<tr>
<th>Type of Body Cell</th>
<th>Average Life Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain</td>
<td>30-50 years</td>
</tr>
<tr>
<td>Red blood</td>
<td>120 days</td>
</tr>
<tr>
<td>Stomach lining</td>
<td>2 days</td>
</tr>
<tr>
<td>Liver</td>
<td>200 days</td>
</tr>
<tr>
<td>Intestine lining</td>
<td>3 days</td>
</tr>
<tr>
<td>Skin</td>
<td>20 days</td>
</tr>
</tbody>
</table>

**Interphase** – periods of growth in the life of a cell; consists of two growth stages and a stage of **DNA replication**.
Cell Cycle Checkpoints – a point in the life of a cell when proteins determine whether cell division should or should not occur.

Stop! Some of the chromosomes have not attached themselves to spindle fibres in metaphase. Stop! Some of the chromosomes have not moved to the poles in anaphase. The cell must be repaired or destroyed.

Stop! The cell lacks nutrients to support its growth. Stop! The DNA is damaged. The cell must be destroyed.

Stop! The DNA has not replicated. Stop! The DNA is damaged. The cell must be repaired or destroyed.

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Click the “Start” button to review the cell cycle.
Cells “die” when they are damaged due to:

- exposure to toxic chemicals or conditions
- physical forces
- the wear and tear of daily use

Cell “suicide” occurs when the cell experiences a “pre-programmed death” due to:

- “suicide” genes code for proteins that kill the cells in specific situations.
- cell contents are packaged for use by other cells
**Cancer and the Cell Cycle**

**Tumour** – an abnormal clump of cells formed when cells divide repeatedly and excessively.

**Cancer** – cells with abnormal genetic material that are dividing uncontrollably and can spread to other parts of the body.
Section 1.4 Review

Concepts to be reviewed:

• the stages of the cell cycle
• the function of cell cycle checkpoints
• cell death and cell suicide
• cancer and how it is related to the cell cycle
In this chapter you will investigate:

- how plant cells specialize to form different tissues
- the link between cells, tissues, organs, and systems in plants
- the function of plant tissues and organs
- how organs work together to meet the needs of a plant
- diseases that threaten plant tissues and organs

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Activity 2-1 Observing Plant Growth

What happened to the seeds when they were soaked in water?

What did you observe inside the “split open” seed?

What will happen to the seed as it continues to grow?
**Cell Specialization** – the process by which cells develop from similar cells into cells that have specific functions within a multicellular organism

- Cells specialize as a result of producing different **proteins**.
- Different **genes** code for different proteins.

**Cell Differentiation** – a stage of development of a living organism during which specialized cells form.
**Specialized Cells and Tissues in Plants**

**Tissue** – a cluster of similar cells that share the same specialized structure and function

**Organ** – a combination of several types of tissue working together to perform a specific function

**Meristematic Cell** – an unspecialized plant cell that gives rise to a specific specialized cell
Click the “Start” button to review plant tissue and cell types.
The plant grows upward, “getting taller.”

The plant grows outward or “thickens.”
Click the “Start” button to review the parts of a leaf.
Transpiration – the evaporation of water from the leaves through the stomata
Chloroplasts – the organelles within plant cells that use the Sun’s energy to chemically convert carbon into glucose (photosynthesis)
Click the “Start” button to review the process of photosynthesis.
A plant’s **stem** has two main functions:
1. physical support
2. transportation of sap
A plant’s **root** has three main functions:
1. to **anchor the plant** in the ground
2. to **take up water and minerals** from the soil
3. to **store energy and nutrient supplies** for later use

**Types of Roots**

- **Tap Root**
- **Fibrous Root**
Click the “Start” button to review stem and root tissues.
Brown rust, shown here, is a type of fungus that affects Canadian crops. It can reduce wheat harvests by up to 20 percent.

Fungal spores from this rust, shown magnified 250 times, interfere with the growth and health of plant tissues.

Brown Rust

Galls

Magnified Rust Spores
The main function of a plant’s flowers is reproductive. Flowers:

- produce **sperm and eggs** for sexual reproduction
- attract insects and other animals for **pollination**
- produce **seeds** and sometimes **fruit** after pollination
Concepts to be reviewed:

• how meristematic cells differentiate into specialized plant cells

• the characteristics of dermal, ground, and vascular tissues

• the four types of plant organs: root, stem, leaf, and flowers

• the process of photosynthesis
System – a group of tissues and organs that perform specific functions

Shoot System – supports the plant, performs photosynthesis, and transports sap

Root System – takes in water & nutrients from the soil and transports them to the shoot system
“The push from below” – Water enters the root by osmosis and moves toward the centre of the root into the xylem vessels. The pericycle prevents the water from moving backward. Root pressure builds up in the xylem and pushes water “up.”

Tiny root hairs increase the surface area of the root.
“The pull from above” – While the roots push the water column from below, the leaves pull from above. Transpiration aids in this process.
Click the “Start” button to review water movement.

This favors the transport of water from the high water pressure root system to the low water pressure leaves and results in the upward movement of water in the plant.
In the **spring**, sucrose from the roots flows “upward” to help produce leaf buds. In the **summer and fall**, the leaves produce glucose that moves “downward” to be stored in the roots.
Click the “Start” button to review the function of the **phloem**.
Concepts to be reviewed:

- the function and characteristics of the root and shoot systems
- the function and properties of xylem and phloem tissue
- the tissues and processes involved in moving water and nutrients
- the movement and storage of the products of photosynthesis
In this chapter you will investigate how:

- the cells in animals become specialized
- unspecialized cells replace and repair damaged tissues
- organs coordinate the actions of tissues and work together in systems
- medical technologies and health strategies affect public health
Skin, our body’s largest organ, is composed of a variety of specialized tissues and cells.

Click the “Start” button to discover details about skin.
Most of the 75-100 trillion cells that make up the human body are specialized to do certain tasks. The three main factors that influence the differentiation of these cells are:

1. the contents of the cell’s cytoplasm
2. environmental conditions, such as temperature
3. the influence of neighbouring cells
Differences between the cells in an amoeba and cells in a blue whale are related to differences in cytoplasm content.
On the cat pictured below, dark- and light-coloured hair developed when skin cells experienced warm or cool temperatures during cell differentiation.
In this chick embryo, neighbouring cells influence the development of the eye in a specific location.
The production of abnormal cells is often linked to environmental conditions, such as the presence of chemical contaminants, temperature changes, diseases, and parasites, that are present during cell development.

Similar cell conditions form similar cells.
Tissue: a cluster of similar cells that share the same specialized structure and function. There are only four main types of tissue: epithelial, muscle, nervous, and connective.

### Epithelial Tissue

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Some Types</th>
<th>Appearance</th>
</tr>
</thead>
</table>
| Epithelial | - line the surfaces of the body, both as a body covering and between internal organs  
- made of cells with strong connections between adjoining cell membranes, so they form a barrier | ![Epithelial Tissue Image](image) |
| Skin epithelia | - made of thin, flat cells that form sheets and act as a semi-permeable barrier between the inside and outside of a body | ![Epithelial Tissue Image](image) |
| Columnar epithelia | - made of columns of cells that line the small intestine (shown here), the stomach, and glands  
- may secrete mucus, have finger-like projections called cilia, and or absorb materials | ![Epithelial Tissue Image](image) |
### Muscle Tissue

**Muscle**
- designed to change their shape
- act by shortening or lengthening

**Skeletal muscle**
- made of cells that line up in the same direction, making the tissue look striped, or striated
- attaches to bone, making it possible for the body to move
- is found in limbs, like arms and legs, and places where the body needs support, such as around the lower abdomen and back

**Smooth muscle**
- made of cells that are tapered at both ends and do not have a striated appearance
- is found in blood vessels and the walls of internal organs like the esophagus and stomach
- contracts more slowly than skeletal muscle, but its action can be sustained for a long time

**Cardiac muscle**
- made of cells whose nuclei sometimes appear to be between cells
- are branched and unevenly striated
- contracts as a unit
- found only in the heart
Types of Tissues

Nervous Tissue

Nervous
- made of cells called neurons, which have finger-like projections to receive and transfer signals
- coordinates body actions

are varied in their actions:
- some relay signals from the brain or spinal cord to muscles and glands
- others detect information from their environment (like the heat of a hot stove) and trigger the body's responses
### Connective Tissue

**Connective**
- strengthens, supports, protects, blinds, or connects cells and tissues
- consists of cells in an extracellular matrix that can range from a liquid (in blood) to elastic materials that can stretch (in ligaments) to mineral deposits (in bone)

**Bone**
- made of cells surrounded by calcium-hardened tissue through which blood vessels run
- needed for movement, support, protection

**Fat (adipose tissue)**
- made of large, tightly packed cells
- found under the skin and around organs
- needed for energy storage, padding and insulation

**Blood**
- includes red blood cells, white blood cells, and platelets within a straw-coLOURED liquid matrix called plasma
- transports nutrients and oxygen
- clots when the skin is cut
- attacks invaders such as bacteria and viruses
Click the “Start” button to review the tissues in the human body.

It may surprise you to learn that although there are millions of different kinds of organisms on Earth, there are only a few different kinds of tissues.

Animals have four main tissues: **epithelial**, **muscle**, **nervous** and **connective**.

Click the buttons below to learn more about these tissues and see how they appear under a light microscope.
**Stem Cell:** an unspecialized cell that can produce various specialized cells

Click the “Start” button to review the specialization of stem cells.
Embryonic stem cells are unspecialized cells that can become any one of an organism’s body cells, making them valuable for research and medical treatment.
Concepts to be reviewed:

- the factors affecting cell specialization (cytoplasm contents, environmental factors, and neighbouring cell secretions)
- the four types of tissues (muscle, epithelial, nervous, and connective)
- the potential and ethical concerns over the production or harvesting of stem cells
An organ is a combination of several types of tissue working together to perform a specific function.

With respect to the human body, a system is a group of tissues and organs that perform specific functions.
Medical imaging technologies are techniques used to form an image of a body’s internal cells, tissues, and organs.

<table>
<thead>
<tr>
<th>Type</th>
<th>Technology</th>
<th>Example</th>
</tr>
</thead>
</table>
| X ray                       | ● produced by transmitting a wavelength of electromagnetic radiation through the body to expose photographic film on the other side  
Example (at right): X rays go through soft tissue, so they are best used for hard tissue, such as bone. Here you can see an X ray of a badly fractured leg. | ![X-ray Image](image1)                                                                      |
| CT or CAT scan (computerized axial tomography) | ● produced by taking X rays of very thin “slices” of a body part that can be reconstructed by a computer into a three-dimensional image  
Example (at right): This three-dimensional CT scan shows a healthy heart. | ![CT scan Image](image2)                                                                |
| Ultrasound (medical sonography) | ● produced by directing high frequency sound waves at a part of the body, usually from a microphone attached to a computer  
● show real-time movement of body parts like the heart: useful for watching organ function  
Example (at right): This ultrasound image has been coloured to more clearly show blood flow through a neck artery. Blood flow is greatest when red and slowest when green. | ![Ultrasound Image](image3)                                                               |
| MRI scan (magnetic resonance imaging) | ● produced using radio signals in a magnetic field to create images of body parts  
Example (at right): This MRI scan shows sites of bleeding in the brain, which has resulted in a stroke. | ![MRI scan Image](image4)                                                                |
Endoscopy involves inserting a flexible tube containing a tiny camera and light into a patient’s body. Compare the two images of an ulcer shown below.

The image on the left was obtained using a barium X ray. The image on the right was obtained using an endoscope. The X ray exposes the patient to radiation. The endoscope does not.
With respect to complexity, the human body is organized from:

**CELLS** → **TISSUES** → **ORGANS** → **SYSTEMS**
Your body has 11 organ systems that keep you alive and healthy.
The digestive system breaks down food both mechanically and chemically in order to release nutrient molecules that the body’s cells can absorb and use.
The primary functions of the digestive system are the breakdown of food (called digestion) and absorption of nutrients.
Click the “Start” button to review how the digestive system secretes gastric juices.
The villi within the small intestine are where nutrients are absorbed into the blood.
The excretory system processes and eliminates liquid wastes from the body. The excretory system interacts with the digestive and circulatory systems.
The circulatory system absorbs and transports nutrients and oxygen to cells and carries wastes to the organs responsible for eliminating them from the body.
The heart is the organ that pumps the blood throughout the body.

The four chambers of the heart are the left and right atriums and the left and right ventricles.
Click the “Start” button to review the operation of the heart.

Action potentials originate in the sinoatrial (SA) node and travel across the wall of the atrium from the sinoatrial node to the atrioventricular (AV) node.
Arteries carry blood from the heart to all body parts.

Veins carry blood from body parts back to the heart.

Capillaries are extremely small, thin-walled blood vessels that connect organs, tissues, and cells to the circulatory system.
The most common causes of circulatory system disease are hypertension (high blood pressure) and arteriosclerosis (a thickening of the walls of the arteries). Each can cause blood clots to form.

A heart attack occurs when a blood clot breaks free and blocks a blood vessel in an artery in the heart.

A stroke occurs when a blood clot breaks free and blocks a blood vessel in the brain.

Healthy (left) versus clogged (right) arteries.
An angioplasty is a procedure designed to open up a clogged blood vessel. The procedure involves inserting a small balloon into the blood vessel and inflating it.
Gas exchange in the body takes place in the respiratory system. Air is inhaled, and oxygen is extracted and absorbed by the blood. Carbon dioxide leaves the blood and is exhaled.

Click the “Start” button to review the function of the respiratory system.
Gas exchange between the respiratory and circulatory systems occurs in the alveoli.

Hemoglobin is the protein in red blood cells that allows oxygen to attach to molecules.
Click the “Start” button to review gas exchange at an alveolus.
Click the “Start” button to review the conditions that make gas exchange possible.

Fresh air entering the lung carries oxygen with a $P_{O_2}$ (partial pressure of oxygen) of 160. The presence of moisture in the lung results in reduction of the $P_{O_2}$ to 104.
The most common cause of respiratory disease is cigarette smoking. The chemicals and foreign particles present in cigarette smoke damage the lung’s ability to exchange gases.
The interaction between the human skeleton and the muscles attached to it allows us to move parts of our bodies.
Concepts to be reviewed:

• the use of medical imaging
• 11 human organ systems interact to perform essential tasks
• the components of the digestive system and their functions
• the function of the excretory system
• the components of the circulatory system and their functions
• the components of the respiratory system and their functions
The development of new medical procedures and technologies and the reintroduction of traditional treatments are currently being used by healthcare practitioners to prevent and treat a wide range of diseases and conditions.
The field of **biophotonics** relates to the use of procedures and devices that use various light technologies to work with living systems, including human systems.

The use of endoscopes to view internal structures and the use of lasers to conduct eye surgery are examples of biophotonics.
Ultrasound technology allows doctors to safely monitor the development of a fetus.
Public health strategies are co-ordinated efforts to track, research, and reduce the incidence of specific health problems in a population.

**Vaccination**, the process of giving a vaccine by mouth or injection, provides active immunity against a disease.
When a human immune system is healthy, the body’s white blood cells fight infections.
When vaccines are not available to control infectious diseases, a variety of public health strategies can be used to control their spread.
Cancer screening tests can detect cancer cells at an early stage of the disease so that it can be treated more effectively.

Cancer Prevention: Lifestyle Choices

Physical Activity

Diet

Smoking

Weight Control
Concepts to be reviewed:

• the technologies involved in the diagnosis and treatment of abnormalities in tissues, organs, and systems

• the public health strategies for improving the health of Canadians
Click the “Start” button to participate in a virtual frog dissection.