

Science Eight

Module Two

Cells and Systems

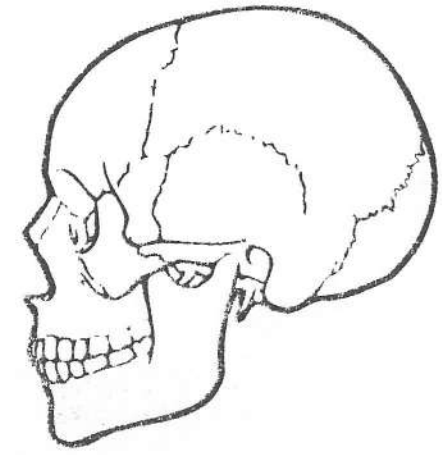
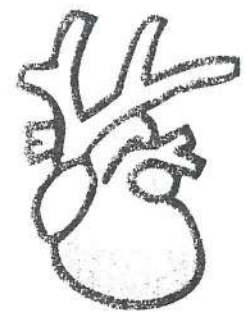
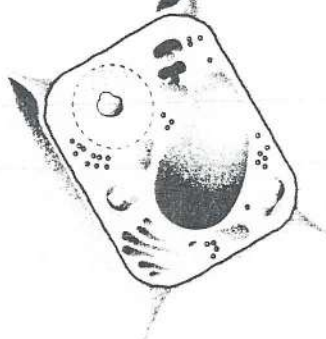
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CELLS AND SYSTEMS





Part A: What is a Living Thing?

Living things are all of the things in our world that are **alive**.

All living things:

1. **Reproduce**...this means they have offspring (babies).
2. Need **energy**...they have to get "food" somehow.
3. Produce **waste**...they get rid of the leftovers in their bodies.
4. **Grow** and develop...they get bigger and mature (become adults).
5. **Respond** to their **environment**...they change.



To figure out if something is living or not, ask yourself if it fits each of the five descriptions above. Most living things fit all five. A virus fits only four out of the five as it does not reproduce.

Non-living things are **not** things that are dead. They are things that have never and will never be alive. Non-living things may fit with some of the five descriptions above, but they will **never fit with all five**.

1. What is the **difference** between something that is **living** and something that is **non-living**?

2. Put a check mark beside the **five** living things:

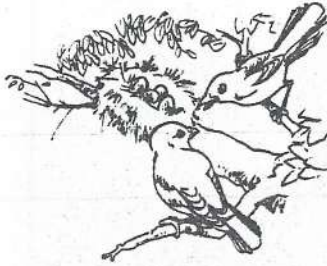
<input type="checkbox"/> wind	<input type="checkbox"/> bird	<input type="checkbox"/> tree	<input type="checkbox"/> computer
<input type="checkbox"/> car	<input type="checkbox"/> dirt	<input type="checkbox"/> rock	<input type="checkbox"/> dog
<input type="checkbox"/> wave	<input type="checkbox"/> butterfly	<input type="checkbox"/> water	<input type="checkbox"/> grass



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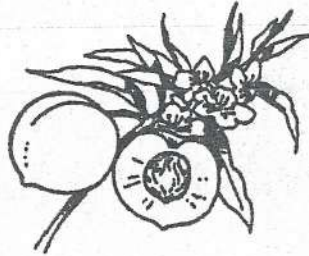


All living things **reproduce**, which means they have young (babies). Think about how each of the following living things reproduce:



Birds lay eggs.

Most plants produce seeds.



Humans and many animals give birth to live young (babies).

Many living things reproduce in the spring, such as animals, birds, plants and trees. Name **five** living things from your neighbourhood that have young (babies) in the spring and explain how they have them (e.g. hatched from eggs, grown from seeds, etc.).

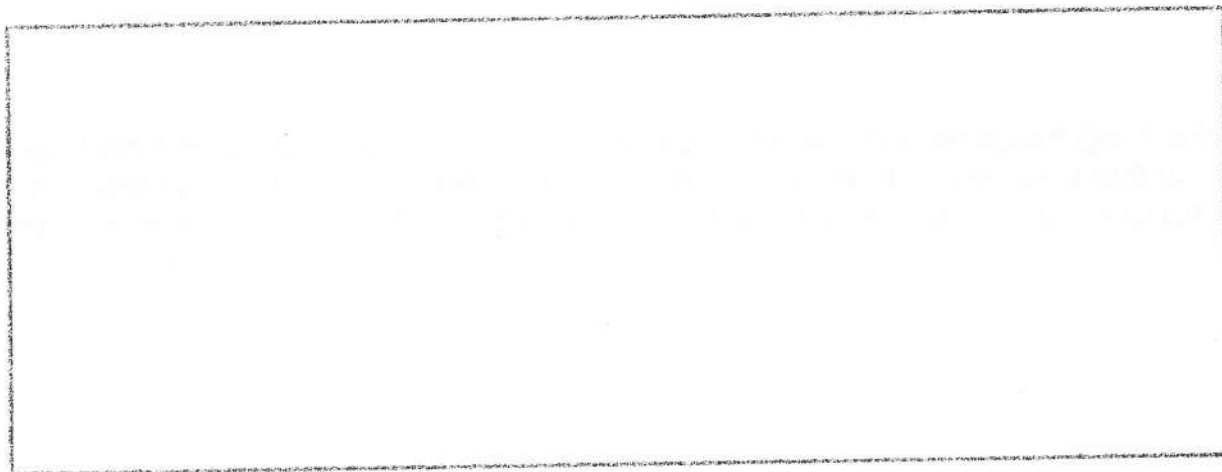
1. _____
2. _____
3. _____
4. _____
5. _____

Use **words** and **pictures** to describe how **three** different living things get energy (food). For example, plants get energy from the sun, the soil and water, rabbits get energy from the grass and plants they eat.

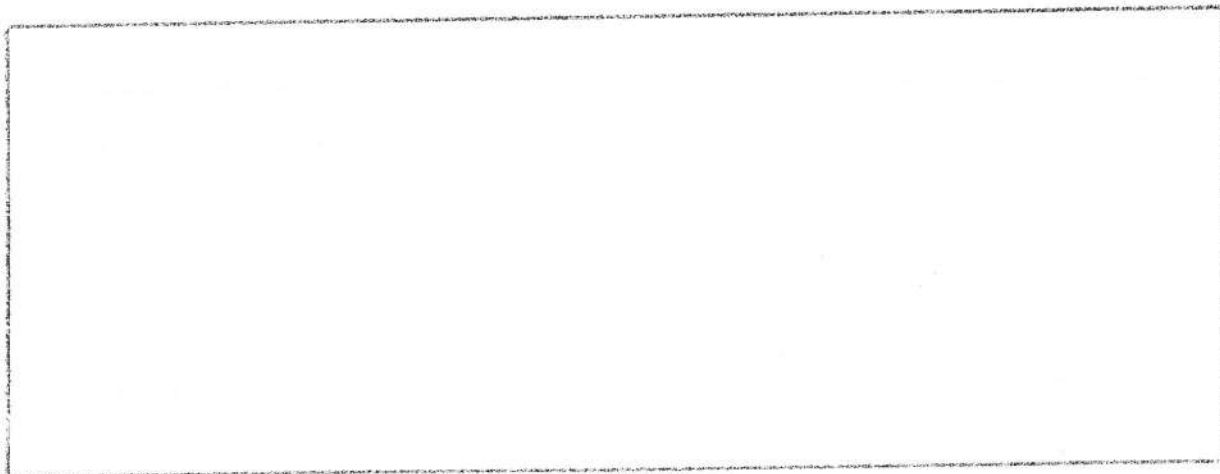
1



2



3



Part B: What is a Cell?

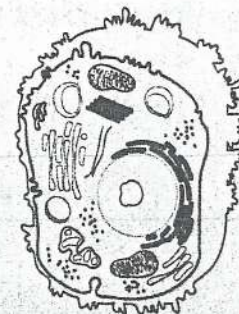
Read the information and then answer the questions below in complete sentences.

Cells are often called the "**building blocks of life**" because they are the **tiny structures** that make up almost every living thing. Your skin, hair, muscles and bones are all made up of hundreds and thousands of tiny cells.

Cells are the **smallest** living things that have all of the **characteristics** of living things—they need energy, they grow, they reproduce, they produce waste and they change to fit in with their environment.

The largest creatures in the world are made of billions of cells. Large creatures often have different kinds of cells that do different jobs. These cells are called **specialized** because they have grown and changed so they are specially made to do one job, such as skin that protects everything that is inside.

The smallest creatures are made of only one cell. When a living thing only has one (or a few) cells, the tiny structures inside the cell (called *organelles*) are specialized to do different jobs.



1. Why are cells called the building blocks of life?

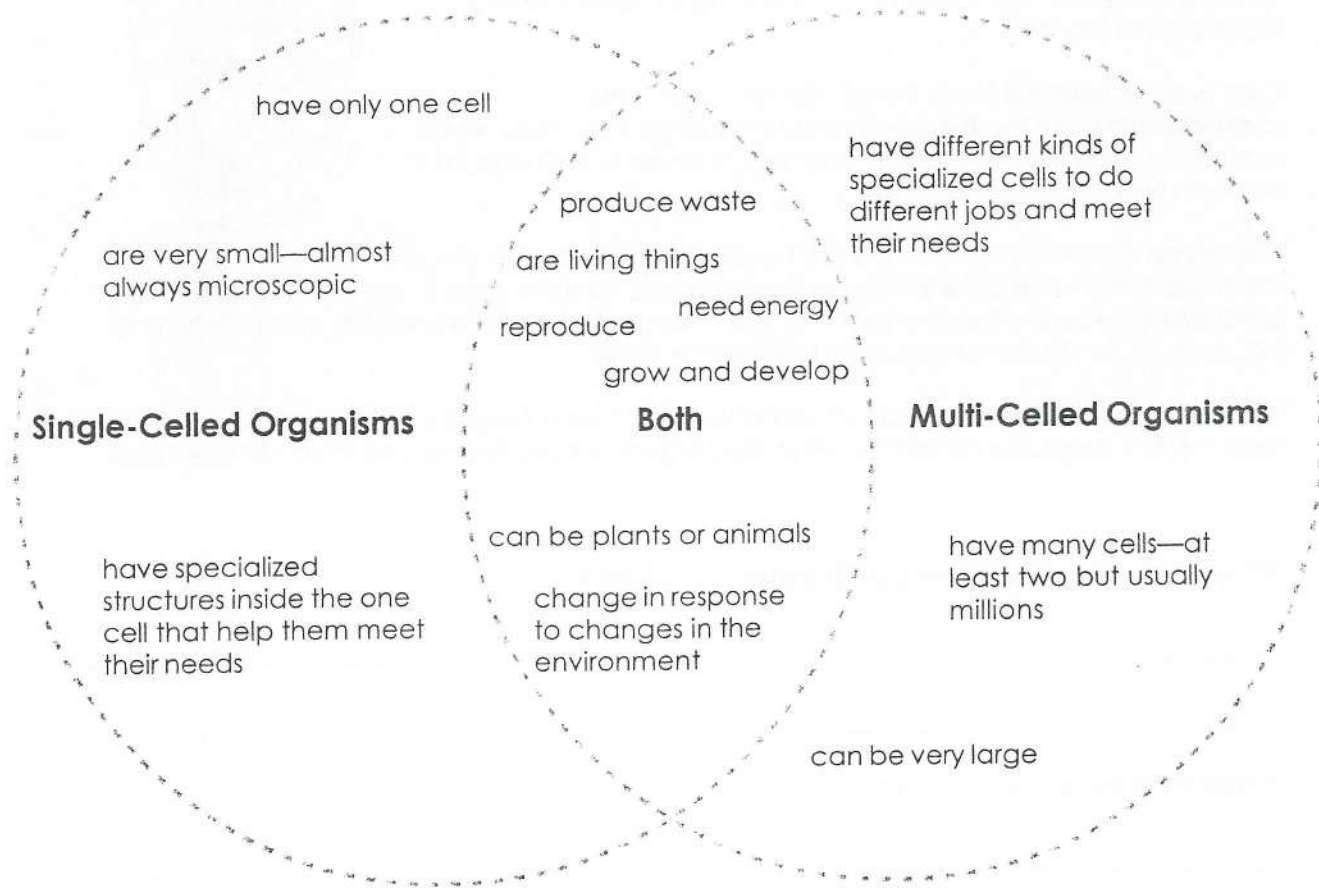
2. What makes a cell a "living thing"?

3. What is a specialized cell?

4. What kinds of creatures have specialized cells?

This diagram compares living things (or organisms) with one cell and living things with more than one cell. The right and left sides contain information that is only true for that type of organism. The part in the middle contains information that is true for both types of organisms.

Read the information in the diagram and then answer the true or false questions below.

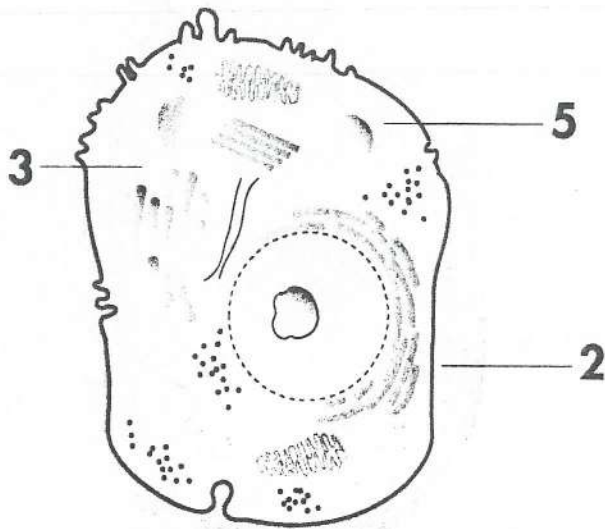


Put a **T** beside the sentences that are **True** and an **F** beside the sentences that are **False**.

1. ____ Single-celled organisms don't have all of the characteristics of living things.
2. ____ Single-celled organisms can usually only be seen with a microscope.
3. ____ Multi-celled organisms can usually only be seen with a microscope.
4. ____ Single-celled organisms are made up of only one or two cells.
5. ____ Single-celled organisms are all plants.
6. ____ Multi-celled means to be made of more than one cell.

Plants and animals have **different kinds** of cells. Study each of the diagrams below and use the information to help you complete the Venn diagram on the next page **comparing** the two types of cells.

Animal Cell

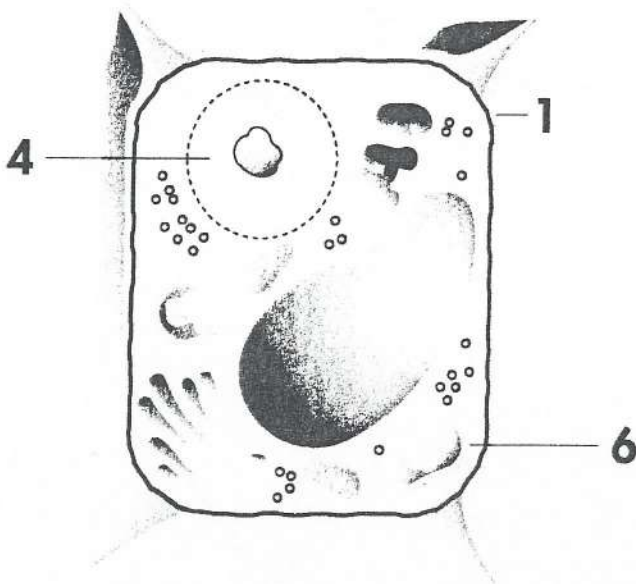


1 **Cell Wall**
Strong, thick outer covering of plant cells that gives the cell a specific shape.

2 **Cell Membrane**
The outer covering the cell that protects it and lets certain things move in and out of the cell.

3 **Cytoplasm**
The goopy, jellylike stuff that makes up most of the inside of the cell – it carries oxygen and food to the different parts of the cell.

Plant Cell



4 **Nucleus**
Controls what the cell does and how it works.

5 **Vacuoles**
Bubble-like spaces in the cell where extra food, waste and other stuff is kept.

6 **Chloroplasts**
Green parts in plant cells that let them change sunlight to food (photosynthesis).



A Venn diagram consisting of two overlapping circles. The top circle is labeled "Animal Cell" and the bottom circle is labeled "Plant Cell". The overlapping area in the center is labeled "Both Cells". The circles are drawn with dashed lines.

Animal Cell

Both Cells

Plant Cell

Activity - Ask about the edible animal cell or the fake microscope to look at some cells

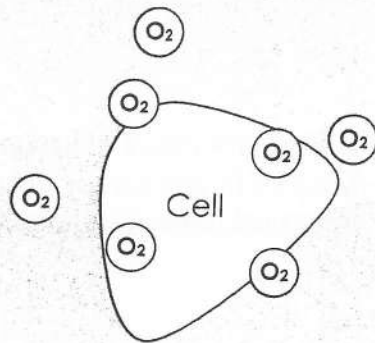
Diffusion and Osmosis

Right now, every cell in your body is letting in water, air and food. They are also producing waste. The part of the cell that allows water, air and food to move in and out is the cell membrane (often called the *gatekeeper* because of the job it has). Many things move through the cell membrane by a process called **diffusion**.

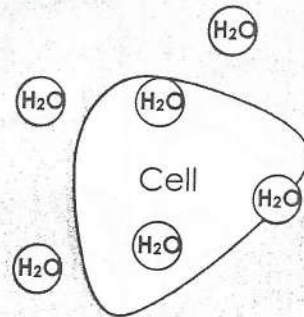
Diffusion is when particles (tiny pieces) of matter move from an area where there are a lot of other particles (called a *concentration*) to an area where there are not many at all. In other words, diffusion spreads particles out to make things more even.

The cell membrane does not let just anything into the cell, but it does let important things like oxygen in. When there is less oxygen inside a cell than outside, the oxygen passes into the cell by diffusion. This evens out the amount of oxygen in the areas of high concentration (outside the cell) and low concentration (inside the cell).

Water moves in and out of cells in the same way, but the process for making sure the amount of water stays balanced is called **osmosis**.



Diffusion



Osmosis

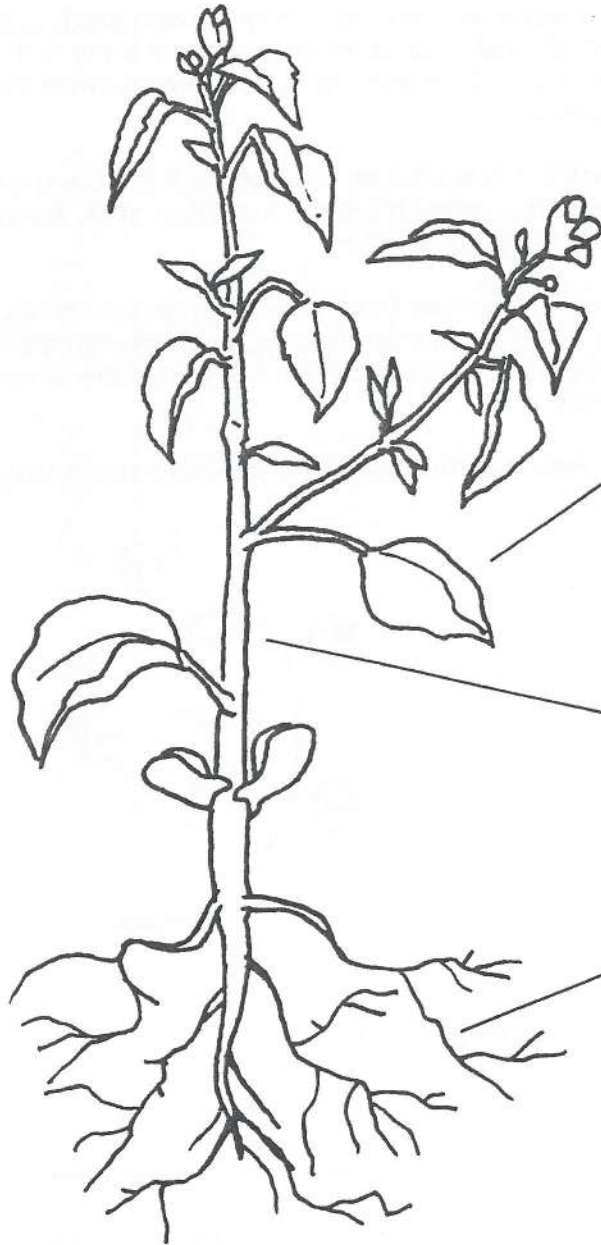
Write a definition for each of the following terms (words):

1. Diffusion

2. Osmosis

3. Concentration

Part C: What parts do plants have?



Plants have three kinds of organs:
leaves, stems and roots.

Leaves are made of different types of tissues that do different jobs. Some make food (photosynthesis), some protect the plant and others transport (move) food and water.

Stems are made of tissues that support (make it strong) the plant and transport (move) water and food.

Root tissues are covered with tiny hairs made of cells that bring water and food into the plant through *osmosis* and *diffusion*.

Match these statements about cells, tissues and organs.

Cells are...

tissues working together.

Tissues are...

the small parts inside tissues.

Organs are...

cells working together.

Part D: How are cells, tissues and organs related?

You have already learned that cells are the building blocks of life—the tiny pieces that make up every part of every living thing. You have also started to learn about tissues and organs.

Cells are the tiny particles that make up living things, but **groups** of the **same** cells that **work together** to do **one job** are called a **tissue** (muscle tissue, etc.).

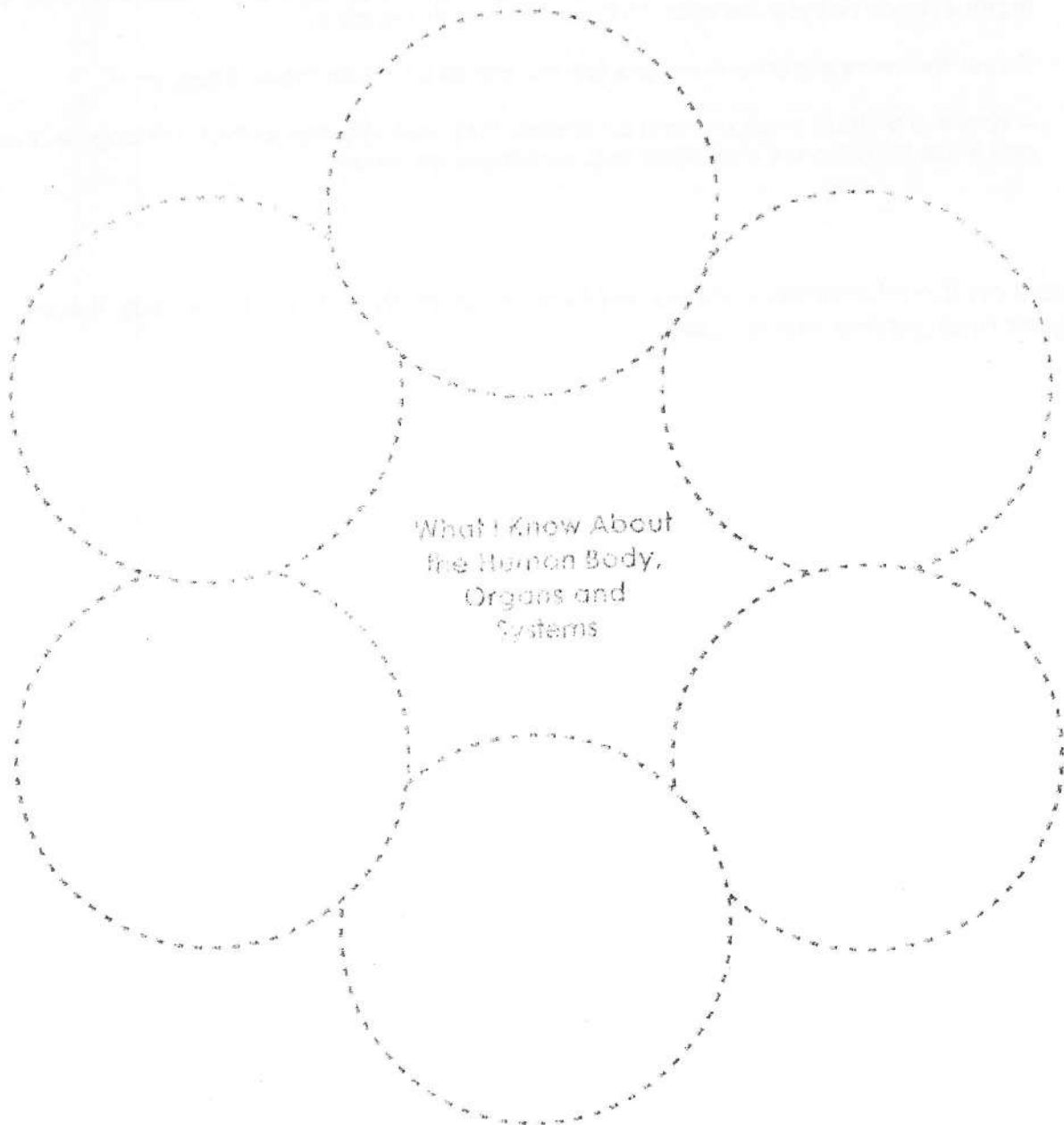
Tissues that **work together** to do **one job** are called an **organ** (heart, lungs, etc.).

A **system** is a group of organs and body parts that **work together** so that a change in one part leads to a change in another (e.g. your digestive system).

Based on the information above, draw a diagram that shows how cells, tissues, organs and systems are related.

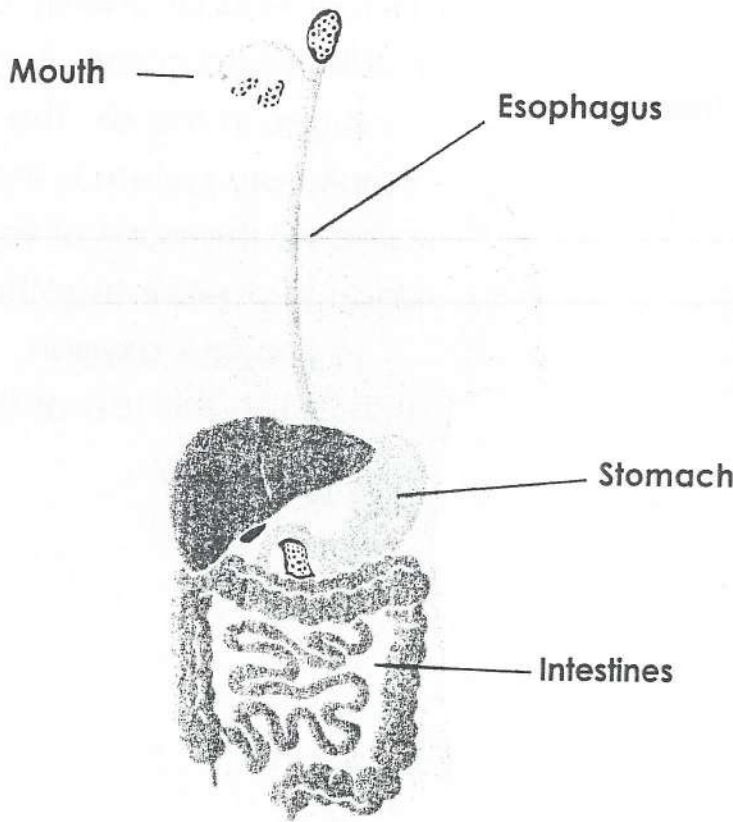
Part E: How do our cells, tissues and organs work together?

Before you continue, take some time to think about what you know about the human body and how the different organs (body parts) and systems (body parts working together) work. Write down all of your ideas in the brainstorming web below.



The Digestive System

You learned before that all living things need energy. The digestive system is the name for the parts of your body that work together to provide food (energy) to the rest of the body.

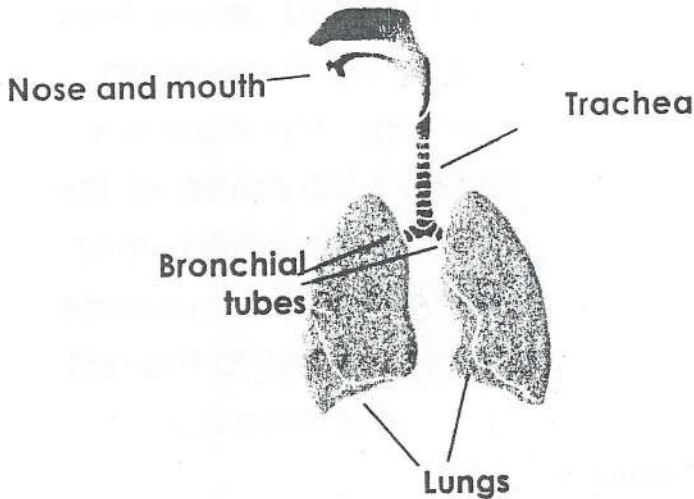


Use the diagram above to help you fill in the missing words.

Food first enters our bodies through the _____ where the teeth and
1
tongue work together to break the food into smaller pieces. Once we swallow, the
food moves down a long tube called the _____ and ends up in the
2
_____. The strong muscles of the _____ continue to break the
3 4
food down into smaller pieces and chemicals begin to digest the food. Once the
food is turned into a thick liquid, it passes slowly through the long, curly
_____ and the body absorbs (soaks up) the food it needs. The body gets
5
rid of any food it does not need (waste).

The Respiratory System

Another kind of energy our bodies need comes from oxygen in the air. The respiratory system is the name for the parts of your body that work together to provide oxygen (energy) to the rest of the body.

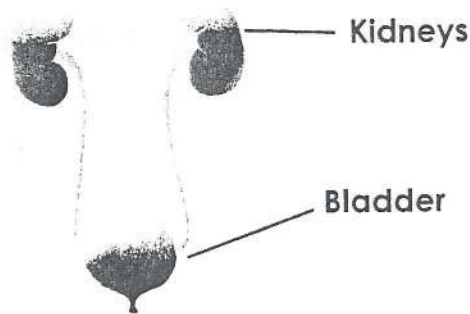


Use the diagram above to help you fill in the missing words.

Air first enters our bodies through the _____ 1 _____ and _____ 2 _____. It moves down a long tube called the _____ 3 _____ and then the _____ 4 _____ tubes divide the air between the two _____ 5 _____. The oxygen passes out through the outer edges of the lungs, where the blood is waiting to carry oxygen to the parts of the body that need it. The air we breathe out is the old air (carbon dioxide) the blood brings back to the lungs. It travels back through the _____ 6 _____ tubes, up the _____ 7 _____ and out through the _____ 8 _____ and _____ 9 _____.

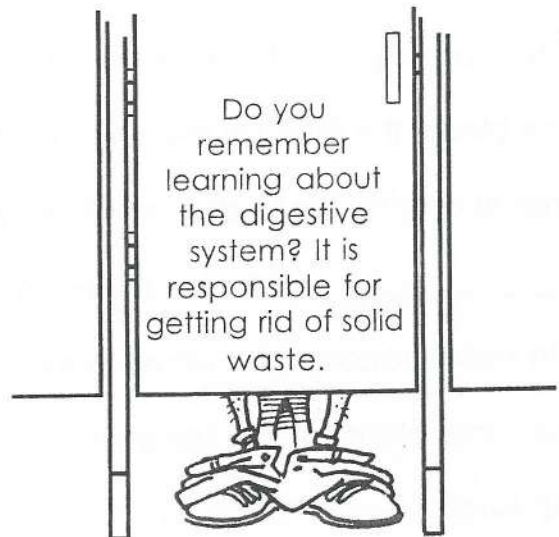
The Excretory System

You learned before that all living things produce waste. The excretory system includes all of the parts of your body that deal with liquid waste.



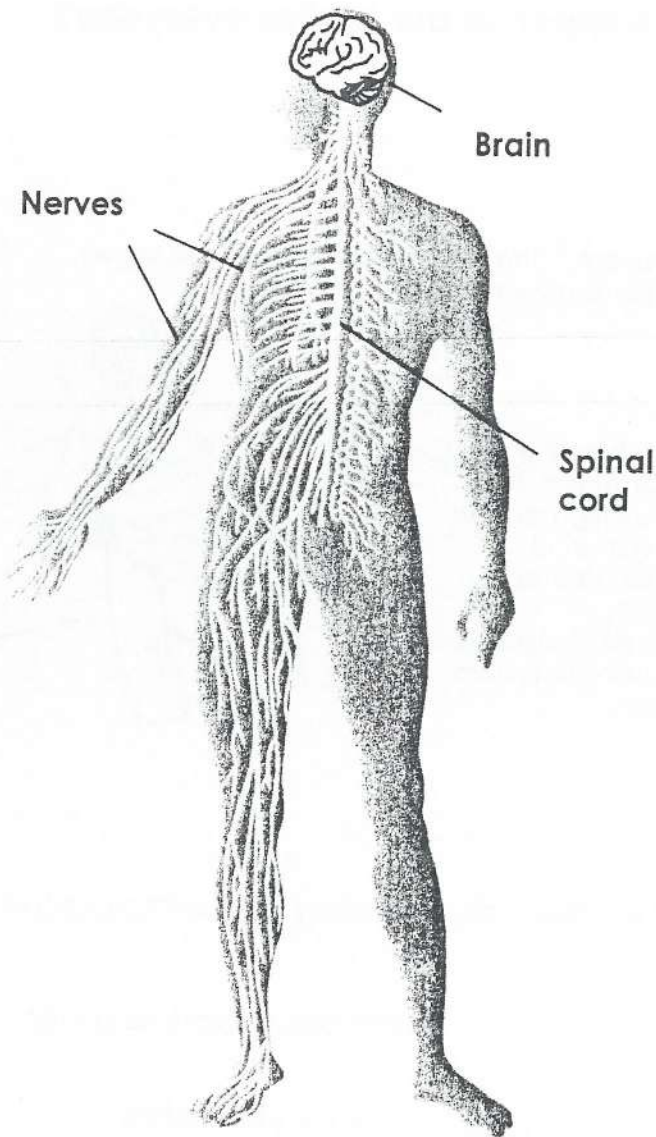
Use the diagram above to help you fill in the missing words.

The excretory system is made of two main parts, the _____¹ and the _____². There are two _____³ and their job is to clean the liquid in our bodies. The extra liquid that we do not need is stored in the _____⁴ which is emptied (usually into a toilet!) when it is full.



The Nervous System

The parts of the nervous system work together to allow us to feel, taste, smell, hear, see, think and move.



Use the diagram above to help you fill in the missing words.

The _____₁ is at the top of the nervous system and it is the part that controls everything we do. Tiny _____₂ all over our bodies send messages that travel up the _____₃ cord and into the _____₄. The brain decides what to do and sends a message back down the _____₅ cord and along the _____₅.

If you want a more in depth look at human body systems check this site out. <http://www.innerbody.com/html/body.html>

Part E: What kinds of changes happen in our bodies everyday?

Sensory Awareness

Our nervous system makes us "sensory aware." That means our brain always knows what is happening around us and tells the body what to do to keep us comfortable and safe.

For example:

As mountain climbers get higher up, the air around them has less oxygen. When they breathe in, the brain senses (feels) that there is not enough oxygen coming in, so it tells the respiratory system to breathe more often and take deeper breaths to help the body get the oxygen it needs. This is an example of **stimulus response**. A stimulus is something that is "noticed" by our nervous system and a response is our body's reaction.



- Match the following stimulus-response pairs by writing the number of the stimulus beside the correct response:
 - You feel hot _____ Your body starts to shiver
 - You feel cold _____ Your mouth waters
 - You see a bright light _____ Your body starts to sweat
 - You bite your tongue _____ You sneeze
 - You breathe in dust _____ Your eyes close
- Choose one of the pairs above and explain why you think your body reacts the way it does.

Investigate

Activity vs. Heart Rate

Consider: How does my heart react when my body does work?

Hypothesis: (check the one you agree with)

- the more active I am, the faster my heart beats
- the more active I am, the slower my heart beats

Materials:

- timer (watch or clock that shows seconds)

Procedure: (record your findings in the chart below)

1. Before you begin, take your resting heart rate (how many times your heart beats per minute when you are sitting still).
2. Walk for two minutes at a normal speed and take your heart rate again.
3. Jog for two minutes and take your heart rate again.
4. Run as fast as you can for as long as you can and then take your heart rate again.

Resting

Walking

Jogging

Running

To take your pulse, place the first two fingers of your right hand under your chin and slide them slowly down and to the right until you feel the pumping of the blood. Count how many times it pumps in one minute.

Conclusion/Analysis:

1. When was your heart rate the slowest?

2. When was your heart rate the fastest?

3. Now, answer the original question using evidence from your investigation.

Part F: What kinds of special cells are in our bodies?

The human body has many types of specialized cells. This means that the cells work or look a certain way that makes them much better at doing their job.

1. Use what you have learned so far to help you match the number beside each type of specialized cell with the descriptions of their jobs.

a. red blood cells

_____ These cells send **signals** to the **brain** through long, finger-like fibres (strings) that reach from one cell to the next.

b. nerve cells

_____ Each of these cells **pulses** (squeezes and then relaxes). All of these cells **pulsing** together keeps the organ **beating**.

c. bone cells

_____ These disc-shaped cells float in liquid and **carry oxygen** through really small **vessels** (tubes) from the heart to the rest of the body.

d. skin cells

e. muscle cells

_____ These cells form thick, flexible (bendy) tissues that give us **strength**.

f. heart muscle cells

_____ These cells work together to form **solid** structures in the **skeletal** system.

_____ These cells work together to form a **protective covering** for the body and for organs inside the body.

Part G: What kind of research is being done to learn about human health?

The Tomorrow Project

The Tomorrow Project is a long-term research study run by the Alberta Cancer Board. The goal of the project is to study the connections between lifestyle (how people spend their time, eat, exercise, etc.) and cancer. The researchers will be using 50,000 randomly-selected people in Alberta.

The study will go on for the next twenty or thirty years. Every few years, the people participating in the study will be asked to provide information about their health and lifestyle. Over time, the researchers will be able to see patterns between people's health and the lifestyle they lead. This information will be used to draw conclusions about the type of lifestyle that increases or decreases a person's chances of getting cancer.



1. Why is cancer research important?

2. What do you think researchers will learn about how lifestyle affects a person's chances of getting cancer?

3. How can cancer research affect the way people live their lives?

Part H: How do diseases affect human health?

Heart Disease

Heart disease is the most common cause of death in North America. Some of the things that increase your risk of getting heart disease cannot be changed. These include your age, your gender (male or female), or a family history of heart disease. There are other risks you can control. Research has shown that:

- Smoking damages the lining of your arteries (blood vessels). It also narrows the arteries, which increases your blood pressure and stops blood from flowing (moving) to the heart properly.
- High cholesterol causes fat to build up in your arteries. The higher your cholesterol, the greater your risk for heart disease.
- High blood pressure happens when blood presses too hard on the walls of the arteries. This damages the lining of the vessels.
- Gaining weight makes your heart work harder. This raises your risk of a heart attack.
- Not getting enough exercise can double your risk for heart disease. That is because the heart is a muscle and being active helps to keep it strong.
- Stress increases your blood pressure and how fast your heart beats (heart rate). Both can damage the lining of the arteries.
- Diabetes causes the amount of sugar in your blood to get too high. Over time, high blood sugar damages the lining of the arteries.

1. Why is research into heart disease important?

2. What kinds of things are bad for your heart?

3. How can you make your heart stronger?

Final 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. Research and identify the main effects that pollution has on the respiratory system. Consider short-term and long-term problems and conditions that affect different age groups.
2. Research and identify the effects of smoking and secondhand smoke on the respiratory system. Consider problems ranging from discomforts to fatal diseases.
3. Research and identify the effects of diet on the digestive system. Consider positive and negative effects of food choices.

