



Little Things

> Section A) Little Things Mean a Lot

Have you ever heard the expression “can’t see the forest for the trees”? We use this expression when someone is focused on one part of something and doesn’t see the whole picture. When we think of forests, usually the first thing we think of are the trees, but there are so many other organisms that live in a forest, and that the entire forest relies on to survive. Some of these organisms are so small we can’t see them without a microscope. They may be tiny, but they are an essential part of the forest ecosystem that many plant and animal species depend on.

When you pick up a handful of soil in the forest, it contains billions of tiny microbes like bacteria and fungi, but they’re so small you won’t even know they’re there.

To introduce you to these tiny organisms, first you have to shrink until you’re smaller than Alice in Wonderland, and even smaller than a grain of sand.

Ready, set...Shrinkkkkkkkkkkkkkkk

Now you’re little enough to see some of the tiniest inhabitants of the forest. Just be careful not to get eaten by any gigantic fleas or humungous mites!



Name: _____

1. Fungi



Many types of fungi live in the forest. Some you can see while others are too small. Some are like the mushrooms that you eat, while others are made up of no more than one cell.

Fungi belong in a kingdom of their own, separate from plants, animals, and other organisms. Fungi differ from plants and animals in the way they obtain their nutrients.

When animals eat, we swallow food and our stomachs produce enzymes (natural chemicals) that digest our food by breaking it down into basic nutrients. We can then absorb the nutrients. Fungi grow in or around stumps and fallen leaves and produce enzymes to break this material down as food *before* they absorb it. Imagine if your food started digesting as soon as you touched it. You wouldn't need a mouth, or teeth, or a stomach. Once food is broken down, fungi can absorb it through their outer skin.

As fungi decompose (break down) dead leaves and wood to absorb as food, they also release some of the nutrients into the soil. In this way, they provide nutrients to other plants and animals. And by breaking down dead plant material, they also make room in the forest for new life to grow.

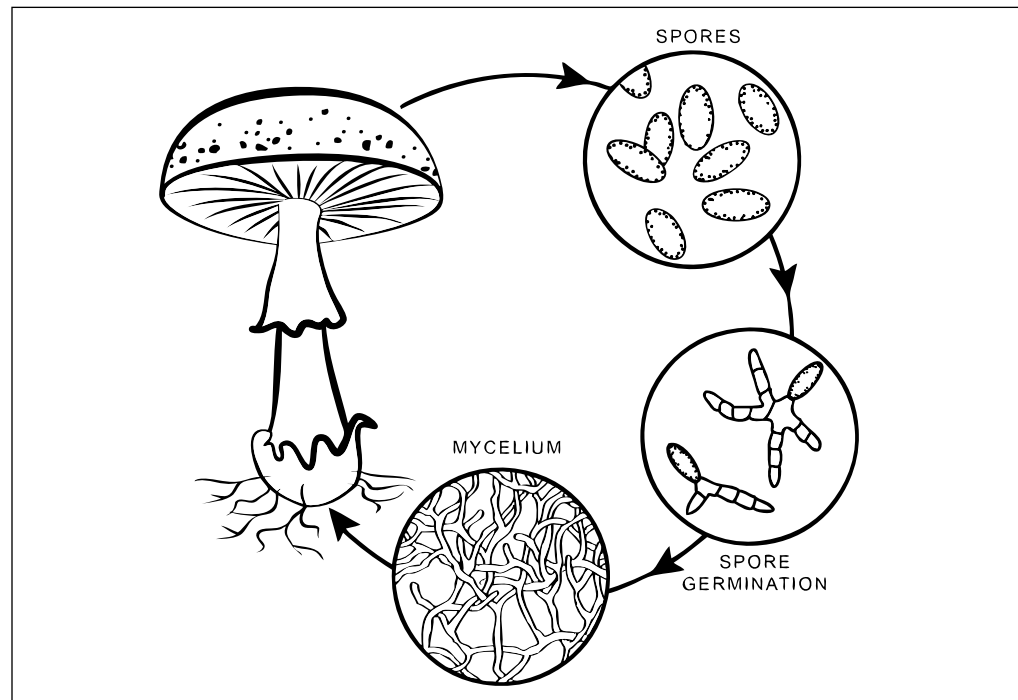
Canon



Name: _____

The mushroom that you eat is only part of a larger fungus. It's like fruit from a tree. Mushrooms sprout long microscopic strands called mycelia that grow in the soil. In many species mycelia wrap around tree roots underground. They are so thin that we can't see them, but they grow so long they can extend for miles underground!

As the mushroom's mycelium weaves itself around the root, the mushroom absorbs water and breaks down minerals for the tree. In return, the tree gives the mushroom nutrients too. Both the mushroom and the tree benefit from this relationship. This kind of cooperative relationship between two living organisms is called symbiosis.



Like tree fruit, mushrooms also produce tiny seeds, called *spores*. Spores are too small for us to see. The mushroom releases thousands of spores from under its cap or top. They blow away in the wind, landing in the soil to produce new fungi. Some animals eat mushrooms, and carry the spores in their droppings. If conditions are right, new fungi will grow in the soil where the droppings are left.





Name: _____

i) Humans eat many types of fungi but some are poisonous to us. Both poisonous and edible mushrooms can be found in the boreal forest. Using the Internet or an encyclopedia, research and draw one poisonous and one non-poisonous mushroom from the list below.

- destroying angel
- chanterelle
- sulfur tuft
- morel

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ii) Humans are not the only animals that eat fungi. Do some research on the Internet or using an encyclopedia and draw and name two boreal forest animals that also eat fungi.

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*** Remember! Only fungi experts can tell which mushrooms are poisonous...so don't touch any!**





Name: _____

2. Bacteria

Bacteria are single-celled organisms that grow in almost every habitat on Earth. In the forest, there are usually millions of bacteria living in every gram of soil, or millilitre of water. They also live on the skin and in the digestive tracts of animals. In fact, the human body contains ten times more bacteria cells than it does human cells!

Most bacteria are harmless to animals and humans. Some help us digest food, while others make us sick or give us diseases. Sometimes, even bacteria that cause disease are necessary in a forest ecosystem. They can help control the population of over-abundant plants and animals by removing a few weak or old specimens.

Bacteria on the forest floor are necessary for the final stages of decomposition. Without bacteria, the remains of dead trees and fallen leaves would accumulate on the forest floor. Instead, bacteria break even the smallest bits into nutrients that can be absorbed by living plants.

Do some research to answer the following questions about bacteria:

- i) Humans sometimes add living bacteria to our food to change the flavour or texture. Draw pictures and label two types of food to which we add bacterial cultures.

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Name: _____

3. Algae

Like fungi, algae can range in size from one-celled organisms to multicellular forms like sea kelp. Algae are similar to plants because they can convert sunlight into food by photosynthesis. Like plants, algae release oxygen into the atmosphere as a byproduct of photosynthesis. In fact, it is estimated that algae produce over 70 percent of the oxygen in the Earth's atmosphere! However, unlike plants, algae have no leaves, roots, flowers, or seeds. They are usually found in damp places or in bodies of water.

In the forest, tiny algae are found floating in ponds, rivers, and puddles. Although they are too small to see individually, sometimes a heavy population of algae will give puddles and ponds a green or brown tinge. Algae provide food for many species of animals living in and around the water.

Do some research to complete the following activities about algae:





Name: _____

i) Draw two boreal forest animals that eat algae:

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ii) Pretend you are a single-celled algae living in a pond. Describe what you see in the water (don't forget how small you are). How do you get food? Where do you live? Who wants to eat you? Can you move to get away from your predator? You may need to do a little research to answer these questions!





> **Section B) Cells**

Cells are often called “the building blocks of life.” Each cell in an organism carries out the functions that we need for survival, like respiration and reproduction.

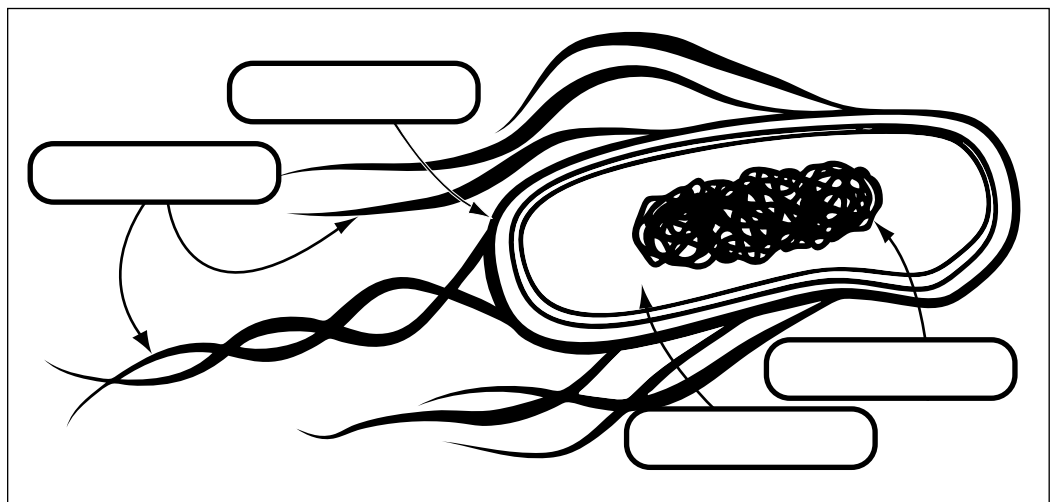
All living organisms are made up of one cell or groups of cells. Humans are multicellular, meaning they are made up of many cells. In fact, one human is made up of trillions of cells. That’s more than 1 000 000 000 000 cells in one human body!

Even your little toe has billions of cells in it. Look at a strand of your hair. The diameter of each strand is about the diameter of the largest cells in your body. Some human cells are so small you could fit 10 in the diameter of one strand of hair.

Some tiny living things, like many species of algae and bacteria, are unicellular, meaning they are made up of only one cell.

1. Diagram of a Single-Cell Bacterium

Use the information below to label the parts of a bacterium cell.





Name: _____

- Cell membrane

The outer layer of the cell is called the cell membrane. A single-celled organism absorbs nutrients through the cell membrane.

- Cytoplasm

Inside the cell is a watery fluid called cytoplasm that contains the nutrients that the cell needs.

- Flagellum

Attached to the cell membrane are long strands called flagella (singular: flagellum). These flagella are like tails that move back and forth to help the organism move. Some unicellular organisms are covered in shorter hair-like tails called cilia.

- DNA

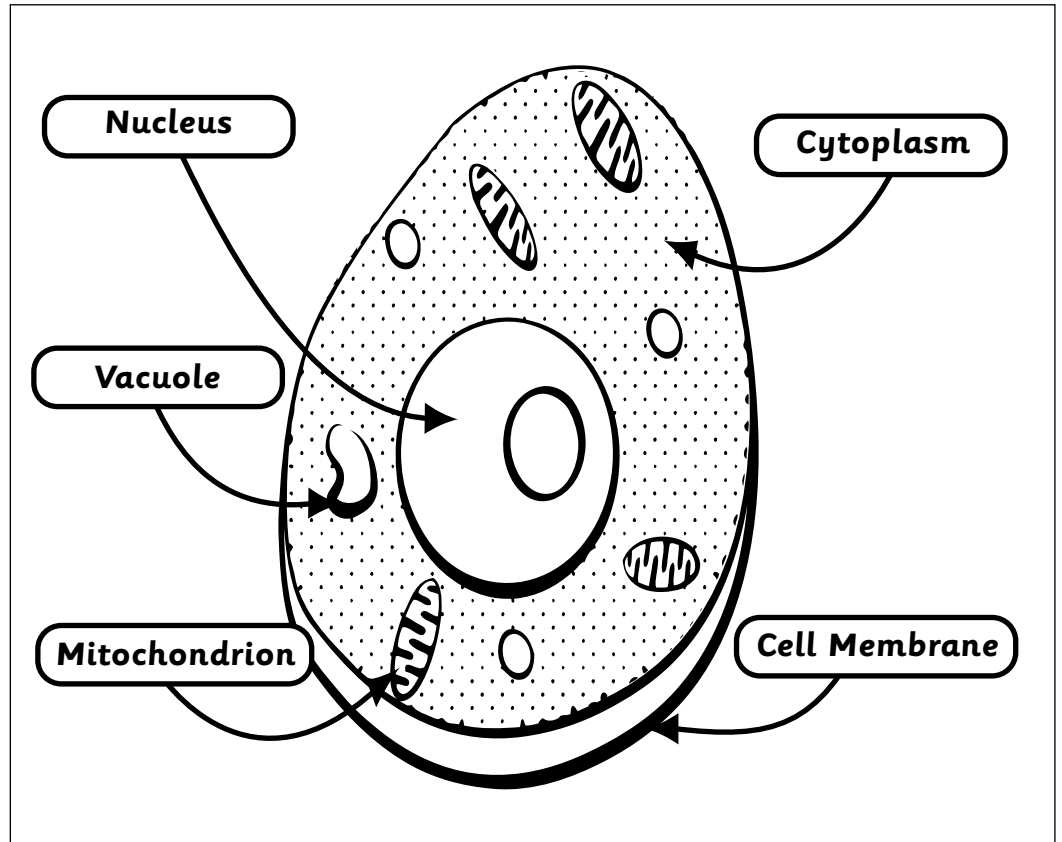
At the centre of the cell is something that looks like a ball of string. These long, tangled strands are DNA. DNA carries all the information that a cell needs to reproduce and survive.

Canon



Name: _____

2. Diagram of an Animal Cell



- Cell membrane
- Cytoplasm
- Mitochondrion
Mitochondria convert nutrients into energy to power the cell.
- Vacuoles
Vacuoles are small, fluid-filled chambers that act as a storage area for water, nutrients, and waste.
- Nucleus
The nucleus contains the cell's DNA.

Canon



Name: _____

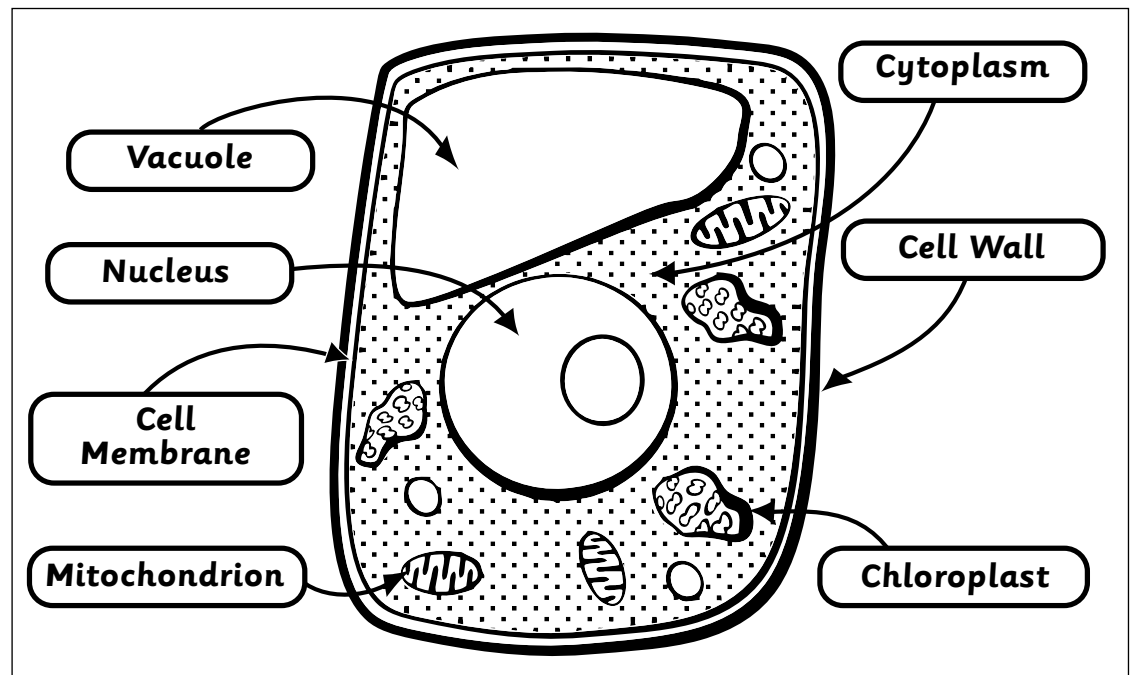
i) Match and Learn

To understand how parts of the cell function, think of them as parts of a machine – like a car. In both cases, each part has a specific function to keep the machine running smoothly. Draw a line to match up the part of a cell that functions similarly to the part of a car.

Cell membrane
Cytoplasm
Mitochondrion
Vacuoles
Nucleus

Driver
Gasoline
Engine
Car frame
Gas tank

3. Diagram of a Plant Cell



• Cell Wall

In addition to a cell membrane, plant cells are surrounded by a thick, rigid cell wall. Since plants don't have shells or skeletons, these rigid walls help keep plants upright.





Name: _____

- Cell Membrane

- Cytoplasm

- Mitochondria

- Vacuole

Plant cells also have one large vacuole that helps the cell stay rigid. As in animal cells, vacuoles are also used for storage.

- Chloroplast

Plant cells also contain chloroplast, which converts sunlight to food. This is the site of photosynthesis.

- Nucleus

The nucleus contains the cell's DNA.

i) What parts do all three types of cells (bacterium, animal, and plant) have in common?





Name: _____

ii) How do plant cells differ from animal cells?

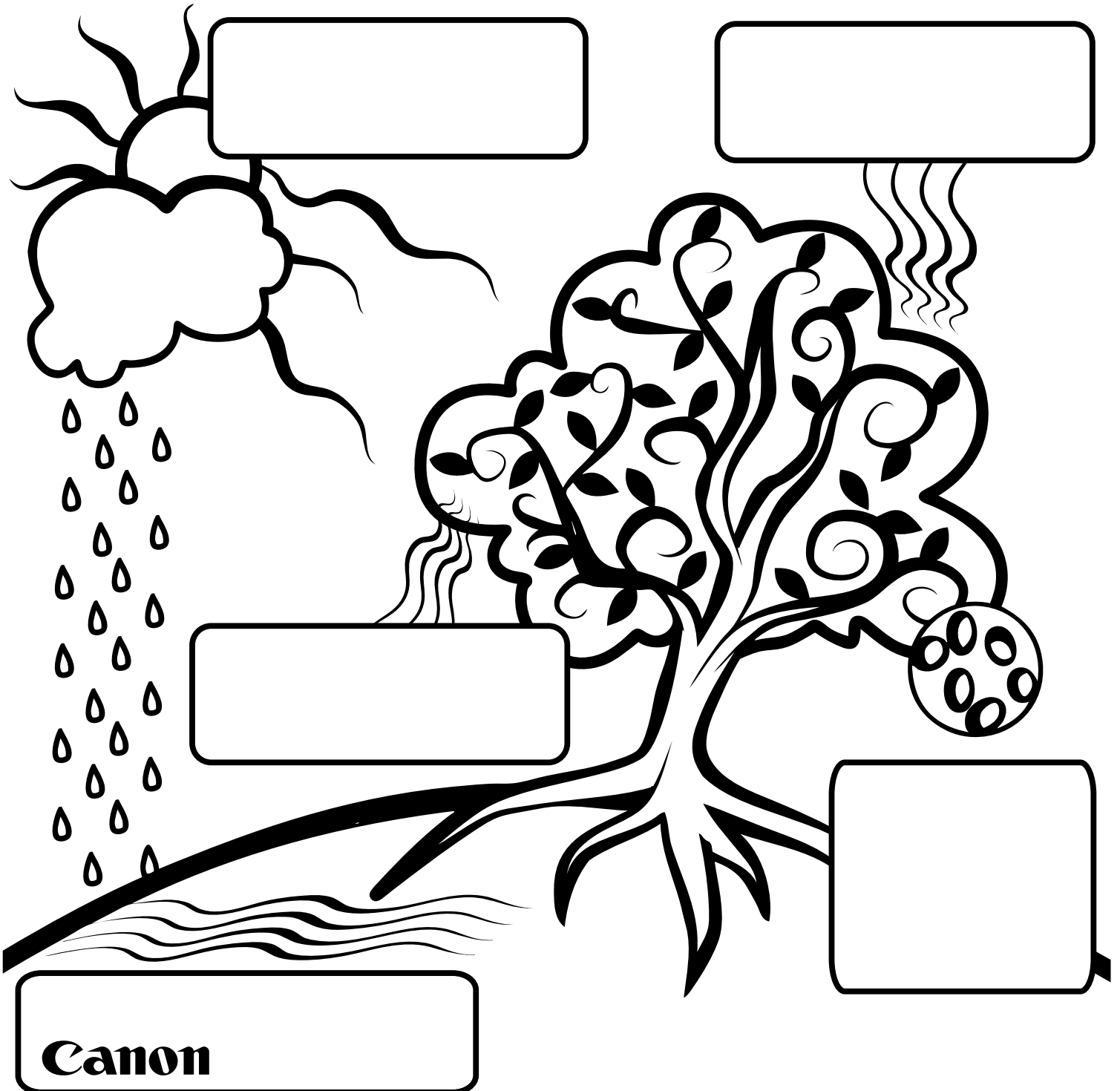
iii) How do plant cells differ from bacteria cells?





Name: _____

iv) Do some research to review photosynthesis. Fill in the boxes below to show how sunlight, water, oxygen, carbon dioxide and chloroplast are all part of photosynthesis.





Name: _____

Understanding Language

v) Often when we want to specify that there is more than one of something, we add the letter “s” to the end of a word. But some scientific words have other endings to make plural forms.

SINGULAR	PLURAL
A mushroom is a type of <i>fungus</i> .	There are many types of <i>fungi</i> in the forest.
Each fungus has a <i>mycelium</i> .	All the fungi in the forest have <i>mycelia</i> .
Each <i>bacterium</i> is surrounded by a cell membrane.	Many types of <i>bacteria</i> live in our bodies.
The <i>mitochondrion</i> in each cell converts nutrients to energy.	<i>Mitochondria</i> are present in all animal and plant cells.
The <i>nucleus</i> of each cell contains DNA.	Almost all <i>nuclei</i> in the cells of our bodies contain DNA.
An <i>alga</i> is too small to see with your eyes.	If there is a lot of <i>algae</i> growing in a pond, the water may have a greenish tinge.
A <i>flagellum</i> is a long strand attached to the cell membrane of certain types of bacteria.	Some bacteria cells have multiple <i>flagella</i> that move back and forth to help the organism move.





> **Section C) Different Types of Cells:**

See for yourself!

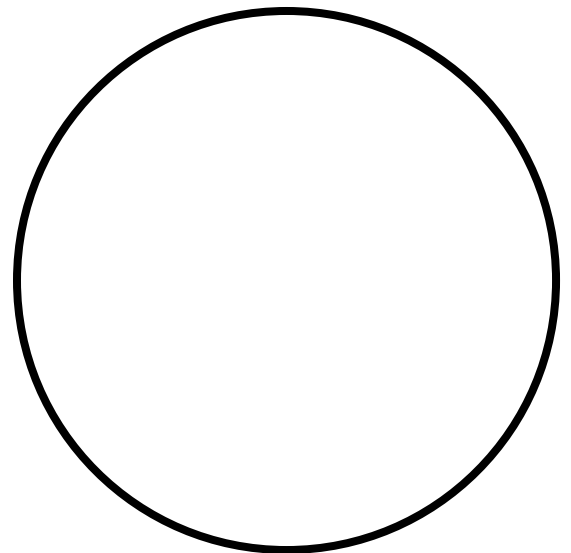
1. Viewing Plant Cells.

Did you know that the thin skin forming the layers of an onion is exactly one cell deep? If you peel a piece off and hold it up to the light, you'll see it's almost transparent. The individual cells are too small to see with your eye, so try viewing them under a microscope.

- Peel off a small piece of onion skin and carefully place it on a clean slide. Use tweezers to pick it up by one edge so you don't crush the cells. Try to lay it flat without folds or wrinkles.
- Add a drop of iodine (or food colouring). This will act as a stain to help you see the translucent parts of the cell a little more clearly.
- Carefully lower a cover slip over the slide. Don't touch the surface of the glass near your sample or you'll leave fingerprints!
- Observe the onion skin through the microscope.

i) Draw what you see.

ii) Label the cell wall,
cell membrane,
cytoplasm
and nucleus.





Name: _____

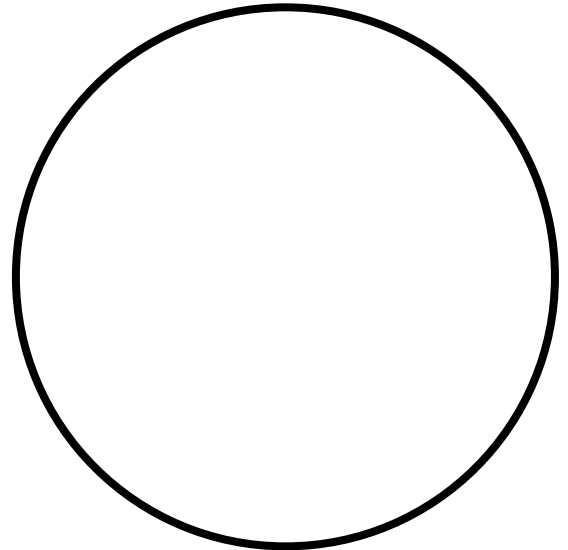
2. Viewing a Unicellular Organism

The yeast we use for baking bread is actually a single-celled fungus. As the yeast feeds on sugar in the bread dough, it releases carbon dioxide, which creates little bubbles of air that make the bread rise.

- Dissolve baker's yeast in warm water (follow package instructions).
- Use an eyedropper to place a drop of the yeast water on a clean slide.
- Carefully lower a cover slip over the slide. Don't touch the surface of the glass near your sample or you'll leave fingerprints!
- Observe your cells through the microscope.

i) Draw what you see:

ii) Label the cell membrane and cytoplasm.





Answers: Little Things

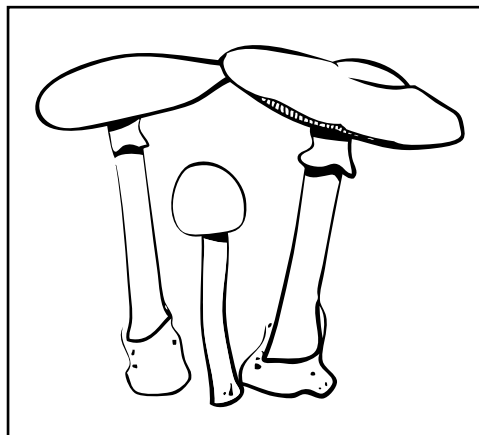
> Section A) Little Things Mean A Lot

1. Fungi

i)

The destroying angel

- One of the deadliest types of mushroom in the world.



Morel

- One of the most sought after mushrooms for eating.



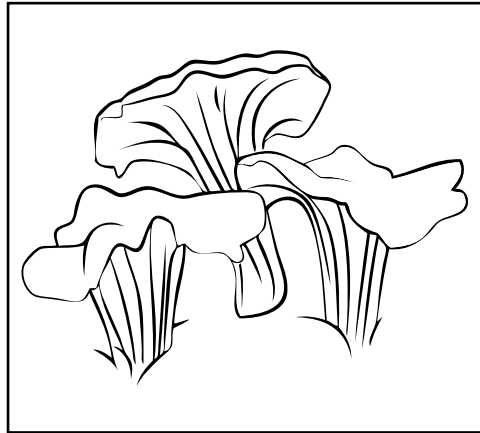
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Answers: (continued)

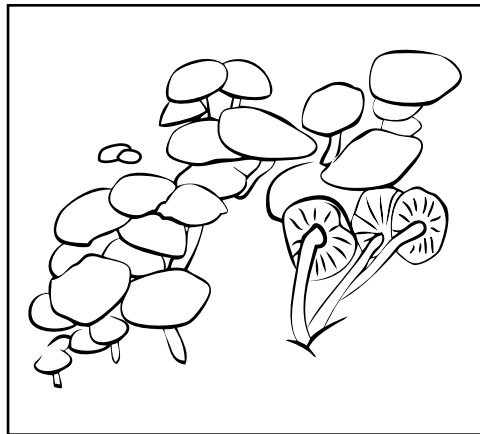
Chanterelle

- Edible with a delicious peppery taste.



Sulfer tuft

- Can be poisonous, but not deadly. Some people eat them.



ii) Open

Possible answers include:

- Caribou, deer, elk and moose eat mushrooms and lichen.
- Squirrels, turtles, voles, chipmunks, bears, boars and some birds eat mushrooms, morels, some bracket fungi, puffballs and other fungi.
- Fly larvae, beetles and other insects eat various types of fungi.
- Some beetles eat slime molds.

Canon



Answers: (continued)

2. Bacteria

i) Open

Possible answers include:

- Beer
- Yogurt
- Cheese
- Wine
- Any alcoholic beverage
- Soya sauce
- Buttermilk
- Sour cream
- Vinegar
- Sauerkraut/Kimchi
- Any type of pickles

ii) Open:

Possible answers include:

- Meningitis: Bacterial meningitis is usually caused by *Haemophilus influenzae*, *Streptococcus pneumoniae*, or *Neisseria meningitides*. The bacteria can spread from coughing or kissing, but it's not as contagious as the flu so just breathing the same air won't cause infection. The disease is caused by a bacterial infection in the spinal fluid and in the fluid around the brain. Symptoms include high fever, headache, a stiff neck, and sometimes nausea, sleepiness, and confusion. It can cause hearing loss, brain damage, or learning disabilities. Most children in Canada are immunized against meningitis. If caught early, it can be treated with antibiotics.
- Pneumonia (*Streptococcus pneumoniae*) attacks the lungs and causes difficulty in breathing. Symptoms include trouble breathing, coughing, fever, and chest pains. Can be treated with antibiotics. People in countries without proper health care, and elderly or immune suppressed people may also die from it. Bacteria typically are inhaled.
- Tuberculosis (*Mycobacterium tuberculosis*) is a disease spread through the air by coughing, spitting speaking or sneezing. It attacks the lungs. Symptoms include bad coughs, pains in the chest, coughing up blood, weakness, chills, and fever. Can be treated with antibiotics, but still kills when not treated quickly and carefully.

Canon



Answers: (continued)

3. Algae

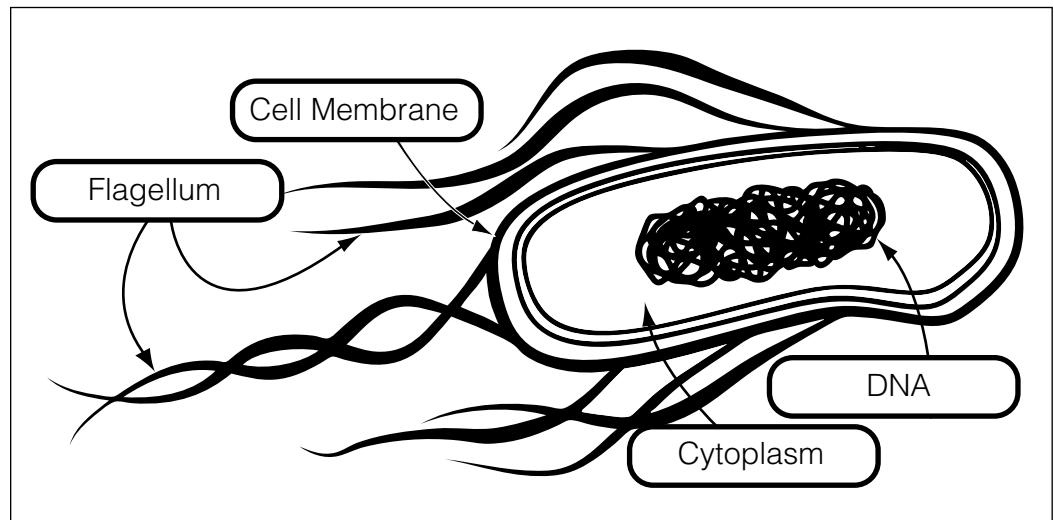
i) Open

Possible answers include:

- Frogs, tadpoles, salamanders, turtles, snails
- Many types of fish, especially bottom feeders like catfish
- Crayfish and freshwater shrimp
- Mayfly, dragonfly and mosquito larvae.

> Section B) Cells

1, Diagram of a Single-Cell Bacterium



2. i)

- Cell membrane - body
- Cytoplasm - gasoline
- Mitochondrion - engine
- Vacuoles - gas tank
- Nucleus - driver

3. i)

- Cell membrane
- Cytoplasm
- DNA

Canon



Answers: (continued)

ii)

- The plant cell has a rigid cell wall and animal cells just have a cell membrane.
- Plant cells have one large vacuole, and animal cells have several small ones.
- Plants have chloroplast, and animal cells do not.

iii)

- Bacteria cells don't have a nucleus to contain the DNA.
- Plant cells don't have flagella or cilia.
- Bacteria cells don't have a rigid cell wall.
- Bacteria cells don't have chloroplast.
- Bacteria cells don't have mitochondrion
- Bacteria cells don't have vacuoles.

iv) Sunlight:

Sunlight is absorbed through the plant's leaves as a source of energy.

Chloroplast:

Chloroplast converts sunlight into energy for the plant cell.

Carbon dioxide:

Plants absorb carbon dioxide and use it, along with water, to convert sunlight to energy.

Oxygen:

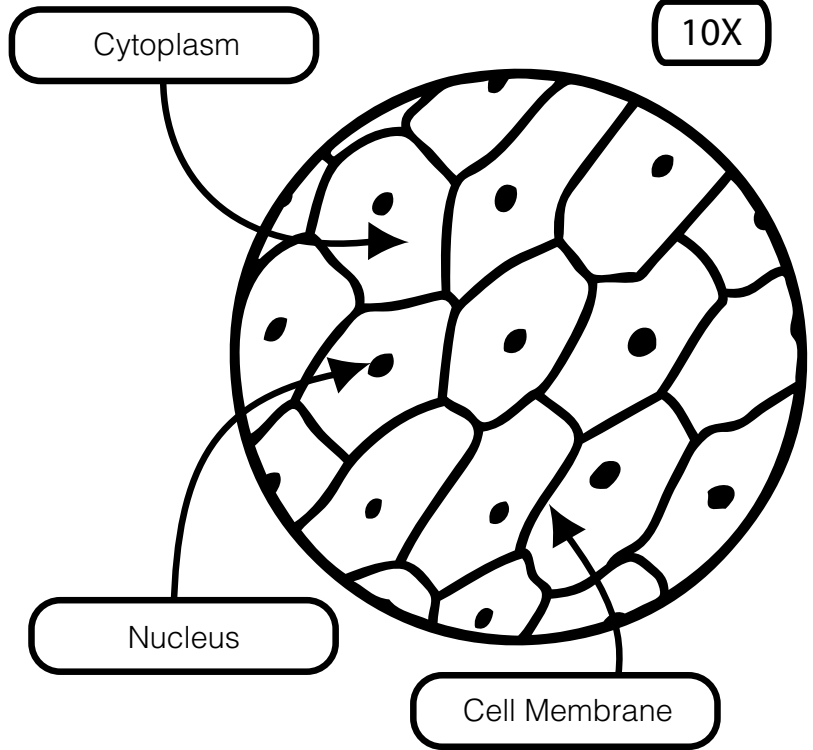
Oxygen is a bi-product of photosynthesis that the plant releases into the atmosphere.

Water:

Plants absorb water through their roots (and sometimes their leaves) and use it, along with carbon dioxide, to convert sunlight into energy.

> Section C) Different Types of Cells

1. Onion skin



2. Yeast cell

