

What makes something living?

➤ Scientists that study living things are called biologists.

➤ Bio=life and -ology=study of

➤ We study Life Science Or Biology

➤ All living things:

1. are made up of **cells**
2. **reproduce**
3. have **DNA**
4. **grow and develop**
5. obtain **energy (metabolize)**
6. **respond to stimuli**
7. maintain **homeostasis** (stability)
8. **adapt/evolve**

For each of the following scenarios, list which characteristic of life applies.

1. A fish lays 100 eggs but only 65 are fertilized and result in healthy babies.

2. When Cindy year old she now weighs 145lbs.

3. Kim and Kyle were lab partners. When Kyle sneezed Kim jumped back and said, "Ewwwww Kyle! Cover your mouth when you sneeze. I don't want your germs!"

Warm Up

1. A fish lays 100 eggs but only 65 are fertilized and result in healthy babies.

Cells, evolution, reproduction

2. When Cindy year old she now weighs 145lbs.

Growth and Develop,

3. Kim and Kyle were lab partners. When Kyle sneezed Kim jumped back and said, “Ewwwww Kyle! Cover your mouth when you sneeze. I don’t want your germs!”

Response to Stimuli, cells, ,homeostasis

Warm Up For each of the following scenarios, list which characteristic of life applies.

4. Before his morning run James makes sure he eats a hearty breakfast so that he has the nutrients to run the entire 5 miles he planned to.

5. When there is too much sugar in your bloodstream the pancreas secretes insulin. The role of insulin is to move glucose from the blood into muscle, fat, and liver cells where it can be used as fuel.


4. Before his morning run James makes sure he eats a hearty breakfast so that he has the nutrients to run the entire 5 miles he planned to. **Use energy, cells, response to stimuli**

5. When there is too much sugar in your bloodstream the pancreas secretes insulin. The role of insulin is to move glucose from the blood into muscle, fat, and liver cells where it can be used as fuel. **Cells, response to stimuli, use energy**



Today I am going to
learn about the
characteristics of
Cells.

What Am I going to Learn Today?



What am I going to DO
today

- Complete Active Reading
- Review the Vocabulary (Unit Vocab in Reading)
- Highlight key ideas from reading.



Active Reading

3 Synthesize Many English words have their roots in other languages. Use the Greek words below to make an educated guess about the meanings of the words *prokaryote* and *eukaryote*. Here *kernel* refers to the nucleus, where genetic material is contained in some cells.

| Word part | Meaning |
|---------------|---------|
| <i>pro-</i> | before |
| <i>eu-</i> | true |
| <i>karyon</i> | kernel |

prokaryote:

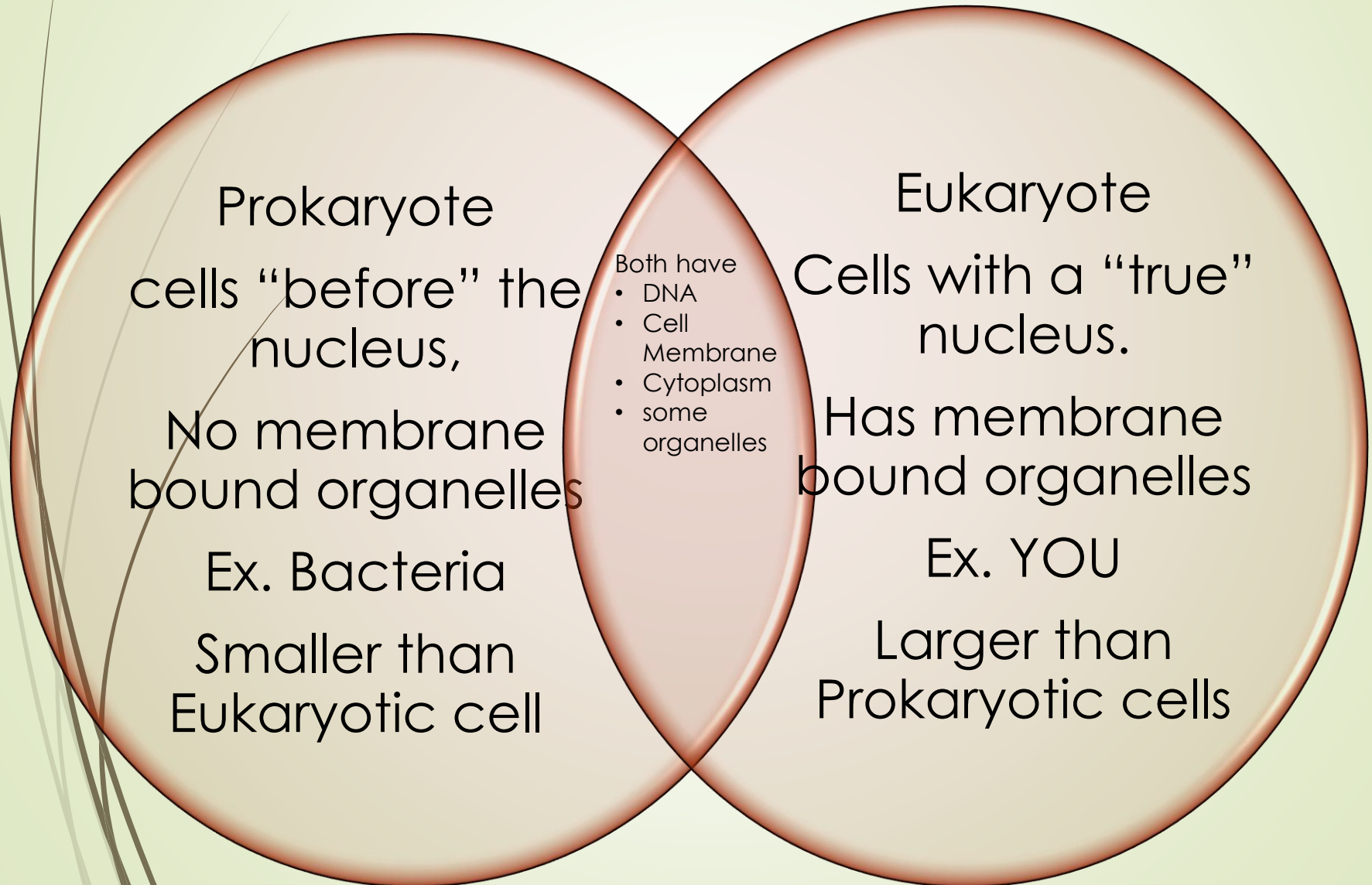
eukaryote:

Vocabulary Terms

- cell
- organism
- cell membrane
- cytoplasm
- organelle
- nucleus
- prokaryote
- eukaryote

4 Apply As you learn the definition of each vocabulary term in this lesson, create your own sketches of a prokaryotic cell and a eukaryotic cell and label the parts in each cell.

Compare/Contrast the 2 types of Cells



Cell Hall of Fame

What is the cell theory?

Scientific knowledge often results from combining the work of several scientists. For example, the discoveries of Matthias Schleiden (muh•THY•uhs SHLY•duhn), Theodor Schwann (THEE•oh•dohr SHVAHN), and Rudolf Virchow (ROO•dawlf VIR•koh) led to one very important theory called the *cell theory*. The cell theory lists three basic characteristics of all cells and organisms:

- All organisms are made up of one or more cells.
- The cell is the basic unit of all organisms.
- All cells come from existing cells.

The cell theory is fundamental to the study of organisms, medicine, heredity, evolution, and all other aspects of life science.



Visualize It!

Provide As you read, fill in the missing events on the timeline.

Model of Hooke's microscope



1673

Anton van Leeuwenhoek made careful drawings of the organisms he observed.

1665

Robert Hooke sees tiny, box-like spaces when using a microscope like this to observe thin slices of cork. He calls these spaces cells.

1858

Rudolf Virchow



Think Outside the Book **Inquiry**

- 9 **Explain** How can microscopes help you see cells? First, think of a good place to collect a sample of cells. Then, in a paragraph, describe how to prepare a microscope slide to observe those cells.



Cells of an iris petal

1838
Matthias Schleiden

1839
Theodor Schwann



Butterfly wing cells

This iris and butterfly are multicellular organisms made up of many cells.

All Organisms Are Made Up of One or More Cells

Anton van Leeuwenhoek (AN•tahn VAN LAY•vuhn•huk) was the first person to describe actual living cells when he looked at a drop of pond water under a microscope. These studies made other scientists wonder if all living things were made up of cells. In 1838, Matthias Schleiden concluded that plants are made of cells. Then in 1839, Theodor Schwann determined that all animal tissues are made of cells. He concluded that all organisms are made up of one or more cells.

Organisms that are made up of just one cell are called *unicellular organisms*. The single cell of a unicellular organism must carry out all of the functions for life. Organisms that are made up of more than one cell are called *multicellular organisms*. The cells of multicellular organism often have specialized functions.

The Cell Is the Basic Unit of All Organisms

Based on his observations about the cellular make up of organisms, Schwann made another conclusion. He determined that the cell is the basic unit of all living things. Thus, Schwann wrote the first two parts of the cell theory.

All Cells Come from Existing Cells

In 1858, Rudolf Virchow, a doctor, proposed that cells could form only from the division of other cells. Virchow then added the third part of the cell theory that all cells come from existing cells.

Active Reading

- 10 **Summarize** What is the cell theory?

What are the two types of cells?

Although cells have some basic parts in common, there are some important differences. The way that cells store their DNA is the main difference between the two cell types.

Prokaryotic

A **prokaryote** (proh•KAIR•ee•oht) is a single-celled organism that does not have a nucleus or membrane-bound organelles. Its DNA is located in the cytoplasm. Prokaryotic cells contain organelles called *ribosomes* that do not have a membrane. Some prokaryotic cells have hairlike structures called *flagella* that help them move. Prokaryotes, which include all bacteria and archaea, are smaller than eukaryotes.

Eukaryotic

A **eukaryote** (yoo•KAIR•ee•oht) is an organism made up of cells that contain their DNA in a nucleus. Eukaryotic cells contain membrane-bound organelles, as well as ribosomes. Not all eukaryotic cells are the same. Animals, plants, protists, and fungi are eukaryotes. All multicellular organisms are eukaryotes. Most eukaryotes are multicellular. Some eukaryotes, such as amoebas and yeasts, are unicellular.

Active Reading

- 12 Identify** As you read, underline the differences between prokaryotes and eukaryotes.

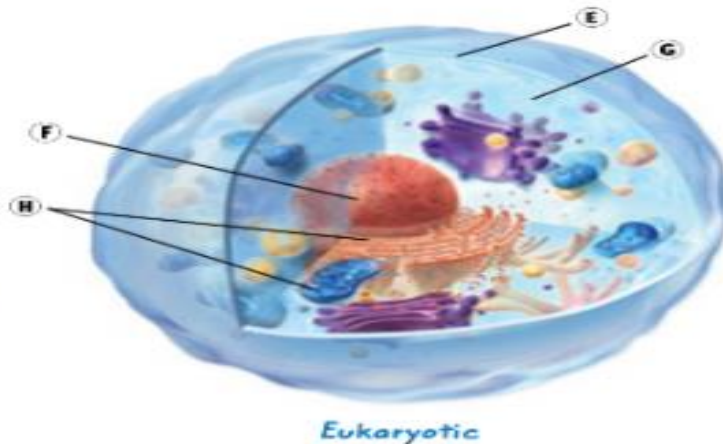
Visualize It!

- 13 Identify** Use the list of terms below to fill in the blanks with the matching cell parts in each cell. Some terms are used twice.

DNA in cytoplasm
DNA in nucleus
Cytoplasm
Cell membrane
Organelles



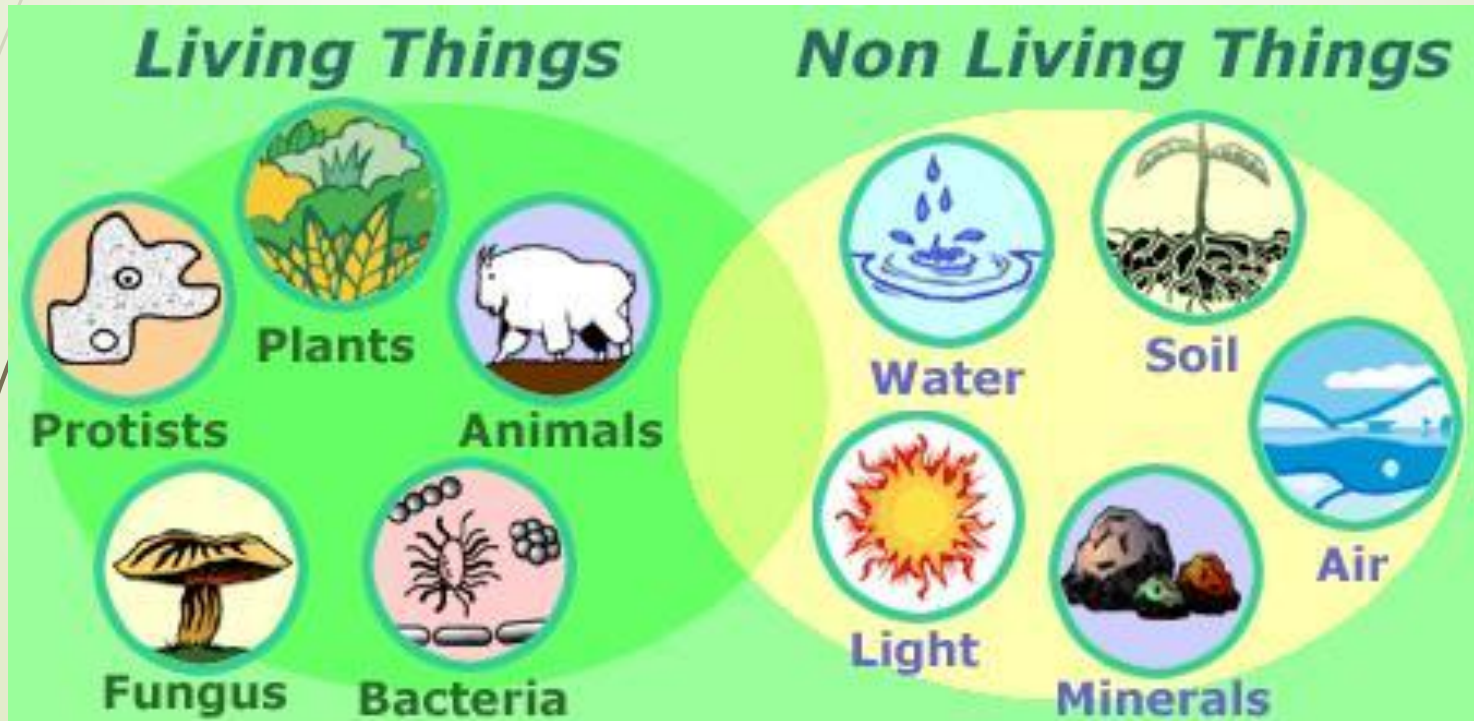
- A _____
B _____
C _____
D _____



- E _____
F DNA in nucleus
G _____
H _____

Characteristics of Living Things

- What makes something living DIFFERENT from something non-living?





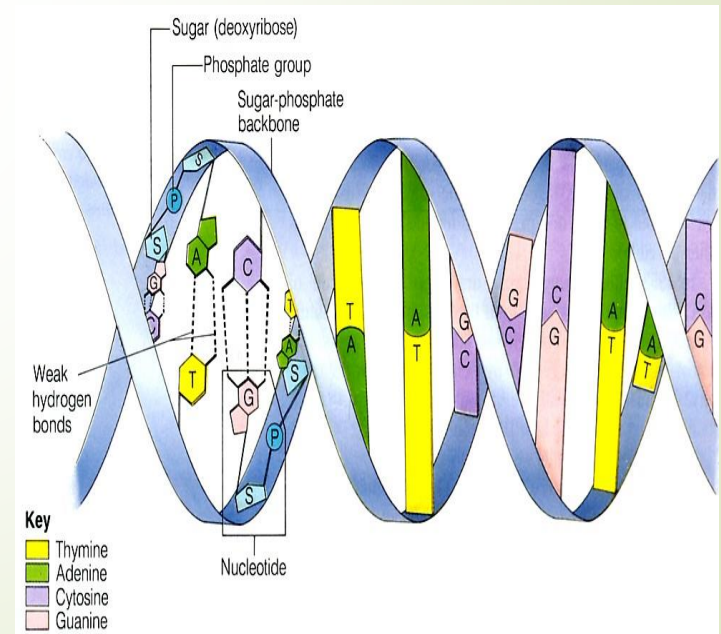
Characteristics of Living Things

- There are actually 8 characteristics that will tell you if something is alive.
- We call them “**Characteristics of Living Things**”
- Let’s examine each of them...

Characteristics of Living Things

1. Living things are based on a universal genetic code.

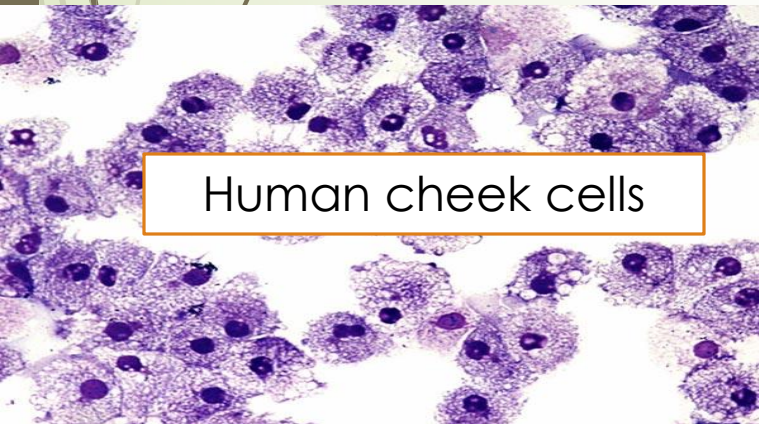
- **DNA controls the structure and function of cells.**
- **All organisms store information they need to live, grow, and reproduce in a genetic code written in a molecule called DNA.**
- **Characteristics of living things are passed on to the next generation.**



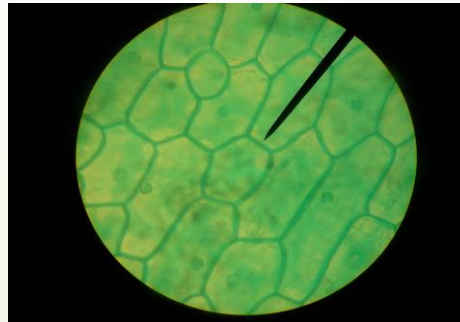
Characteristics of Living Things

2. Living things are made up of cells.

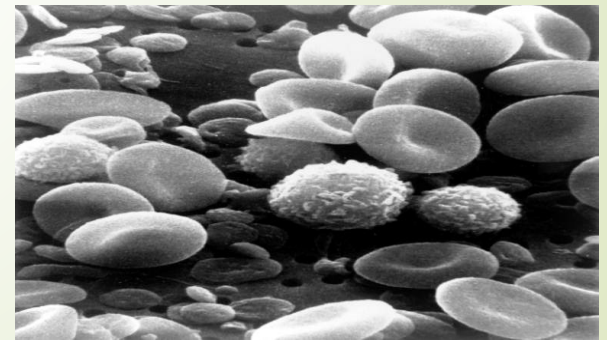
- Basic unit of life.
- All things composed of one or more cells.
- Cells are the smallest living things.
- Cells are complex and very organized.



Human cheek cells



Plant leaf cells

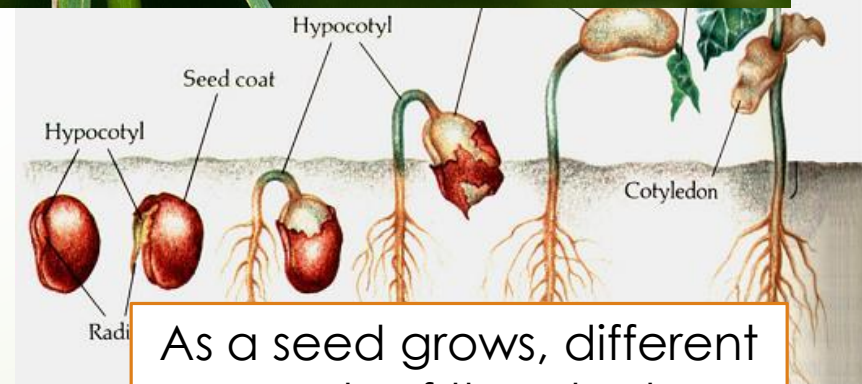


Blood cells

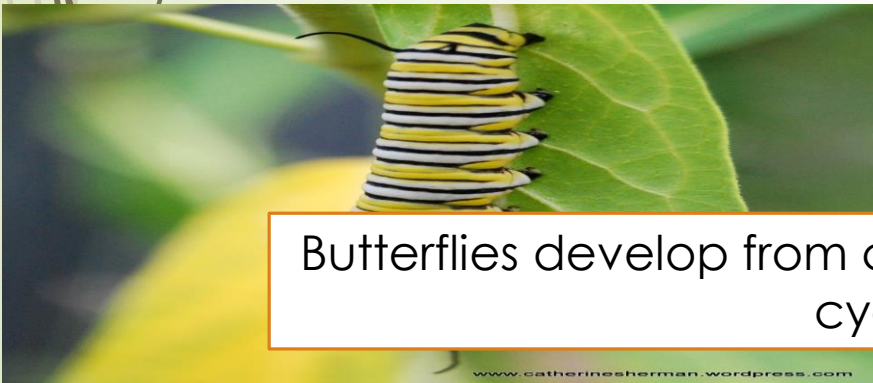
Characteristics of Living Things

3. Living things grow and develop.

- ▶ Living things may change as they grow.
- ▶ Every organism develops at a different rate.
- ▶ During development a single cell divides again and again.
- ▶ Increase in size.
- ▶ Mature over time.



As a seed grows, different parts of the plant develops.



Butterflies develop from caterpillars during their life cycle.

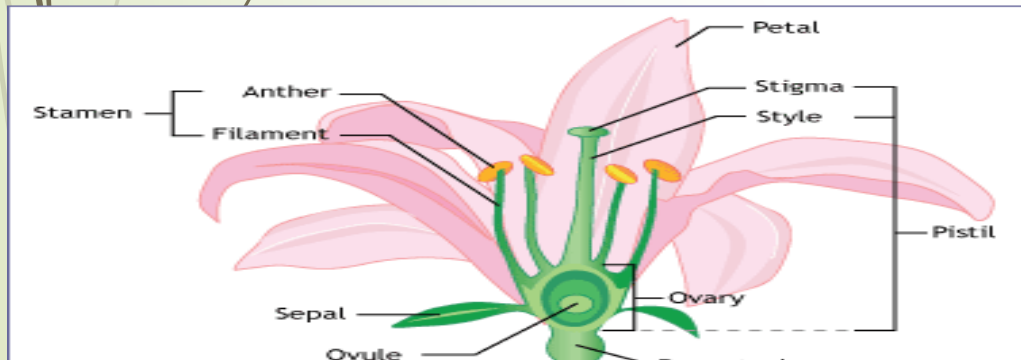
Characteristics of Living Things

4. Living things reproduce.

- **Organisms make other organisms similar to themselves.**
- **Organisms produce offspring.**
- **Sexual reproduction (2 parents)**
- **Asexual reproduction (1 parent)**



Birds have two parents, so these chicks are produced through sexual reproduction.



This flower has male and female sex cells, so it is using sexual reproduction.

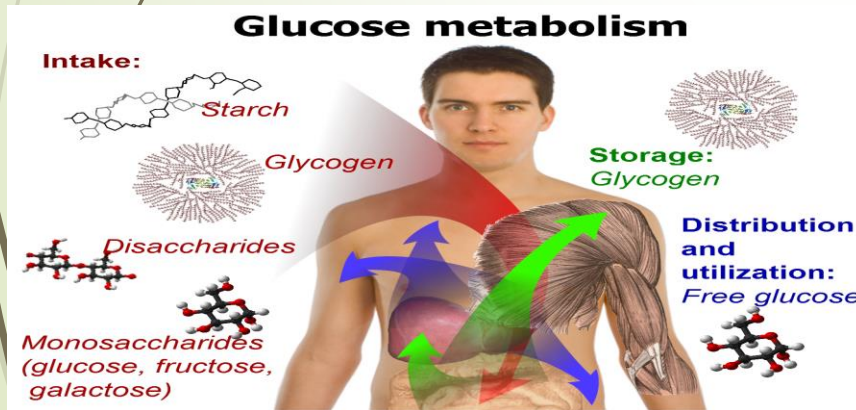


This fern has produced spores by dividing its own leaf cells. A fern uses asexual reproduction.

Characteristics of Living Things

5. Living things obtain and use material and energy.

- **Organisms either make their own food, eat other things, or break down dead material.**
- **All organisms must take in materials and energy to grow, develop, and reproduce.**
- **Chemical reactions breaks down materials in what is called metabolism.**



Characteristics of Living Things

6. Living things respond to their environment.

- **A stimulus is an external change.**
- **All living things respond to external changes or stimuli.**
- **Organisms detect and respond to signals from their environment.**
- **Sensitive and can react rapidly to surroundings.**



For example, plants respond to light by growing



Mammals respond to cold temperature by growing thicker fur.

Characteristics of Living Things

7. Living things maintain a stable internal environment.

- ▶ All organisms need to keep their internal environment relatively stable, even when external conditions change dramatically.
- ▶ This is called HOMEOSTASIS

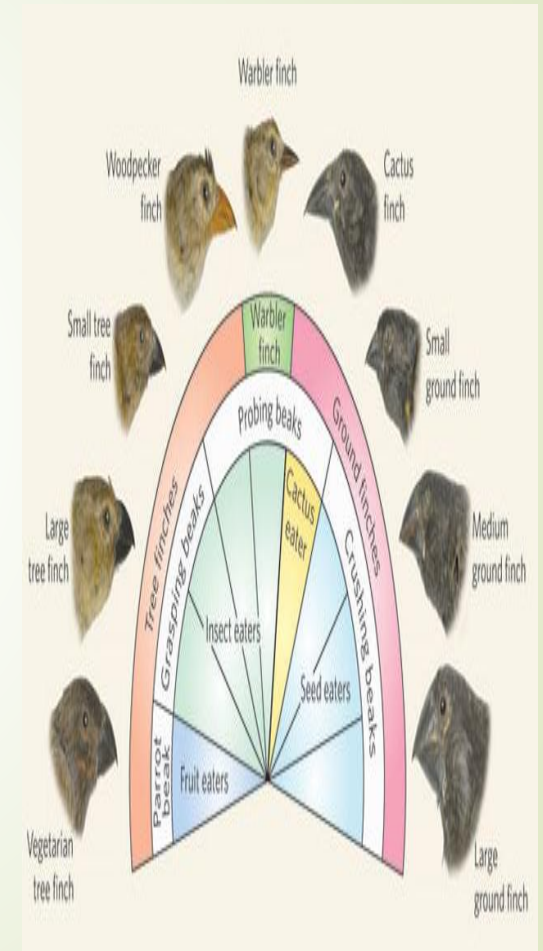
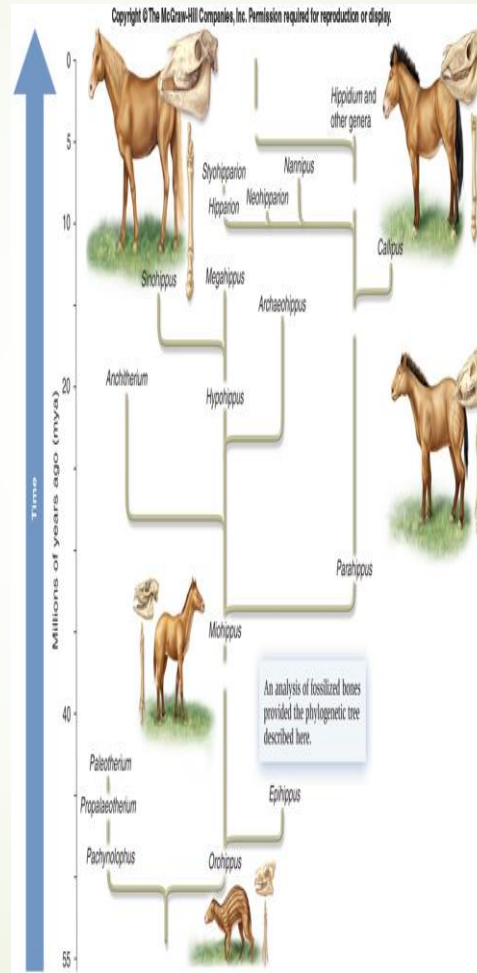


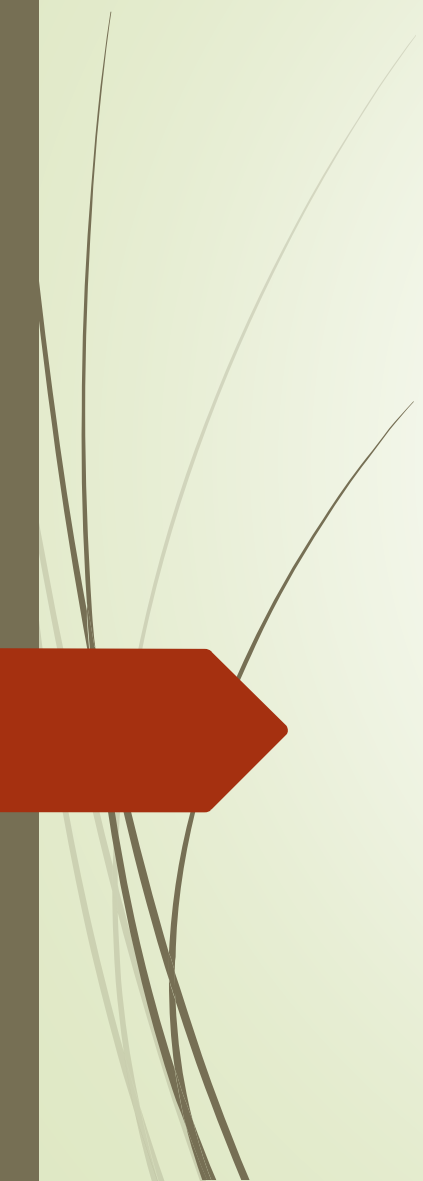
Thermal images show that even though the temperature outside the body is cool, inside there is warm and stable environment.

Characteristics of Living Things

8. Living things adapt to their environment through evolution

- ➔ **Evolution is change over a long period of time to better survive in an environment.**
- ➔ **Species will change not an individual organism.**
- ➔ **Due to variation, organisms with advantageous traits will survive and be able to reproduce.**





You can take any
living organism and
apply all eight
characteristics...

Example: Pigmy Seahorse

1. Living things are based on a universal genetic code (DNA):

The Pigmy seahorse has 48 chromosomes



Example: Pigmy Seahorse

2. Living things are made up of cells:

Seahorses have fewer cells than other ocean-dwelling animals.

All of the cells of the species *Hippocampus trimacutus* can fit inside it's 3 cm length body.



Example: Pigmy Seahorse



3. Living things grow and develop:

Most seahorses reach the age of reproduction at about 100 days old.

Example: Pigmy Seahorse

4. Living things reproduce:

Mature seahorses can reproduce 10-12 times each year.

Female seahorses will release several hundred eggs at



Example: Pigmy Seahorse



5. Living things obtain and use material and energy

Seahorses eat the larvae of small crustaceans.

This food provides the energy for seahorses to live.

Example: Pigmy Seahorse



6. Living things respond to their environment:

Seahorses can adapt to a variety of water temperatures.

They can only reproduce when the water is 20-28 degrees C.

When light intensity is too bright or too dim birth defects can occur in the babies.

Example: Pigmy Seahorse



7. Living things maintain a stable internal environment:

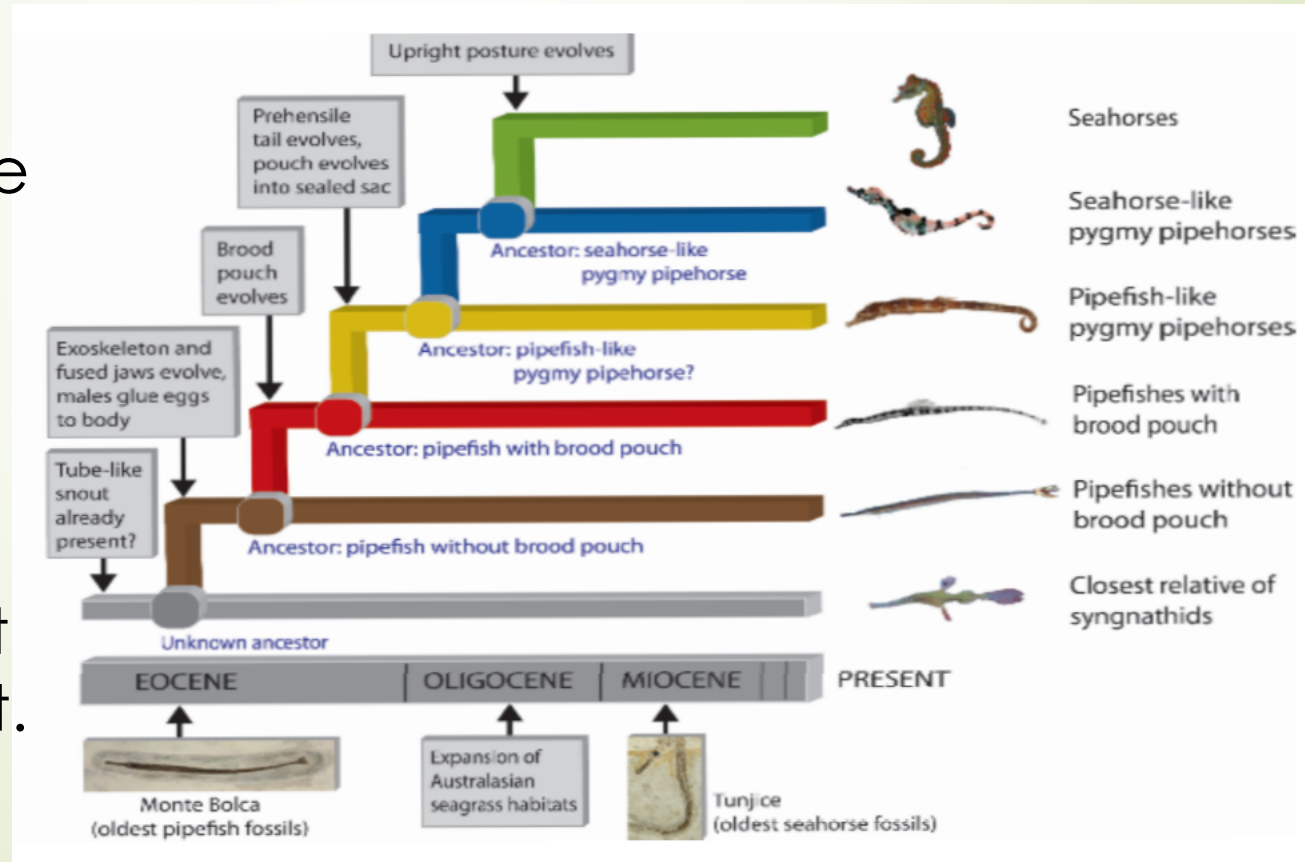
Seahorses are cold blooded, so their internal environment depends on the temperature of the water they are in.

They survive best in water that is 28 °C on average.

Example: Pigmy Seahorse

8. Living things adapt to their environment through evolution:

Seahorses have evolved over millions of years. Their ancestors did not have a tube like snout or swim upright.





How will I show what I have learned

- Cornell Notes Summary
- Review the questions from the “Alive or Not?” Lab
- Would you change any of your answers? Why?



Characteristics of Living Things

▶ Let's Summarize:

▶ Living things...

- Grow and Develop
- Are based on a universal genetic code
- Respond to their environment
- Are made of cells
- Reproduce
- Maintain a stable internal environment
- Obtain and use material and energy
- Adapt and evolve over time



Reference:

➤ <http://www.fao.org/docrep/field/003/AB736E/AB736E01.htm>

