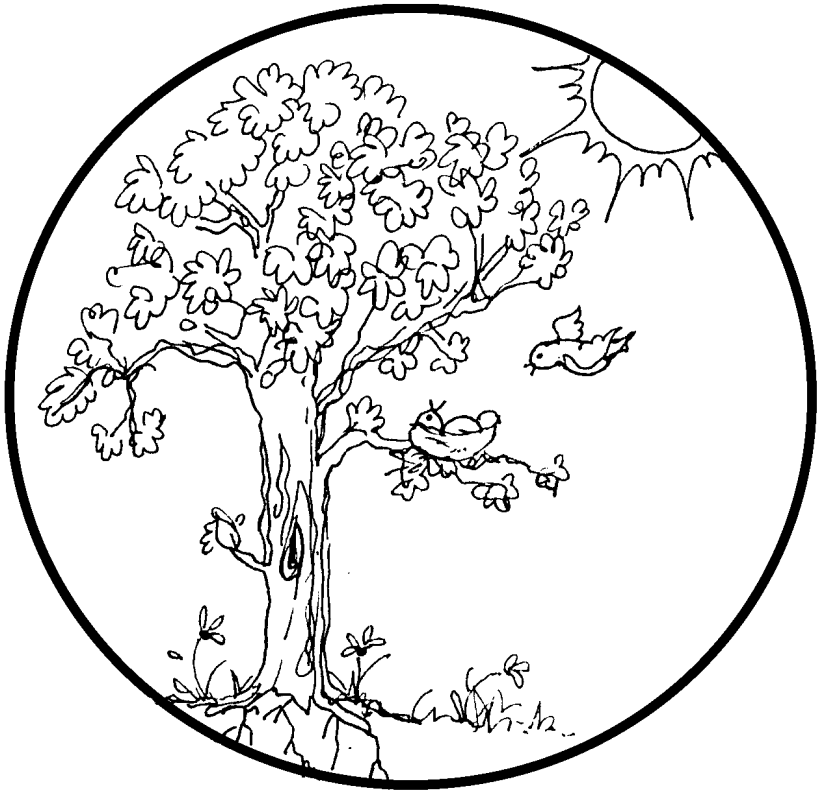
Life Cycle

Diversity in a Balance

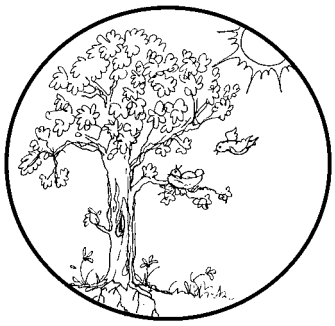
FIFTH GRADE

ORGANISMS



2 WEEKS
LESSON PLANS AND
ACTIVITIES

LIFE CYCLE
OVERVIEW OF FIFTH GRADE



ORGANISMS

WEEK 1.
PRE: *Identifying animal and plant cell parts.*
LAB: *Exploring the different organelles of a cell.*
POST: *Exploring the importance of RNA and DNA.*
WEEK 2.
PRE: *Explaining the importance of reproduction.*
LAB: *Comparing asexual and sexual reproductive strategies.*
POST: *Comparing characteristics of the 5 kingdoms.*

HUMAN BIOLOGY

WEEK 3.
PRE: *Comparing functions of specific body systems.*
LAB: *Calculating calorie intake.*
POST: *Comparing how and where digestion takes place.*
WEEK 4.
PRE: *Comparing the three types of muscle tissue.*
LAB: *Calculating reflex time.*
POST: *Defining different components of the medical profession.*

PLANT LIFE

WEEK 5.
PRE: *Analyzing the structure of plant cells.*
LAB: *Observing different plants under the microscope.*
POST: *Demonstrating photosynthesis.*
WEEK 6.
PRE: *Exploring the diversification of plant reproduction.*
LAB: *Comparing reproduction of a gymnosperm and angiosperm.*
POST: *Discovering how seeds are dispersed.*

NATURAL ENVIRONMENT

WEEK 7.
PRE: *Exploring coral species.*
LAB: *Exploring and distinguishing the different types of corals.*
POST: *Discussing the requirements of corals.*
WEEK 8.
PRE: *Comparing autotrophs and heterotrophs.*
LAB: *Exploring the eating habits of an owl.*
POST: *Interpreting data obtained from owl pellets.*

LIFE CYCLE - ORGANISMS (5A)

PRE LAB

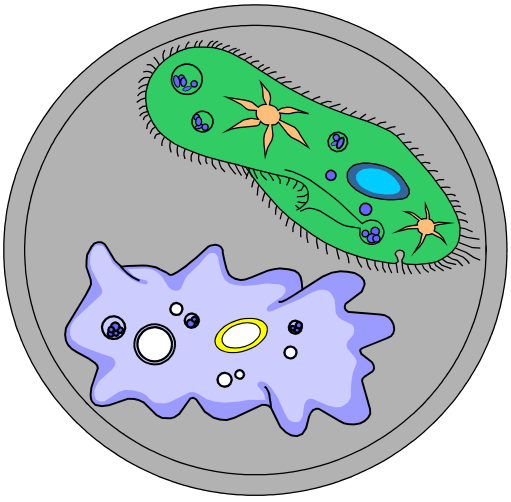
Students construct a model of a plant and animal cell.

OBJECTIVES:

1. Identifying animal and plant cell parts.
2. Constructing cell models.

VOCABULARY:

cell
organelle



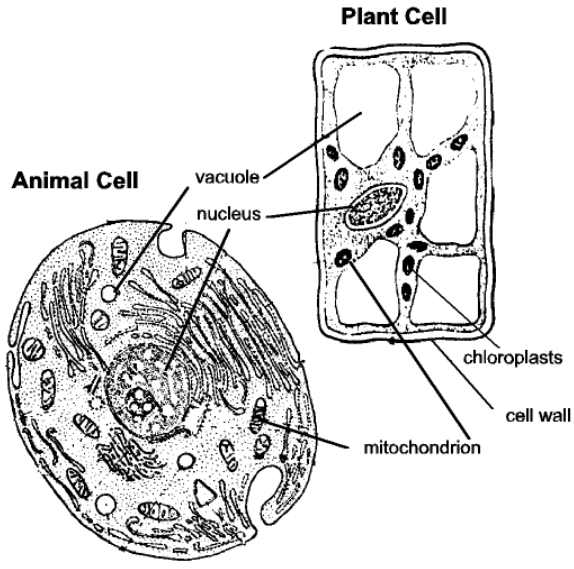
MATERIALS:

worksheets
construction paper
scissors
glue

BACKGROUND:

Cells are the fundamental units of living material. The bodies of all living things are formed from cells, and without cells there would be no life. Every large living thing is made of billions of cells.

A cell contains special structures called organelles which have specific functions for maintaining the health of the cell. These functions include taking in food and breaking it apart into simple molecules, releasing energy from food, building and repairing cell parts, getting rid of harmful wastes, and making more cells.



There are thousands of different kinds of living things that are made up of only single cells. They are restrictive in what they can do, however, because one cell just can't conquer the world.

In most plants and animals, the cells are organized to do different types of jobs. In plants, for instance, there are specialized root cells whose function is to take in minerals and water. These specialized cells are arranged into tissues that do the same job. Muscle tissue, for

example, is made up of many individual muscle cells. Different tissues that work together form organs. Examples of organs include the stomach, kidneys, and lungs. Organs are groups of tissues that work together to perform a specific function. Organs do not operate in isolation and together they form systems, like the respiratory, circulatory, and digestive systems.

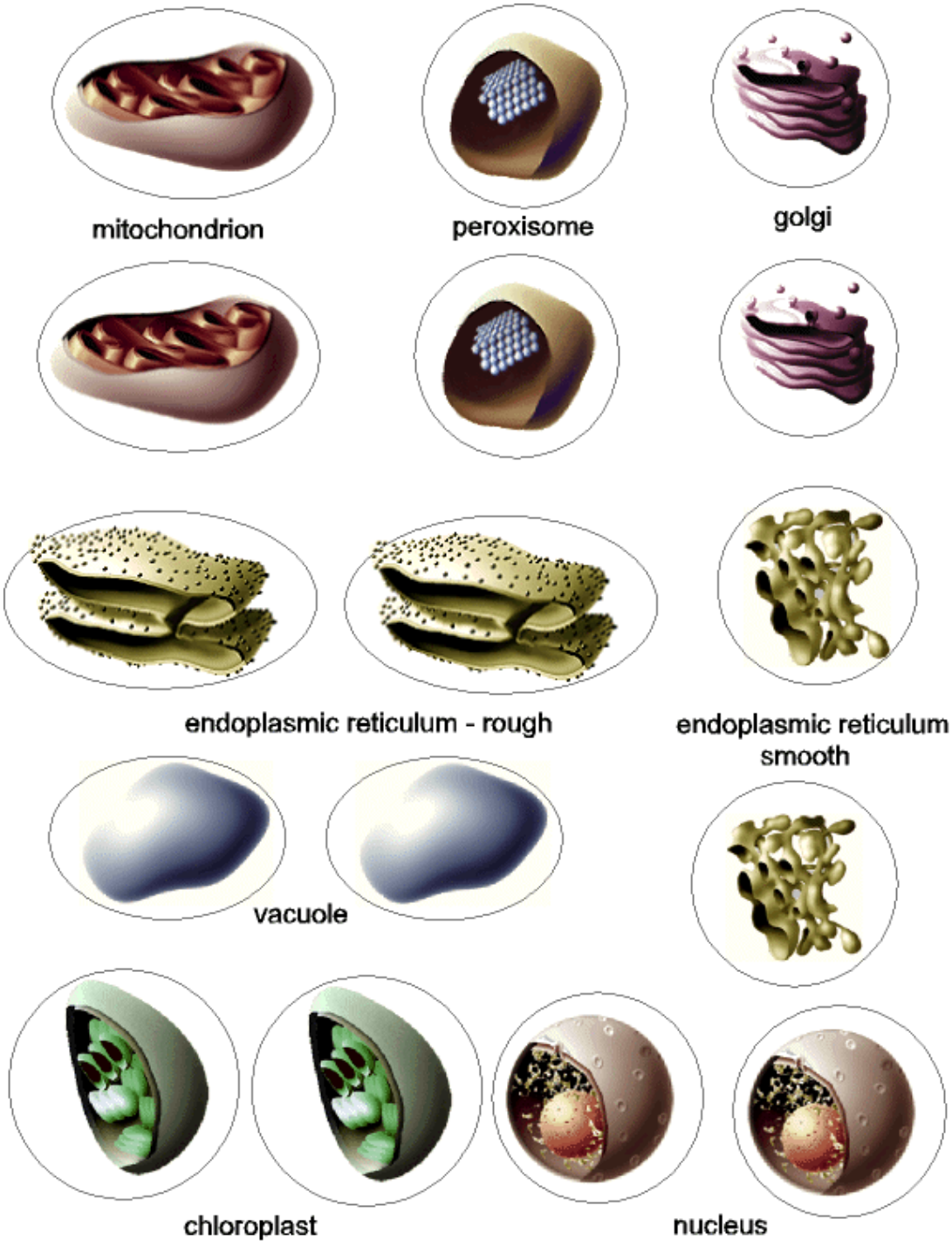
PROCEDURE:

1. Discuss the main organelles of a cell. Emphasize the importance of the nucleus and its function. Explain the differences between plant and animal cells, especially the presence of chloroplasts and a rigid cell wall in plant cells.

2. Have the students construct a paper model of a plant cell and an animal cell by cutting and pasting from the provided sheet. The major part is that the animal cell will not have a cell wall and chloroplast.

LIFE CYCLE - ORGANISMS (5A)

PRE



LIFE CYCLE - ORGANISMS (5A)

LAB

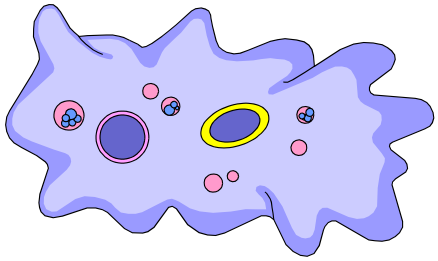
Students use a microscope to observe plant and animal cells.

OBJECTIVES:

1. Discovering the differences between plant and animal cells.
2. Exploring the different organelles of a cell.

VOCABULARY:

cell wall
chlorophyll
chloroplast
starch grain
vacuole



MATERIALS:

Swift-GH Microscopes
Prepared Microscope Kit
onion
iodine
3 unknown samples of animal or plant slides

BACKGROUND:

Cells are the fundamental units of living material. The bodies of all living things are formed from cells, and without cells there would be no life. Every large living thing is made of billions of cells that have different sizes, shapes, and functions. Cells contain special structures called organelles which have specific functions for maintaining the health of cells. The types of jobs that organelles perform include taking in food and breaking it apart into simple molecules, releasing energy from food, building and repairing cell parts, getting rid of harmful wastes, and making more cells.

These organelles can help identify whether a cell comes from a plant or an animal. Only plants, for instance, have chloroplasts and starch grains. Chloroplasts are needed for photosynthesis and starch grains (amyloplasts) store the starch that is produced by photosynthesis. Vacuoles in an animal cell are not as large as those in plant cells. Learning the specific functions of the various organelles will continue in the post lab, so it is important that the students recognize and be able to distinguish the differences between animal and plant cells.

PROCEDURE:

1. Students have compared an ideal model of a plant cell with an ideal model of an animal cell. However, when you look at real samples, the differences may not be as obvious as they were on the models.

2. Have the students look at a thin slice of onion and animal cell as directed in the lab. Cut the onion skin very thin and put a drop of food coloring and then blot it. Use some hamburger meat and squish the cells on a glass slide. Make sure the students see that the onion cell has a thicker wall around each of the cells. This is the only real difference the students can see with the Swift-GH. You may want to use a higher magnification.

3. Then have the students look at the 3 unknowns (pine stem x.s. [plant], hyaline cartilage tracheo region s.x. [animal], and bone cancellous sec. [animal]. The major difference is the cell wall that can be seen in the pine stem.

LIFE CYCLE - ORGANISMS (5A)
PROBLEM: What are the differences between animal and plant cells?
PREDICTION: _____
MATERIALS: MICROSCOPES, food coloring, 3 unknown samples

PROCEDURE: First examine a plant cell (onion) and an animal cell. Your instructor will give you a small piece of onion skin. Put a drop of food coloring on the onion, and observe. Draw both the animal and plant cell.

PLANT CELL	ANIMAL CELL

Describe the major difference between plant and animal cells.

_____

Now look at the 3 unknown samples. Draw what you see. Determine whether they come from an animal or a plant.

UNKNOWN 1	UNKNOWN 2	UNKNOWN 3
TYPE_____	TYPE_____	TYPE_____

CONCLUSION: How can you distinguish a plant cell from an animal cell?

_____

_____

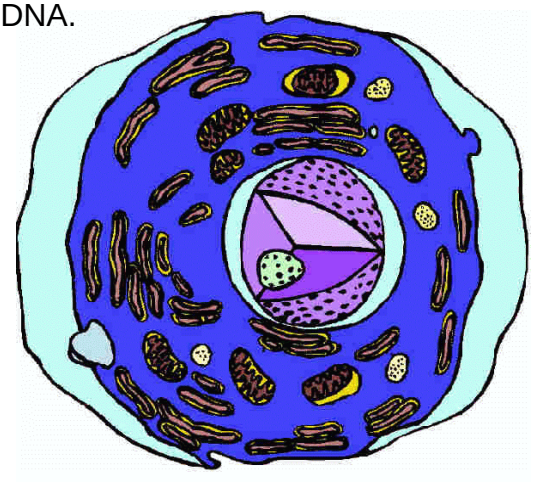
LIFE CYCLE - ORGANISMS (5A)

POST LAB

Students color a DNA sequence.

OBJECTIVES:

1. Distinguishing different organelles.
2. Exploring the importance of RNA and DNA.



VOCABULARY:

DNA
gene
mitochondria
nuclear envelope
plasma membrane
RNA

MATERIALS:

crayons
worksheet

BACKGROUND:

The blueprint for the structure and functioning of our bodies is contained in the genetic material found in the nucleus. The genetic material (chromatin) is composed of DNA (Deoxyribonucleic acid) and protein. During certain times in a cell's life the chromatin will condense and form x-shaped structures called chromosomes. Chromosomes are found in the nucleus of cells at some time in their life spans. Human beings have 46 chromosomes, arranged in 23 pairs. Heredity is encoded in DNA within the chromosomes. A gene is a very small cluster of chemical units which group up to form the DNA molecule. RNA (ribonucleic acid) is the messenger of DNA within the cell. Forms of RNA direct the cell to manufacture specific enzymes and other proteins. Modern biological research is developing a much more complicated picture than what is described above. Students in the fifth grade should learn the general outline and parts, but to really understand what is going on is not really completely known.

DNA functions by carrying the template or "map" of chemical compounds, amino acids, that are used to build proteins. DNA directs the production of proteins by providing the sequence of amino acids necessary to produce specific proteins. Amazingly, there are only 20 amino acids that are utilized to produce every protein in the human body. Of course, certain "modified" amino acids exist, but these still require the starting 20 amino acids. In order to gain an understanding of DNA, we must start at the heart of the matter, the cell.

This summary mainly is concerned with human cells but the basic theory holds for most organisms. Most human cells have a distinguishable central structure called the nucleus. The nucleus is the "storage area" for the cell's genetic material. The nucleus houses DNA and its corresponding helper molecule, RNA (ribonucleic acid). The nucleus is often referred to as being the "control center" of the cell and, the nucleus does in fact regulate cell activity. This regulation is brought about under the influence of the genetic information that is housed in the cell. This genetic information informs the cell of what activities it is to undertake and what it is to accomplish. The cell carries out these "orders" by performing specific biochemical reactions, often times under the influence of enzymes (proteins that are catalysts) that are produced in the cell. The nucleus is the depository for nucleic acids (DNA and RNA). It is in the nucleus where DNA replication occurs.

The sugar-phosphate backbone consists of deoxyribose sugar groups connected together by phosphate groups. The sugar groups are, in turn, connected to the four bases: adenine, guanine, cytosine, and thymine. Adenine and guanine are called **purines** while cytosine and thymine are called **pyrimidines**. The bases are often abbreviated as A, G, C, and T. A purine base can only bond to a pyrimidine base, and a pyrimidine only to a purine. Adenine will only bond with thymine and guanine will only bond with cytosine. The nucleotide base pairs are held together by hydrogen bonds. It follows then that the number of adenine bases will equal the number of thymine bases and the number of guanine bases will equal the number of cytosine bases. This presumption led the way for the formulation of Chargaff's rules which was the basis of DNA investigation prior to the discovery of the double helical nature of DNA.

DNA carries a template that determines amino acid sequences which are then used to produce proteins at the ribosomes. Since proteins cannot produce other proteins DNA serves as a "storage" center for the amino acid sequences of all the proteins produced by an organism. A particular amino acid sequence that codes for a specific protein is called a **gene**. The genes of an organism are stored in structures called **chromosomes**, which are the familiar x-shaped structures often seen in biology books. An organism's DNA is not always organized into chromosomes, rather these structures appear at particular times during the life cycle of a cell. A chromosome consists of DNA associated with a group of proteins known as the **histone** proteins. DNA is a long, linear, polymer (*poly*=many, *mer*=unit) that if stretched out could be up to several or even thousands of meters long. One chromosome consists of a single molecule of DNA.

Humans reproduce sexually through the successful union of a sperm and egg cell. The sperm and egg, referred to as **gametes**, contain one half the number of chromosomes found in other human cells. When a cell contains one half the number of chromosomes it is referred to as being **haploid**. Conversely, when a cell contains the full number of chromosomes it is referred to as being **diploid**. Human sperm and egg cells are haploid and contain 23 chromosomes. The diploid number for human cells is 46 chromosomes. When an egg and sperm unite each cell contributes 23 chromosomes and the resulting fertilized egg has 46 chromosomes. Through this mechanism genetic variability and heredity is expressed. Therefore a child will have received one half of his DNA from his mother and one half from his father. The traits that are then expressed in the child are a function of which DNA (ie, the father's or mother's) was expressed. The study of how traits

are inherited and passed on through generations is referred to as *genetics.*

DNA has an analogous helper molecule called RNA (ribonucleic acid.) RNA's structure is similar to DNA's except in the following manners:

1. RNA contains the sugar **ribose**, whereas DNA contains the sugar **deoxyribose.** Deoxyribose has one less oxygen than ribose, hence the name deoxy-.
2. RNA contains the base uracil instead of thymine.
3. RNA is usually single stranded.

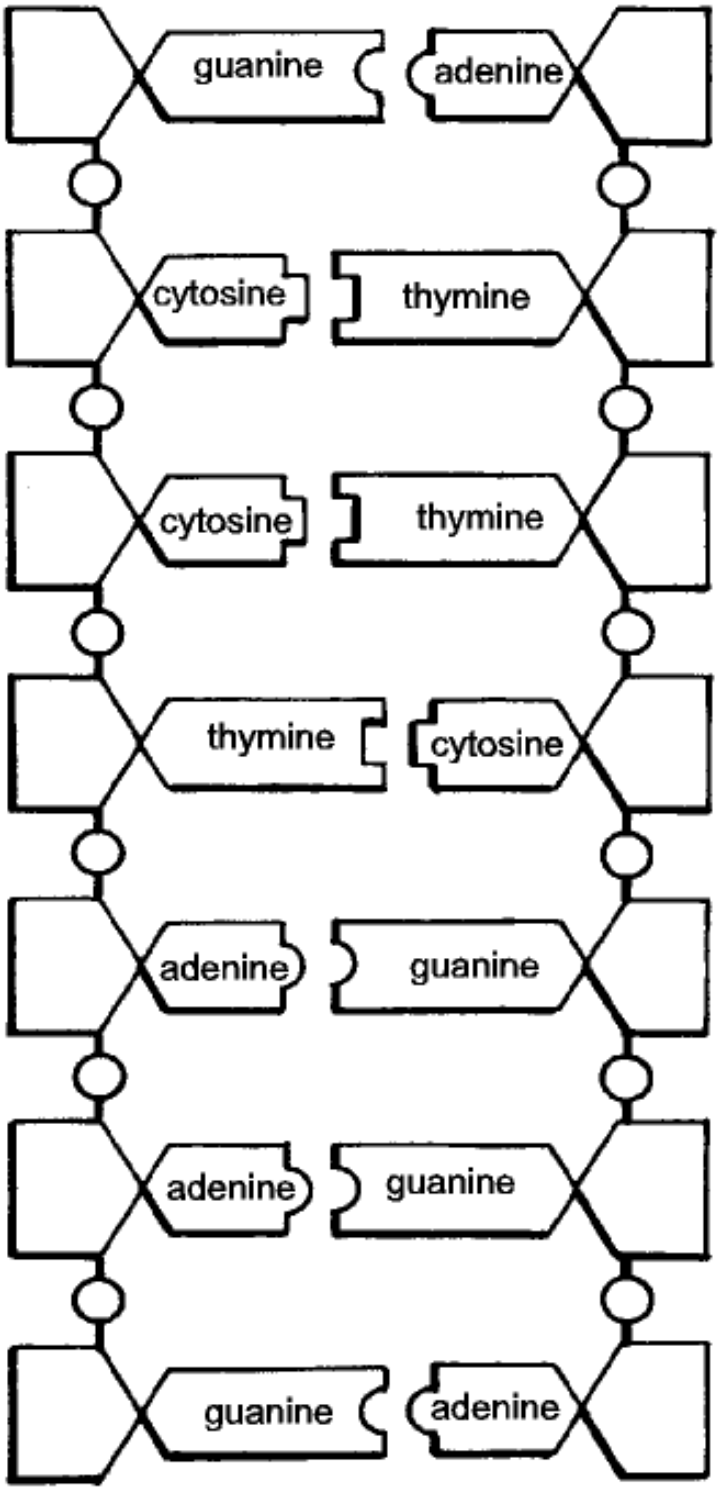
PROCEDURE:

1. Discuss with students DNA and RNA. Use the information above to help you discuss this important concept.

2. Color the backbone which hold the pyrimidines (thymine and cytosine) and purines (adenine and guanine). The small pentagon and circle.

3. Color each of the pyrimidines and purines. The purine base adenine always bonds with the pyrimidine base thymine, and guanine always bonds with cytosine.

LIFE CYCLE - ORGANISMS (5A)



LIFE CYCLE - ORGANISMS (5B)

PRE LAB

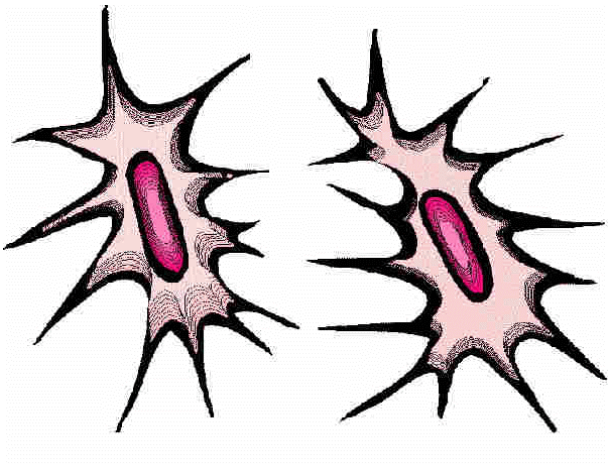
Students use a worksheet to compare asexual and sexual reproduction.

OBJECTIVES:

1. Comparing asexual and sexual reproduction.
2. Explaining the importance of reproduction.

VOCABULARY:

asexual
reproduction
sexual



MATERIALS:

worksheet

BACKGROUND:

Reproduction is important for the survival of all living things. Without a mechanism for reproduction, life would come to an end. There are two types of reproduction to learn in elementary grades, asexual and sexual reproduction. Many teachers are afraid of discussing reproduction, but if presented as a factual lesson it is easy for the students to understand the principles without the standard giggles.

Asexual reproduction refers to simple cell division that produces an exact duplicate of an organism. There are many different types of asexual reproduction which can be discussed to show students the variability of modes of reproduction. Some single-celled organisms reproduce by simple cell division, this is called binary fission. In this manner, the mother cell simply splits in half producing two daughter cells. Some cells reproduce by unequal division of the cells, this is called budding. In this process the bud forms as a knob on the mother cell. The nucleus divides and identical parts go to the mother cell and the bud. The bud may grow until it is as large as the mother cell and can form buds of its own. In some cases buds remain attached to the mother cell. In others, they break away and live as separate organisms.

Sexual reproduction involves the joining of male and female sex cells. The sperm refers to the male sex cell and the egg refers to the female sex cell.

PROCEDURE:

1. As you discuss this with students, tell them that trees, fish, flowers, and many other organisms have sperm and eggs. Tell students to look at organisms on their way home, to see if they can predict which ones reproduce by sexual or asexual means.

2. There are some reproductive strategies that are difficult to classify for students. Ferns, fungi, and some protozoa reproduce by spore production. Spores are formed by divisions of special mother cells and are released from the parent organism. A single spore develops into a new organism.

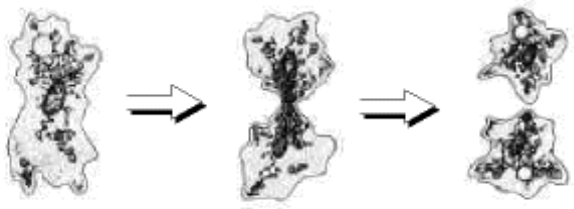
3. The worksheet shows students the difference between asexual and sexual reproduction. **The answers are as follows:** 1. yes; 2. in half; 3. little one celled creatures; 4. zygote 5. female, male, a baby; 6. larger organisms with organs; 7. larger organisms cannot simply divide, it is more efficient for little organisms to reproduce in that manner.

LIFE CYCLE - ORGANISMS (5B)

PRE

REPRODUCTION

ASEXUAL



1. Can a daughter become as big as the mother?

2. How does the mother divide?

3. What organisms have asexual reproduction?

SEXUAL

4. What does ♀ mean? ♂ ?

What is produced?

5. What organisms have sexual reproduction?

6. Why do organisms have 2 different methods of reproduction?

LIFE CYCLE - ORGANISMS (5B)

LAB

Students sort asexual and sexual reproduction.

OBJECTIVES:

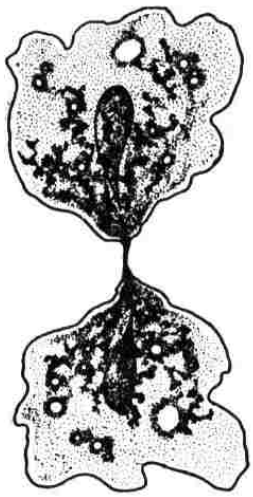
1. Understanding asexual and sexual reproductive strategies.
2. Exploring why large organisms reproduce sexually.

VOCABULARY:

asexual
organism
reproduction
sexual

MATERIALS:

asexual/sexual sheet



Binary fission

BACKGROUND:

Larger animals tend to reproduce sexually and smaller organisms reproduce asexually. Larger animals have developed more complex organ systems and with these organ systems they can adapt to their environment more easily than smaller organisms. The complex brain and sense organs of larger organisms allows them to adapt to their environment.

Organisms that reproduce asexually cannot develop much variety, because they are "copying" the original organism almost exactly. Sexual reproduction allows for great diversity, because the zygote is different from the mother's egg and father's sperm; it is a combination of both. Sexual reproduction produces a greater chance of variation within a species than asexual reproduction would. This variation improves the chances that a species will adapt to his environment and survive.

Heliozoa, Amoeba, and Euglena all reproduce by binary fission, which is the mother cell dividing into two daughter cells. The Heliozoa and Amoeba belong to the Protista Kingdom. The Euglena is an odd one celled plant that sometimes have characteristics of a protist. Heliozoa live in fresh water and have pencil like axopods that aid in eating. Amoebas live in fresh water, and move in a unique manner. An amoeba will move its entire body in a "blobby" motion. Euglenas live in fresh water and have a long tail that helps move the organisms through the water.

Planaria, round worms, and leeches are mostly hermaphroditic. The male and female reproductive systems are distinct, but may join terminally in a common chamber on the same organism. Self fertilization is rare. Some of the representatives of these groups are parthenogenetic: females asexually produce females. Planaria also are capable of

extensive regeneration.

Gorillas, elephants, rats, zebras, and dolphins are all mammals that reproduce sexually. There is a male and female in each of these species. Kangaroos are mammals but they are marsupials. There are female and male kangaroos, but after sexual reproduction the fetus leaves the mother and goes into her pouch until it is large enough to leave.

Fish and frogs have sexual reproduction, but it is externally. The female lays eggs and the male externally fertilizes the eggs but squirting sperm in the water. Frogs develop differently, in that they have a tadpole stage and them metamorphose into a frog.

A turtle lays eggs, but like a bird and probably a dinosaur, fertilization occurs internally. Dinosaurs are extinct, but because we have found dinosaur eggs, we believe that they reproduced much like chickens. The male internally fertilized the female, and then the female laid her eggs.

PROCEDURE:

1. In this lab activity, have students cut out the pictures on the asexual and sexual reproductive chart.

2. They are to divide the pictures into two groups, those that they predict would reproduce sexually and those that the believe reproduce asexually.

3. The discussion after the grouping should be centered on how the organisms reproduce, and what characteristics seem to be more common in the sexual versus asexual modes of reproduction.

LIFE CYCLE - ORGANISMS (5B)

PROBLEM: How can you determine which organism reproduces sexually or asexually?

PREDICTION:_____
_____

MATERIALS: Asexual/Sexual Reproduction Chart, paper, glue

PROCEDURE:

1. After reviewing why some organisms will reproduce sexually versus asexually, cut out the organisms.
2. Group the organisms into two categories, those that reproduce sexually and those that reproduce asexually. Glue the two groups on two separate sheets.
3. Determine from your categories what could be characteristic of the different reproductive strategies.

CHARACTERISTICS OF SEXUAL REPRODUCTION

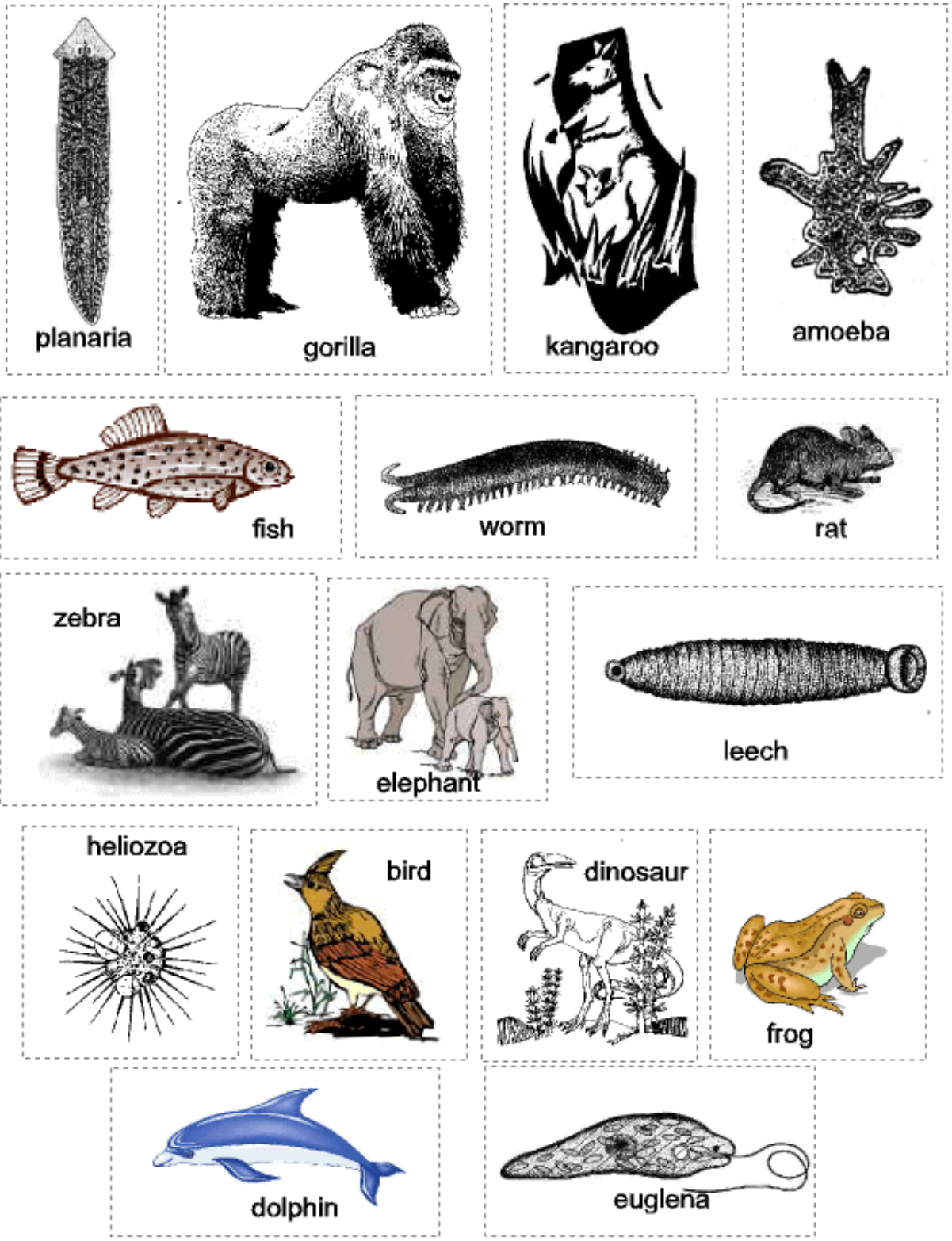
CHARACTERISTICS OF ASEXUAL REPRODUCTION

CONCLUSION: Can large animals reproduce asexually? Why?

_____
Why don't little organisms reproduce sexually?

_____

LIFE CYCLE - ORGANISMS (5B) LAB



LIFE CYCLE - ORGANISMS (5B)

POST LAB

Students draw their own tree of life.

OBJECTIVES:

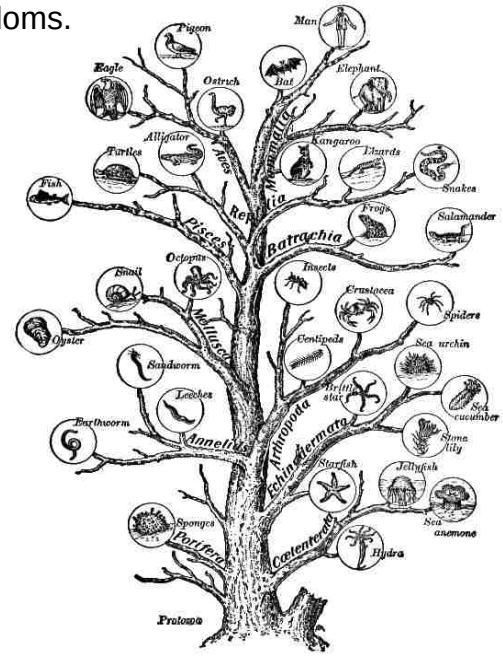
1. Comparing which organisms reproduce sexually and which reproduce asexually.
2. Comparing characteristics of the 5 kingdoms.

VOCABULARY:

animal
fungi
kingdom
monera
plant
protozoa

MATERIALS:

worksheet
kingdom chart



BACKGROUND:

The reason for grouping into Kingdoms is not always obvious. The development of a classification scheme probably started when humans began to think. Aristotle recorded his classification scheme into vegetables and animals. There have been many classification schemes developed through time, changing from 2 kingdoms to 3 to 4 and to the present 6 kingdom system. Don't be surprised if this changes. There are many organisms that we simply don't know enough about.

You may want students to bring in pictures of different organisms as a homework assignment. Have them classify their organisms within the 6 kingdom scheme. Have the class decide where the organisms should go. Remember how the organisms eat and reproduce help to group the organisms.

The simplest organisms are either bacteria or a blue-green algae and classified in the large grouping of Monera. Monera has been recently divided into 2 major groups of Eubacteria and Archeobacteria. Both groups have a very simple nucleus that is not surrounded by a nuclear envelope. The Archeobacteria are more ancient than the Eubacteria. The Kingdom Protista or Protozoa is made up of one celled organisms that have a nuclear membrane. Protozoa will eat their food and asexually reproduce more commonly than they would sexually reproduce. The Fungi lack chlorophyll and absorb food from the surrounding ground. Fungi possess organs and reproduce by sexual means (spores). The Plant Kingdom is characterized by its member's ability to reproduce by either sexual or asexual means. The animal kingdom is divided into invertebrates and vertebrates. An animal eats its food and reproduces mainly by sexual means. Organs are

much more developed in the Animal Kingdom than in the other kingdoms.

PROCEDURE:

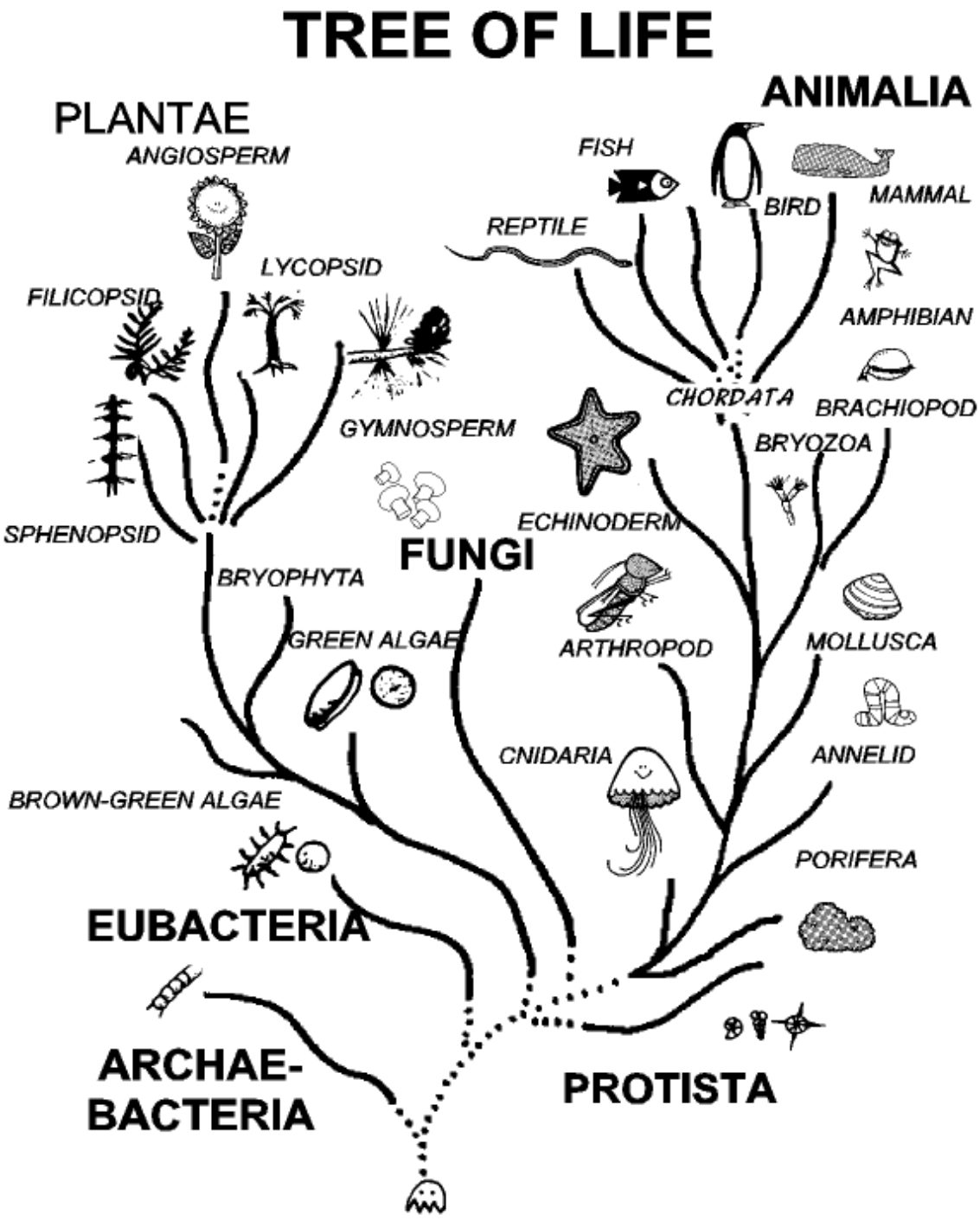
1. Discuss with students that living organisms are grouped into kingdoms so it is easy for people to discuss them. Either make a transparency or use the enclosed master as a worksheet to illustrate the common phyla within each kingdom.

2. You may want to use the following summary:

KINGDOM	REASON
plant	make own food, mainly green
monera (including Eubacteria and Archeobacteria	one cell, primitive nucleus
protozoa	one cell, eat food
fungi	absorb food
animal	multicellular, eat food

3. Give students the blank “Tree of Life” and have them draw what they think the organisms look like.

LIFE CYCLE - ORGANISMS (5B)



LIFE CYCLE - ORGANISMS (5B) POST