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A Background Program in Sex Education: A Proposed Course of Study for Fifth Grade

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A BACKGROUND PROGRAM IN SEX EDUCATION:

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Chapter 1

INTRODUCTION

Sex Education is a crucial and controversial issue facing the modern educational system. Sex has been in the past a topic not talked about openly. The Victorian moral code gave existence of sex a rather hidden place in society. It was something seldom discussed. The information gained was inaccurate and many times came from other sources or individuals that were misinformed.

Sex became the brunt of jokes and was referred to in vulgar terms. These vulgar terms are frequently learned first by young people before the scientific and correct terminology is learned. The first introduction of terms and discussion of body functions probably came from the peer group whose information could be wrong, at least in part, as well as given in a type of romantic, exciting, and secretive manner (11:95).

The age we live in presents sex symbols everywhere. The communications industries seem to be vying with each other to see how far they can go in presenting aspects of sexual matters that at one time were considered immoral. Sex images and fantasies hammer at us daily from television, billboards, posters, magazines, books, records, and other forms of mass media (19:63).

Sex should be taught by the parents. This is one area that many hold to be the family's responsibility. Sex education should take place as a natural course of instruction within the family structure. But in our present society, the family structure as well as the society has made some drastic changes. Society's values have brought some of these changes about. The affluent society has changed the position of the mother as well as the children. The woman of the household is now a more economic entity. Many mothers are now in the labor force. This helps the family to have more material things and many of society's values are based on material wealth. It also means that with the mother being removed from the home, many of the children are being raised by a babysitter. The discipline, security, closeness, and communications between parents and children can become quite strained. When communication between parents and children are not free and relaxed, topics such as development and reproduction are in some instances embarrassing to both child and parent. The embarrassment could come from lack of adequate knowledge or in not knowing what and how much should be told at the various levels of the child's maturation (11:183).

When the parents are faced with competitive pressures, their attention becomes preoccupied with materialistic goals. The rapid changes in an affluent society has produced a generation gap or dislocation between generations. The values are confused and the guidelines blurred.

Can this gap be closed? If society can adjust its attitudes to provide the basic facts and present them effectively, sex education can be established as a health entity. Sex education can be beneficial to society in controlling some of the ills such as illegitimacy, homosexuality, and venereal disease (22:13).

The author feels there is a great need for sex education at an early age within our school system. This study is an attempt to present a biological background program which will help lay a foundation of knowledge for eleven-year-old children.

Statement of the Problem

It is the purpose of this study (1) to survey one aspect of a meaningful background sequential program on sex education from kindergarten through sixth grade, and (2) to design available background resource materials in sex education adaptable to the eleven-year-old child in the fifth grade.

Importance of the Study

This study was conducted in an attempt to develop a unit of study that would give the student enough background in terminology of plant and animal life processes to make the life functions of the human being, including reproduction, a natural part of a total program where both boys and girls learn together without embarrassment. Parents and teachers are less hesitant to accept the challenge of sex education involvement, when the student possesses sufficient informational knowledge and usable resource material. The approach affirms that sexuality exists in plants, animals, and humans, and that it develops as a continuing force from birth to death.

With proper preparation in terminology and basic life concepts--common to plants and animals--the actual presentation of human biological functions including reproduction should be a natural, matter-of-fact part of the course of instruction. An integrated classroom of boys and girls should accept the material as normal life processes, common to plants, animals, and human beings. Sensationalism of human reproduction should be removed.

Chapter 2

REVIEW OF LITERATURE

The human being is self named Homo sapiens. He belongs to the primate group. Originally, the primate group came from primitive insectivore stock. These early mammals were small, insignificant creatures, scuttling nervously around in the safety of the forests while the reptiles were dominating the animal scene. Following the great age of reptiles, between eighty and fifty million years ago, these little insect eaters began to venture out into new territories. Clinging to the undergrowth of the forest vegetation for security, they began to broaden their diet to fruits, nuts, berries, buds, and leaves. As these primitive insectivore stock evolved into the lowest forms of primates, their vision improved, the eyes came forward to the front of the face, and the hands developed as food graspers. With three-dimensional vision, manipulating limbs, and slowly enlarging brains, they came more and more to dominate their world.

Between thirty-five and twenty-five million years ago, these pre-monkeys started to evolve into monkeys proper. About fifteen million years ago, their forest strongholds became seriously reduced in size. The ancestral apes were then forced to cling to what was left of their old forest homes or to leave. The ancestors of the chimpanzee, gorillas, gibbons, and orangutans stayed in the forest, but the ancestor of the Homo sapiens left.

Faced with a new environment, our ancestors had to become either better killers than the carnivores or better grazers than the herbivores. Vital changes began to take place. With strong pressure on them to increase their prey-killing prowess, our ancestors became more upright and better runners. Their hands, freed from locomotion duties, became strong, efficient weapon holders. Their brains became more complex--brighter, quicker decision-makers.

This ancestor of the Homo sapiens was able to blend his frugivorous heritage with a newly adapted carnivorous environment. He had the wrong kind of sensory equipment--his nose (sense of smell) was too weak and his ears (sense of hearing) were not sharp enough. His physique was hopelessly inadequate, but he had an excellent brain with more general intelligence than his carnivore rivals. Because of his vertical position, his freed, grasping hand, and his improved thinking and reasoning brain, he had a surviving chance in his new environment.

Since this environmental battle had to be won by brain power, a dramatic evolutionary step had to take place--a process called neoteny. Certain juvenile or infantile characteristics are retained and prolonged into adult life. A chimpanzee, for example, completes brain growth within twelve months after birth. In Homo sapiens, however, brain growth at birth is 23 per cent of its final size and the growth is prolonged into adult life. It continues for about ten years after he has attained sexual maturity. This gives the human adequate time for development before he has to go out and survive on his own. He could be taught by his parents as no animal had ever been taught before. He could continue adding to that knowledge after he was on his own and, above all, his weaknesses could be compensated for by his intelligence and his imitative abilities.

He began using artificial weapons instead of natural ones. From tool-using to tool-making was the next step, and alongside this development went improved hunting techniques--not only in terms of weapons but also in terms of social cooperation. As their techniques of killing were improved, so were their methods of social organization.

Since the hunting Homo sapiens was less fit physically than the carnivores for attacking and defending or obtaining food, he had to cooperate with his fellow beings to survive. He had to increase his ability to communicate. Facial expressions and vocalizations had to become more complicated. With the new weapons at hand, he had to develop powerful signals that would inhibit attacks within the social group. As part of his new found cooperativeness and because of the nature of the food supply, he had to share his food.

As complexity of the hunt increased, it became essential for the hunting human to have a home--a place to return to with the spoils and where the females and their slow growing young would be waiting and could share the food. Because of the extreme long period of dependency of the young and the heavy demands made by them, the females were confined to the home base. The hunting parties became all male groups. The males had to go off hunting and this left the females behind unprotected from the advances of other males and dangers. This absence demanded a major change in social behavior.

The development of a pair-bond relationship became the male and female answer. The male and female fell in love and remained faithful to one another. The relationship solved three problems. It meant that the females remained bonded to their individual males and faithful to them while they were away on a hunt. It meant that serious sexual rivalries among males were reduced. This aided their developing cooperativeness. Third, the development of a one-male and one-female breeding unit meant that the offspring also benefited. The heavy task of rearing and training the slowly developing young demanded a cohesive family unit.

The human has the greatest sexual urge of the primates. The reason for this stems from the importance of this pair-bond relationship. The simplest and most direct method of maintaining a pair-bond was to make the shared activities of the pair more complicated and more rewarding. This was done by making the female receptive at all times. Even when she has stopped going through her monthly cycle--when she is pregnant--the female remains responsive to the male. This is important because with a one-male and one-female system, it would be dangerous to frustrate the male for too long a period. It might endanger the pair-bond (18:94-108).

In this type of hunting economy it seemed to take the food producer all his time to produce enough food for him and his family. But with a family, the mate also had certain other responsibilities of providing not only the food but also the other comforts--fire, storage, and shelter.

A great change took place from precivilized to a civilized cooperativeness. Societies began to develop. This development depended upon two phenomena: the development of agriculture and the development of exploitation. With agriculture's superior employment of human resources, the food producer can produce more than his family can eat. When a surplus of food is produced, cities begin to spring up. The city is dependent on the food producer and on some existing organization which can obtain this surplus of food from the producer. With this food surplus, the political organization feeds kings, priests, armies, architects, and builders. When politics exist, that is exploitation. Political science in the earliest form was the knowledge of how to get the food surplus from producer without giving much in return.

Now our society is in a third great change from precivilized, civilized, and modern. This can be thought of as change in our evolutionary process. Man seems to have been slow to exploit his potentiality, but this rate of change seems to have been accelerated by the appearance of the sphere of knowledge. With the surplus of food from agriculture, it becomes possible to feed specialized scribes. With the development of writing, man did not have to depend upon the uncertain memories of the aged for record and a great accumulation of knowledge began.

Out of civilization comes science, a superior way of organizing the evolution of knowledge. This leads to the acceleration of change.

The United States today is rapidly reaching the point where 10 percent of the population produces all the food, and there are still large agricultural surpluses. This leaves 90 percent of our people to produce automobiles, air planes, luxuries, and other conveniences of life.

The modern civilization that we live in is an uncertainty as yet. We can speculate that it will probably be a world-wide society because of the ease in communication and transportation. We can go faster and faster to places more and more like the places we left behind.

One of the problems of our age is the disintegration of the institutions. Agriculture diminishes until it occupies only a small proportion of our society. War, poverty, and inequality are tending to disappear due to Federal aid. The society is in an affluent state and it produces large quantities of goods. It is a society where technology almost prohibits great inequalities in consumption. The products of the economy consist of mass produced clothes, automobiles, appliances, contraceptives, and prefabricated homes.

Another change is in the life expectancy. The expectation of life at birth has risen to seventy years and may be even more. With this in mind some form of conscious birth control and limitations on the number of children per family is becoming an issue of thought (3:2-6).

In the last few years, educators, religious leaders, social workers, public officials, and especially parents have come to agree that sex education of some kind is necessary. With the changing society and cultural values, young people need guidance before puberty. Healthy infants can grow into acceptable members of the community only through a long and often severe discipline in social living--a process we call education. This education includes guidance and adjustment with respect to sex (8)

The screen, the stage, the printing press, television, and the radio help in mass distribution of sex allure and of education in the techniques of irresponsible sex gratification. What is displayed on television or in the show window and in current literature or advertising may be no more than a reflection of our casual routine of living. But it is a powerful and moving drama that carries forward under private pressures with no responsibility and no regard for the boys and girls who are the concern of the home and the school--and who are to be the fathers and mothers of the next generation.

The soundest kind of education regarding sex normally comes about in the home where the parents are themselves mature and adjusted regarding sex, and where questions children ask are answered simply and casually. But such homes are not the prevailing kind. All too often embarrassed parents mumble platitudes to embarrassed children while most church and educational groups shy away from discussing any but the simplest aspects of sex with young people. Thus somebody must be at hand to answer questions truthfully. The school becomes the next choice for it is their function to educate (7).

The attitude of many college young people is if unmarried men and women wish to live together, it is up to them. Sex education in the schools did not produce this attitude, because hardly any of today's college students have any formal teaching in human sexuality. If present trends continue, premarital intercourse will almost certainly increase.

Where is the starting point to counteract the attitudes not only of college young people but in general young people? Children begin their sex education the moment they are old enough to observe their parents or look at television. With this in mind, sex education should begin in kindergarten and continue all the way through college (13:80-85).

Like other areas, teaching sex education touches on many topics and should grow with the student. You begin simply and build as you go. Utilize the natural desire of children to wonder and ask about the start of life in various forms. It is during these years that school responsibility is greatest, for regarding sex we are reaching into the "tabula rasa"--John Locke's blank sheet. Distorted attitudes are at a minimum; they are not cluttering up a young mind.

Elementary science should present the beginnings of life, the development of plants, animals, and human beings. All processes of life should be taught; reproduction should not be singled out as an isolated factor.

Hence, the primary program is frequently one of "spontaneous combustion." No complex units are needed. The key is teacher appraisal of a focal point that may deal with growth or family. Sex education is taught as the occasion arises.

The intermediate grades are the foundation grades for the study of human reproduction and growth. The fifth grade seems to be a good time for this information. The children have reached a transitional period in life. The student now feels grown up and ready to assume a more mature role.

The instructor must be knowledgeable about the interest of upper elementary grade children; he must be well versed in the ways of plant and animal reproduction; he must retain a sense of humor; and he must be poised, self-confident, and comfortable with biological terminology.

The instructor should meet and discuss with parents his method of presenting sex information. He must arrange for coordinated, supplementary lessons for girls on menstrual hygiene to be presented by the school nurse.

Intermediate grade children are fascinated with the many adaptations that plants and animals have created to meet the needs for the continuance of life. This is lore only a science-oriented background can bring them, and it bridges the gap to an understanding of human reproductive processes.

The school provides a means for the parents to accept their responsibility as well. The families can conduct at home discussions largely because of the available booklets that can be brought directly into the home.

Student maturation and boy-girl interest is great on the junior high level. The pupils strongly desire to assume their sex roles, yet they need assurance and confidence so that they can handle their respective relationships. To further complicate matters, peer acceptance is foremost in their minds. Emotions, dating, growth spurts, family responsibility, voice and body changes, morals, and venereal disease are areas of instruction for this age group. In science, have a unit on the human body systems --the endocrines and the physiology of reproduction--and add basic genetics. In social studies, have a unit on social behavior, covering boy-girl relations in dating, responsibility to the family, parents' point of view, and ideals for future living. In health, cooperate with science teachers in teaching about venereal diseases.

The church needs to coordinate sermons and work with youth groups along the lines of increased morality and self-control. It is up to the religious leaders in the community to set unalterable standards without a pious "oh-isn't-it-awful" attitude and without a series of thunderous prohibitions. To meet the needs of the young people in a changing society, it is going to take the efforts of school, home, and church working together in a reinforcement and guidance program (22:31).

VARIOUS SEX EDUCATION PROGRAMS

There is no evidence that sex education is harmful, that it excites curiosity or stimulates sex urges and desires. On the contrary, there is ample evidence that it aids children in gaining a wholesome attitude toward sex and an understanding of the normal sex attitudes, roles, and relationships.

It is important that sex instruction should be linked with the rest of school instruction as naturally as possible. It should proceed in a completely everyday manner and be free of anything suggesting the sensational. Boys and girls must be taught together, at least until puberty. The program should be initiated in kindergarten when children are normally asking questions about birth, reproduction, and sex. It is through these early years during which the teacher acts as a parent substitute, and all questions should be answered even if at times the questions become subjects of group discussion.

In answering questions, there are certain cardinal principles which should be followed: (1) always tell the truth, (2) never put off answering, (3) use correct terms, (4) answer as much as the child desires and no more.

Milton I. Levine, M.D., suggests the following as a public elementary school curriculum.

Kindergarten

1. Life comes from life.

2. All babies, animals and humans, come from their mothers.

3. All animals produce babies of the same kind.

4. There must be a father and a mother before a baby can be born.

5. Boys and girls are different physically.

6. Boys remain males and grow up to be men, and girls remain females and grow up to be women.

First and Second Grades

1. A study of animals.

   a. The study of guppies in an aquarium to reinforce basic concepts from kindergarten. Guppies are tropical fish which give birth to live young. Observe by size of the female abdomen when she is pregnant and likely to give birth. Once the young fish are born, the mother should be removed from the aquarium. Larger fish eat the young--not an example of child care and mother love. Baby fish are born ready to take care of themselves and no animals give the degree of love and care and continued attention to their young as do human beings.

2. Plant seeds and watch them germinate.

Third and Fourth Grades

1. Children should learn that in all animal life--except lowest--there must be a father as well as a mother before reproduction occurs.

2. Structural differences between the sexes.

3. The human being baby develops within the body of its mother.

Fifth Grade

1. Learn that all animals develop from eggs.

2. The eggs are in the mother and the sperm are in the father.

3. In many animals including the human being, the sperm must travel from the father's body to the mother's body and unite with the egg before the egg can start developing into a baby.

4. In all mammals including human beings, the baby develops within the mother's body, but that some animals lay their eggs and the fertilized eggs (those that have been joined by sperm cells) will develop into baby animals of the same kind.

Sixth Grade

The subject matter should deal primarily with the human being.

1. The differences between the sexes.

2. Knowledge of the functions of the ovaries and testes.

3. The sperm and egg.

4. Menstruation.

5. Seminal emissions.

6. The development of the baby within the mother's body.

7. The need for the child to have a mother and father.

8. Human family relationships (14:30).

Lester A. Kirkendall outlines his plan for sex education in the elementary school. Seven objectives are suggested as the most appropriate ones for elementary school attainment. All of them are applicable to all grades except the last one, which becomes applicable as the child approaches puberty. These objectives are:

1. To help the child build objective and wholesome attitudes in his relationships with others, and toward matters of sex

2. To give the child an adequate understanding of life processes in plants, animals, and human beings

3. To provide the elementary facts of human reproduction

4. To build an appreciation of the contributions which family members can make to each other, and a concept of the child's place in his family

5. To provide social opportunities in which boys and girls may associate freely and naturally.

6. To build wholesome standards of conduct

7. To prepare the child directly for the physical changes of puberty and sex maturity.

Elementary schools have used the following procedures and activities to attain these objectives.

I. Incorporate the necessary materials into elementary science, nature study, and social studies.

A. In science and nature study, materials on nature, the seasons, and plant and animal life provide an understanding of life processes.

1. Utilize the children's pets for illustrative purposes.

2. Keep some animal pets, such as guinea pigs, white rats, or rabbits, in the classroom for observation and study.

3. Excursions to farms, rabbit hutches, dog kennels, or dairies will be useful.

B. Include in library such books as The New Baby, A Baby Is Born, Growing Up, How Life Is Handed On, and The Wonder of Life. For the older pupils, select materials suited to their development level such as Understanding Sex, Dating Days, and Growing Up In the World Today.

C. Health and physical activities classes, which usually are separated by sex for part of the class activities at least, provide an opportunity to give older pupils instruction concerning puberty and manifestations of maturity.

D. In social studies, stress may be laid upon courtesy, respect for others, and respect for personality, including those matters which relate to associations between the sexes. The same emphases may be made in social activities, extracurricular activities, and through the selections used in literature.

II. Provide program of social activities and cooperative projects in which boys and girls may learn to play and work together cooperatively and with understanding.

III. Teachers who are able counselors give individual guidance and counseling on questions and problems of adjustment pertinent to incidents about school; involving individuals or groups often opens the way for individual counseling.

IV. Provide assistance to parents so they may be more effective in the sex education of children within the home, through:

A. Individual conferences with parents

B. Provision of literature for parents, and for the parents' use with children.

C. Discussion groups for parents to help them understand better how to educate their own children (12:192-193).

Helen Mauley states:

> Sex education should be taught naturally and not as something unusual. Boys and girls need the right answers and factual knowledge to counteract the fantasies and half-truths they are getting from their peers and mass media. The schools have a responsibility for helping boys and girls to understand and assume their sex roles (16).

The teacher of the young child takes him with his good, bad, or lack of sex information, satisfies his curiosity, and relieves any of his anxieties on this subject. There are certain routines in school which are strongly connected with preschool family living. The child needs to take care of himself in the toilets and to develop habits of neatness, sanitation, and courtesy to others in the bathroom. He becomes aware of the difference in the girls' and boys' toilets, and his curiosity is satisfied by teaching him the location and use of the toilet, including the stools and urinals and the flushing of these.

In the homes of these young children, baby sisters and brothers often arrive. This furnishes a natural opportunity to supplement home teaching with acceptable terminology. Raising animals in the classroom, visiting the farm, observing pictures of the life of people in other countries, and children's questions will bring occasions for further information. Teachers answer children when a question is asked, whether it is about South America or sex, but only in terms of the child's maturity and understanding.

Objectives for a program in sex education in the primary grades may be expressed as follows:

1. To help each child develop a wholesome attitude toward sex.
2. To establish the use of the proper terminology in reference to the body
3. To help children understand that there are sex differences of boys and girls
4. To discuss with frankness and lack of embarrassment their problems of growing up and living in a sex-oriented world
5. To discourage the unnecessary handling of parts of the body
6. To give correct and understandable answers to his questions on reproduction
7. To help each child be a good family member--with the loyalty, love, and appreciation of his family

In the intermediate grades, children are ready for scientific and direct teaching in health and are interested in the physiology of their bodies. They can understand and appreciate the human body and how its parts work. The reproduction of plants and animals can form an excellent background for a unit of sex education which might be placed in an area of the curriculum for the sixth grade. This might tie into health, social studies, or science.

The objectives of the program at the intermediate level may be stated as follows:

1. To continually stress a wholesome attitude toward sex
2. To give students an understanding of the scientific vocabulary for discussion of natural processes

3. To help preadolescents understand the changes that are and will be taking place in their bodies

4. To develop a mature attitude toward sex (to talk freely without embarrassment and to know the facts scientifically)

5. To help boys and girls understand growth and how it is tied into physiology and inheritance

6. To develop respect for social customs

7. To deepend family loyalties

8. To respect the miracle of life

The science program in the intermediate grades includes plant and animal growth and reproduction, which is a forerunner of the processes of human growth. Children need to know that all living things produce their own kind. They should develop an appreciation of the wonder and meaning of reproduction, understand that male and female are necessary for reproduction, and know that there are definite growth patterns before birth. They should be helped to regard reproduction as a privilege and a function only in marriage.

Boys and girls need to understand the function of menstruation in its relation to reproduction. Girls should be given more time on this area and some opportunity to ask questions of a woman and in the presence of girls alone (16).

Chapter 3

DEVELOPMENTAL STUDY

The following Plant and Animal Units were presented to a fifth grade class in the school year of 1967-1968. These units were prepared for a sequential development program in sex education that would be suitable to the Prosser School District and its community. These particular units are for fifth grade use. The purpose was to gain an understanding of the parallels between plant, animal, and human life. Stress was placed on the life functions from the lowest form of plant life to the specialized and highly developed human.

The materials used in development of these units were materials available within the Prosser School District and community. The format was geared to a fifth grade science text--A B C Science Series.

The films and filmstrips shown were available through the Educational Film Cooperative located in Richland, Washington. This cooperative serves nine districts in the South Central Washington area of which Prosser is a participating member.

The units were prepared for general information and as a teaching guide. Included in them are added helps to activities, ditto seatwork, drawings that could be assigned or used for illustration, transparency patterns, and some student written film and filmstrip outlines and summaries.

In presenting these units, each student was required to make and keep a notebook. The notebooks were used for reference as well as to enhance language art skills.

The units presented are to be used with A B C Science Series, by Willard J. Jacobson and Cecilia J. Lauby (New York: American Book Company, 1961), pp. 50-94, 97-166. This is the fifth grade edition of a series of text books used in the Prosser schools.

Philosophy: The study of growing things leads the child to a better understanding of his own growth and development.

Objective: To introduce the life cycle and establish parallels between plant, human, and animal growth and reproduction.

Approach: This unit permits further development of the scientific approach--observation, experiment, measure, record, and interpretation.

Method: An emphasis was placed on the use of the audio-visual materials--overhead projector, transparencies, films, models, filmstrips, opaque projector, and drawings. Some of the drawings were teacher made and transferred to transparencies and dittoes. Most of the drawings, however, were assigned to the student either to find in a reference source or were taken from their own text book. A notebook was made of daily assignments and drawings. Also any extra interesting material that the student found pertaining to the subject matter could be included in their notebook.

Introduction of terminology: The terminology will be introduced in each unit as the units progress. Each section will have an emphasis on certain vocabulary words.

PLANTS

I. Introduction of the Cell

A. An English scientist, Robert Hook, studied the structure of cork (from the bark of an oak tree) with a strong magnifying lens.

1. He found it to be made up of tiny "empty boxes" with thick walls. He named these boxes "cells."

B. Cell Theory

1. Cells are the units of structure of all living things. (All plants and animals are made up of cells.)

2. Cells are, therefore, the units of function of all living things. (It is within the cells that our life activities occur.)

3. All living cells come from other living cells.

C. Types of Cells

1. Plant

2. Animal

D. Make-up of Cells

1. Basic anatomy and physiology

a. Cell membrane--the outer surface of the cell protoplasm.

(1) Its function is to regulate the passage of liquids and gases into and out of the cell.

b. Cytoplasm--the protoplasm that is in all plants and animal cells.

(1) Its function is to carry on all the activities of metabolism (the building up and breaking down of protoplasm).

c. Nucleus--Its function is to control the activities of the cell, especially the cell division. Cell division is either to make a group of like cells or to reproduce the species.

d. Vacuoles--spaces within the cytoplasm which store water and necessary materials dissolved in water and collect liquid waste.

e. Cell wall--a hard, outer "shell-like" substance called cellulose which surrounds the soft cell or plasma membrane.

(1) Its function is to protect the cell and give it stiffening and support.

f. Chloroplasts--the green color-bearing bodies of particles in the cytoplasm.

(1) It performs the vital function of food manufacturing within the green plant.

g. Centrosome--a tiny structure found in the cytoplasm just outside of the nucleus.

(1) Its function seems to be to aid in the process of cell division.

E. Characteristics of All Cells

1. Responses to stimuli from the environment.
2. Movement--has the power to move itself.
   a. Even plants seem to twist and turn as they grow.
   b. The movement of most animals helps them to find food and escape from enemies.
3. Reproduction--ability to reproduce its own kind.
4. Nutrition
   a. Plants capture sun's energy to help manufacture own food.
   b. Animals feed on other living things or on things that were once alive.
   c. Take in food, digest the food, and change the food into protoplasm.
5. Uses oxygen--living things generally use oxygen for the activities of the cell.
6. Respiration--takes place within the cells. It is the conversion of glucose to energy.
7. Excretes--gets rid of waste products.

F. Vocabulary:

cell membrane	cellulose	nucleus	cytoplasm
respiration	cell wall	protoplasm	stimuli
cell division	nutrition	excretes	excretion

G. Activities

Microscope:

A. Parts and functions of a microscope

1. Eyepiece

a. Is a lens with a magnifying power of 5X or 10X.

(1) The lens makes something look five times to ten times larger than it actually is.

2. Tube, nosepiece, objective

a. The eyepiece is in a large tube leading down to the nosepiece which turns to bring each objective (lens) in line with the tube.

b. Microscopes usually have one, two, or three objectives.

(1) The shorter one is the low power and has the magnifying power marked on side.

3. Coarse adjustment--large knob

a. Moves the tube up and down quickly

b. Use it first to locate the object

4. Fine adjustment

a. Use to sharpen the picture

5. Stage

a. Holds the slide and permits light to enter the hole

6. Mirror

a. Is located below the stage and directs the correct amount of light through the hole onto the specimen.

7. Arm, base

   a. When moving your microscope from place to place, hold firmly to the arm and put your other hand under the base for support.

8. Inclination joint

   a. Used to tilt the top of the microscope backward on its base.

B. Use of the microscope

1. Swing the nosepiece until the low-power clicks in place under the tube and over the place under the tube and over the slide.

2. Looking in the eyepiece, adjust the mirror under the stage until you have a bright light.

3. While you are watching the low-power objective, turn the coarse adjustment away from you until the lens is very close to the slide.

   a. Do not look in the eyepiece while you are turning the coarse adjustment away from you.

      (1) You could easily ram the objective into the slide, breaking it and scratching the fine lens on the microscope.

4. Look in the eyepiece and very slowly turn the coarse adjustment toward you until the specimen comes into view.

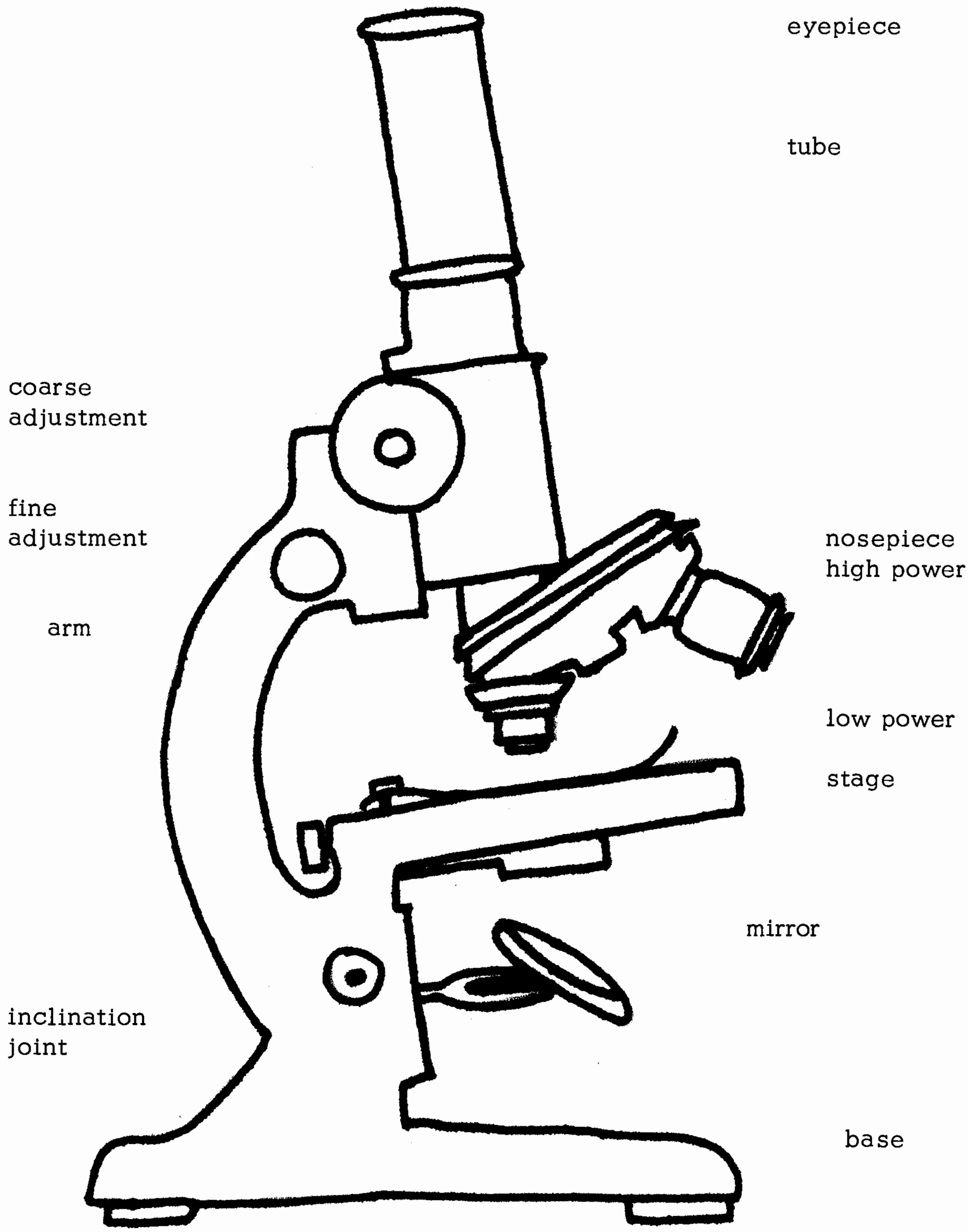
5. If fuzzy, use fine adjustment to clear up.

C. Lenses will become dusty and fingerprinted periodically.

   1. With lens paper and xylol clean the objectives, eyepiece, and mirror.

D. Clean the materials after using them each time and store them in a covered box.

PARTS OF A COMPOUND MICROSCOPE



Experiments:

Plant: Cut an onion in half. Peel off an inside layer. On the outside of this layer you will find a transparent skin as thin as tissue paper. With scissors, cut a piece of skin about a quarter of an inch square. Place the small piece of skin in a drop of water on a glass slide. Put a very thin piece of glass, called a cover glass, on top of the piece of skin.

Put the prepared slide on the stage of a microscope. Turn the focusing knobs of the microscope so that the low-power lens almost touches the cover glass. Then focus the microscope on the piece of skin by turning the focusing knobs upward.

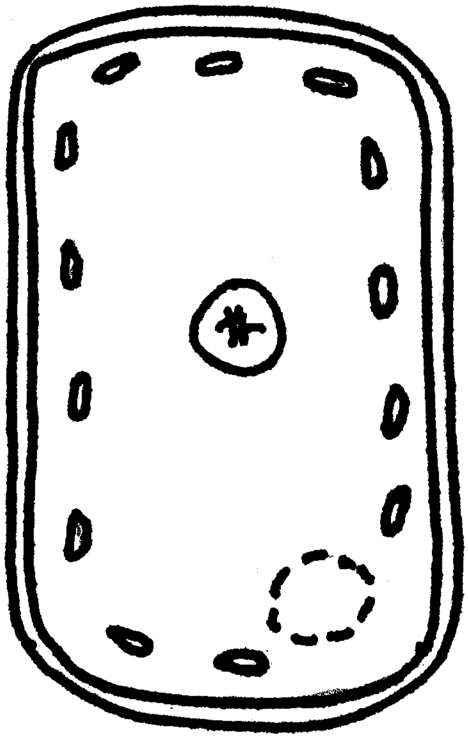
Using a small glass rod or the point of a pencil, place on the slide one drop of iodine or methylene blue, a dye, just at the edge of the cover glass. The iodine or the dye will stain parts of the cells and help you to see the onion cells clearly.

Animal: Gently scrape the inside of your cheek with the blunt end of a toothpick. A whitish speck will cling to the edge of the toothpick. Place this speck in a drop of water on a microscope slide. Add a drop of iodine so that the cells will be stained and made easier to see.

Prepared slides of plant and animal cells were also used. These slides came from:

National Teaching Aids, Incorporated
386 Park Avenue, South
New York, New York 10016

Draw and label plant and animal cells.



cell wall

cell membrane

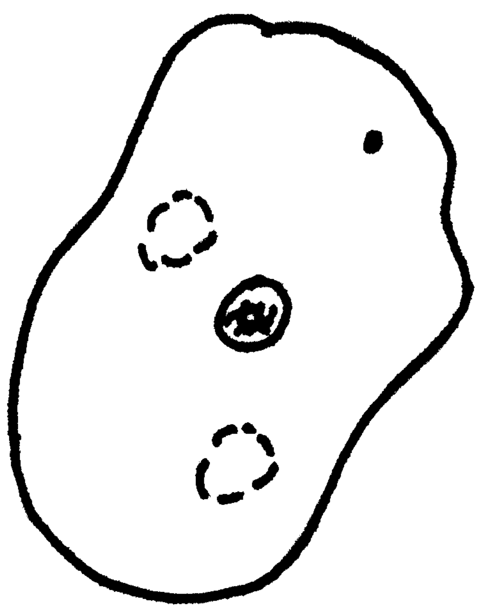
nucleus

cytoplasm

vacuole

chloroplast

PLANT CELL



cell membrane

centrosome

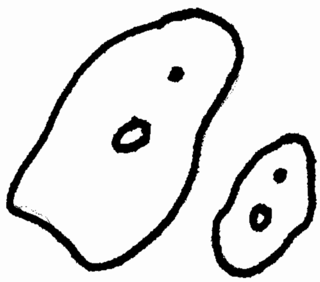
nucleus

cytoplasm

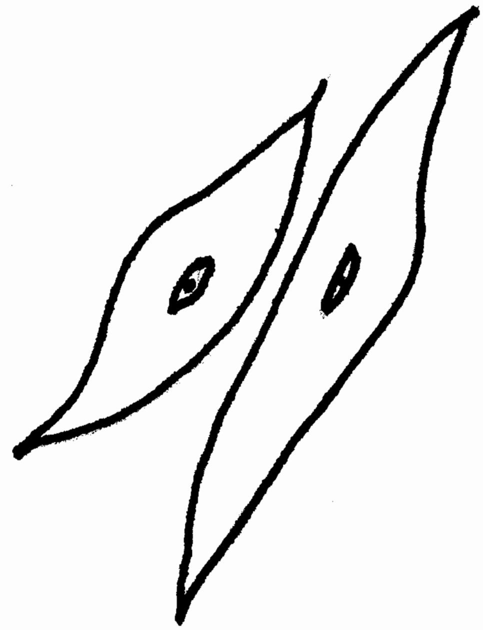
vacuole

ANIMAL CELL

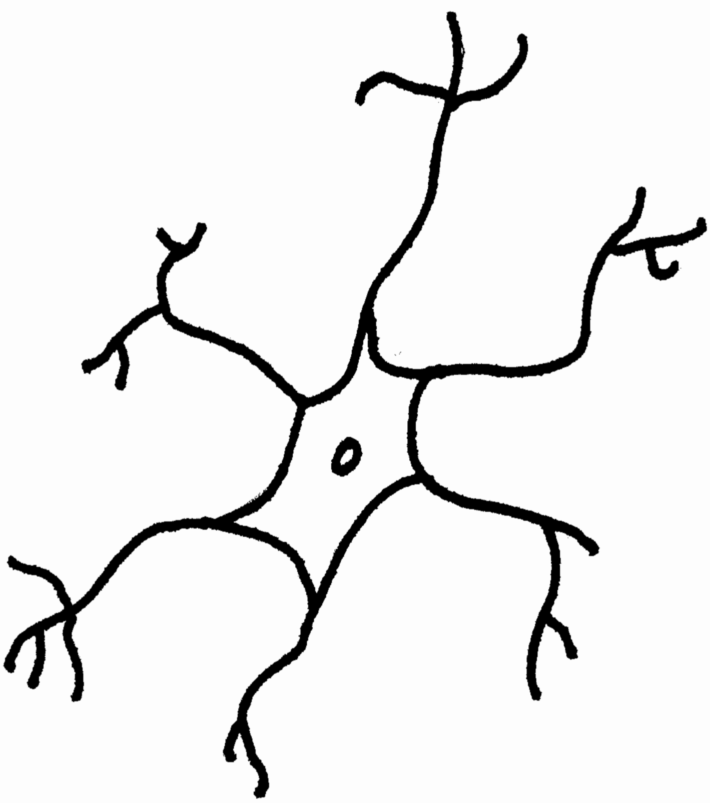
Draw various animal cells.



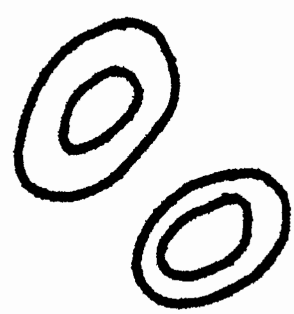
CELLS LINING CHEEK



MUSCLE CELLS



NERVE CELLS



RED BLOOD CELLS

Properties of Protoplasm:

1. All living things respond to stimuli.

2. Living things can move themselves in some way.

3. Living things can reproduce their own kind.

4. Living things grow.

5. Living things carry on the processes of nutrition.

6. Living things carry on the process of respiration.

7. Living things get rid of waste materials in a process called excretion.

Prepare an outline of pages 54-58.

Student Outline:

I. Properties of Protoplams

    A. Responds to stimuli

        1. Heat

        2. Light

        3. Moisture

    B. Protoplasm can move itself

        1. Contract

        2. Relax

    C. Can reproduce itself

        1. Cell division--cell divides in half becoming two cells

    D. Nutrition

        1. Takes in food

        2. Digests the food

3. Change the food into more protoplasm.

E. Uses oxygen

1. It takes oxygen through cell wall and cell membrane

F. Excretes

1. Gets rid of waste products

FILM: <u>Living and Non-Living Things</u> (MP-0159)

12 minutes, black and white, intermediate

The characteristics of life are observed in a chicken--animal and runner bean--plant. Animated diagrams show growth process.

Student Outline of Film:

I. Living things

    A. Animals

        1. Movement

        2. Sensitive--respond to stimuli

            a. See, hear, feel, smell

        3. Uses oxygen

        4. Takes in food, digests food, and makes food into more protoplasm.

            a. Can't make own food

        5. Growth

        6. Reproduce

    B. Plants

        1. Movement

        2. Sensitive--respond to stimuli

            a. Sun, water

        3. Uses carbon dioxide and oxygen

        4. Makes its own food

a. Photosynthesis--sunlight, water, minerals, chlorophyll, carbon dioxide are combined to make a simple sugar called glucose.

5. Growth

6. Reproduce--flower

II. Algae and Fungi

A. Algae

1. Algae are simple green plants that have chlorophyll in their cells.

a. The chlorophyll is normally contained in tiny structures called chlorophlasts.

b. These cells can make their own food.

2. Reproduce by fission (asexual)

a. Fission--single cells reproduce by simple cell division.

b. Asexual--reproduction without union of male or female germ cells.

3. Has no true roots, stems, or leaves.

4. Usually water habitat

B. Fungi

1. The fungi belonging to this group do not contain chlorophyll; thus they cannot make their own food and must depend on green plants.

a. Fungi which live on other living things are called parasites.

b. Fungi which live on the bodies of living things that have died are called saprophytes.

2. Mushroom

a. Mushrooms are grown underground until the mass of root-like threads or mycelium is well developed. These threads fill with water after a heavy rain and top of the mushroom pushes up through the soil in a few hours. The top opens wide and stands there until the spores are formed. Then the mushroom dries up. The spores fall to the ground. Each spore, if it has the right conditions, can start a new mushroom.

3. Yeast

   a. Yeast cells carry on all life functions except the process of locomotion.

   b. Since they have no chlorophyll, they obtain food elsewhere. They produce enzymes which digest their food outside the cells. Digested food enters into the cell by the process of osmosis through the cell membrane.

   c. Yeast cells require oxygen, as do all other living cells, and give off carbon dioxide and water vapor through the cell membrane.

   d. These simple plants reproduce by budding.

      (1) The mother cell grows to capacity; then the nucleus divides in two and a small bud (the daughter cell) appears. This may remain attached to the mother cell or split off to form an individual cell and reproduce itself by budding. (asexual reproduction)

4. Lichen

a. A combination of alga and fungus plant

b. The alga and fungus help each other survive. The cells of alga make the food, and the fungus cells give the plant shape and help keep the alga moist.

c. Lichens are pioneer soil builders on the bare rocks scoured clean by glaciers, wind, and flood. As they die, their decaying remains begin to form the first soil in which other larger plants can grow on later. The rhizoids of the lichens attach to the rock and thus help break it up.

(1) Rhizoids are tiny rootlike threads and not true roots.

C. Vocabulary:

fungi	yeasts
spore	fermentation
nitrogen fixation	budding
mushrooms	buds

D. Activities

Fungi (pp. 59-68) Name____________________

Fill the blanks in these sentences with the correct words from this list:

mushrooms	plant	living	fungi	spores
decay	thousands	mold	food	bacteria
pasteurizing	plants	athlete's	fungus	budding

1. Fungi are simple __plants__ that cannot make their own food.
2. Fungi depend upon other living or dead things for __food__.
3. The smallest plants are one-celled fungi called __bacteria__.
4. There are __thousands__ of different kinds of bacteria.
5. __Decay__ is caused by certain kinds of bacteria.
6. When conditions are unfavorable, bacteria either die or form __spores__.
7. Yeast plants are very small __fungi__.
8. As yeasts grow on sugar, they change the sugar to carbon dioxide and __alcohol__.
9. Like all fungi, rusts and molds get their food from other __living__ or once living organisms.
10. When mold spore lights on material a mold can use for food, the spore grows into a new mold __plant__.
11. The largest fungi are __mushrooms__.
12. Yeasts reproduce by __budding__.
13. Killing the bacteria in milk by using heat is called __pasteurizing__.
14. A certain kind of mold causes "__athlete's__ foot."
15. Penicillin is made from a special kind of __molds__.
16. Wheat rust is a __fungus__ which forms on the leaves of wheat.

Algae, Mosses, Ferns, and Seed Plants (pp. 68-77) Name____________________

Fill these blanks with the correct words from this list:

seed	lumber	food	flowers	seeds
diatoms	food	edible	plant	food
useful	moss	fibers	leaves	scum
chlorophyll				

1. Algae are the simplest kind of plants that can make their own food.
2. Plants that make their own food contain a substance called chlorophyll.
3. In the oceans and seas are vast numbers of algae called diatoms.
4. Mosses can make their own food.
5. Ferns have real roots, stems, and leaves.
6. Seed plants are divided into two main groups: one kind bears covered seed, and the other kind bears seeds without a covering.
7. Plants that bear covered seeds bear flowers.
8. Grasses are a very important kind of plant.
9. Vegetables are important seed plants that provide food for man.
10. Another group of seed plants provide fiber from which cloth is made.
11. Trees, the largest of seed plants, provide us with fuel and lumber.
12. Some seed plants produce edible fruits.
13. Beverages are made from another group of useful seed plants.
14. The accumulation of floating algae on the water of a pond is called green pond scum.

15. Moss is sometimes found growing on the north side of tree trunks.

16. The species of moss called peat moss, or sphagnum, is useful to man.

FILM: Simple Plants: Algae and Fungi (MP-0704)

14 minutes, color, intermediate--senior

Film shows the major characteristics of simple plants and how they differ from higher plants. Major differences between algae and fungi are explained.

Student Outline:

I. Simple Plants--no true roots, leaves, and stems

   A. Algae

      1. Make their own food--contain chlorophyll

      2. Reproduces by cell division

      3. Found in water

      4. Kelp is the largest algae

         a. 200 to 300 feet long

   B. Fungi

      1. Cannot make own food

         a. Saprophytes--they live on dead things that were once alive.

         b. Parasites--they live on living things.

      2. Reproduces by spores

      3. Found in damp, shaded areas

      4. Types of fungi

         a. Bacteria--simplest smallest fungi

         b. Mushrooms

         c. Molds--penicillin

         d. Yeast

C. Lichens

1. Partnership between algae and fungi.

Compare Algae and Fungi as to how they get their food, kind of plants, reproduction, and result of occurrence.

Student's comparison:

	Algae	Fungi
Food	it can make its own food due to cells containing chlorophyll	depends on living things or dead things that were once alive
Kinds of Plants	pond scum, diatoms, sea water algae, spirogyra	bacteria, yeasts, molds, mushrooms, rust
Reproduction	cell division	spores
Result of Occurrence	fish eat algae we eat the fish agar-agar--food for bacteria cultures	bacteria--butter, vinegar, cheese yeast--bread rust--destroys food plants molds--causes diseases, makes drugs called antibiotics

Things to Do:

Cut tops off mushrooms and place them on sheets of white and blue paper, top side up. Cover the mushroom caps with a glass jar or beaker. Let them stand overnight. In the morning, carefully life off the jars and caps. On the paper you will see patterns very similar to the structures on the under surface of the caps.

Moisten a slice of bread and place it on a dish. Let it stand for a short time in a warm place. Then cover it with a glass jar. If bread mold is growing on your bread, the white mycelium may soon fill the jar.

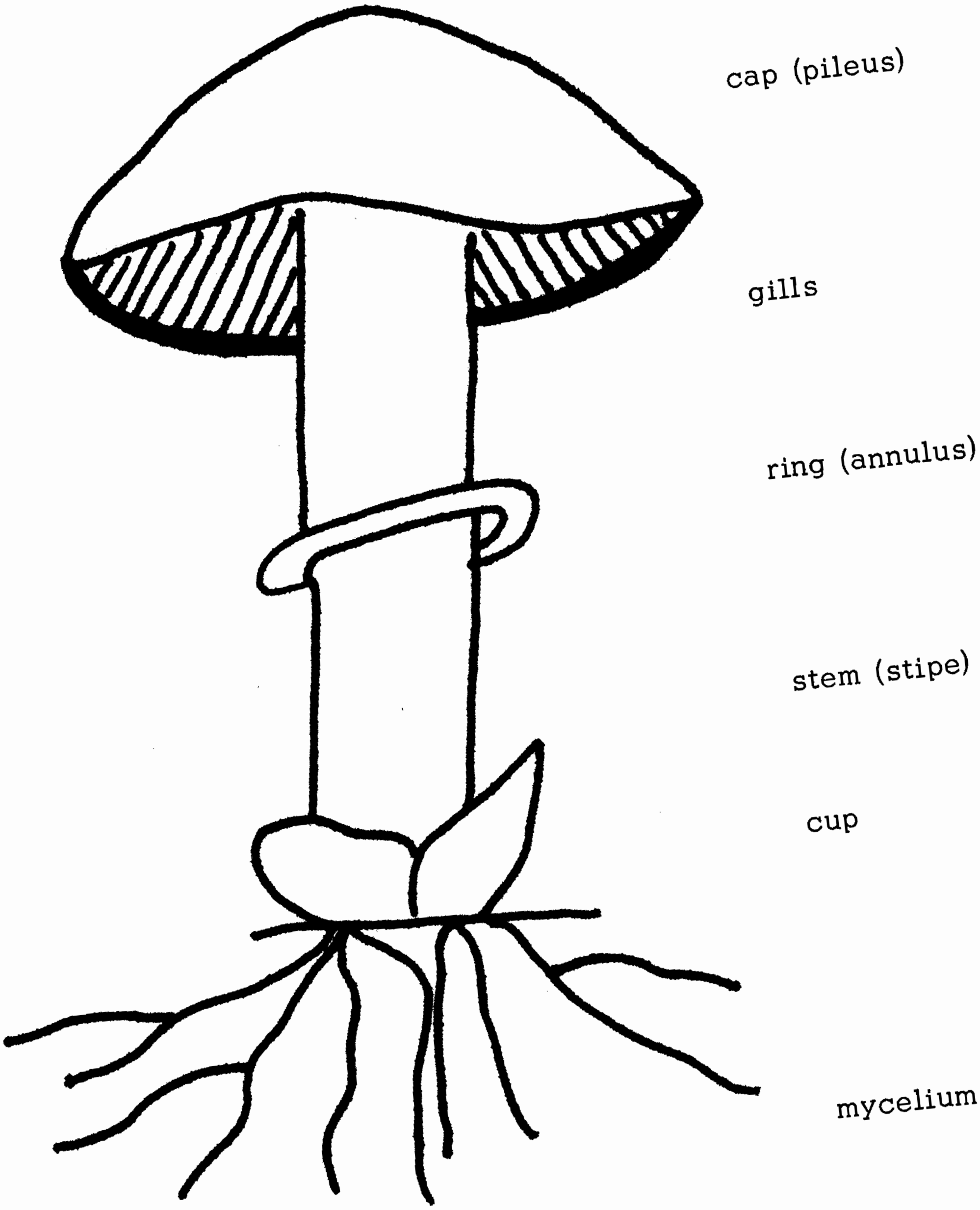
Collect Fungi--Look for mushrooms, tree brackets, puffballs, toadstools, morels, lichen, smut, mold, rust, and mildew. Some grow on trees and bushes, some on river banks, in open fields, and still others on dead logs. Dry fungi may be put in jars or boxes. Fleshy fungi should be dried or placed in alcohol.

A living fungus collection may be raised in a terrarium. The fungi grow best in warm, damp places. It is necessary to use care in digging them up from their natural habitat. Take a clump of soil and vegetation with their underground parts. Many fungi have root-like structures called rhizoids or mycelium that may break. Keep the terrarium out of direct sunlight and water often.

Typical Mushroom:

A typical mushroom consists of a stem or stipe, supporting a circular cap or pileus. On the stipe is a collar known as a ring or annulus. Radiating from the stipe to the margin of the cap onto its underside are the gills where the spores are formed. Spores serve a similar purpose to that of seeds, but they should not be confused with seeds. Because spores are produced in enormous numbers, there is a good chance that the wind will carry some of them to spots favorable to growth. If a spore falls in a warm, moist place where food is available, the single cell absorbs nourishment. It grows by division until long chains of cells resembling threads are formed. Such a chain is called a hypha. A tangle of them is called a mycelium. Along the mycelium tiny balls no larger than pinheads develop and become mushrooms.

TYPICAL MUSHROOM



III. Green Plant

A. The typical flower plant

1. Roots--to anchor plant in ground; to absorb water for the rest of the plant.

2. Stems--to support leaves, flowers, etc.; passage for vascular tubes.

3. Leaves--to manufacture food for plant; to give off excess water; to "breathe" for the plant.

4. Flowers--contain reproductive organs of plants; in some instances, the flowers attract insects to insure pollination.

5. Fruit--womb of the seeds; to provide protection and food for seeds.

6. Vascular system--bundles of tubes, which conduct water upward from the roots (xylem) and carry dissolved food from leaves to other parts of the plant (phloem).

B. Roots

1. Functions

a. Absorb water containing dissolved minerals usually found in soil.

b. Anchor the plant firmly in ground.

2. Types of roots

a. Taproots

1. A single large root from which many root hairs or secondary roots grow outward.
2. Examples: carrots, beets, radishes.

b. Fibrous roots

1. Roots that look like a number of strings or threads all growing downward from the stem.
2. Examples: grasses, corn, wheat.

3. Root cap--covering the very tip is a group of tough cells, the root cap, which protects the fine end of the root from injury as it pushes down into the soil.
4. Hydrotropism--the tendency of roots of a plant to grow towards water.

C. Stems

1. Functions
   a. To carry water from the roots to the leaves.
   b. To distribute manufactured food from the leaves to other parts of the plant.
   c. To hold the leaves up to the sunlight so that they can manufacture food.
   d. To store food
2. Phototropism--the plant turns toward light.

D. Leaves

1. The food for the entire plant is manufactured in the leaves.

2. Classification of leaves.

    a. Simple leaves

    b. Compound leaves

3. Venation in leaves

    a. Pinnately veined leaf

    b. Parallel veined leaf

    c. Palmately veined leaf

4. The parts of a leaf

    a. Blade--broad, flat part of the leaf

    b. Petiole--stem of the leaf

    c. Veins--conduct water and dissolved minerals into the leaf

    d. Midrib--middle of the leaf

5. Cross-section of a leaf

    a. Upper epidermis--protection of inner leaf tissues

    b. Palisade layer--manufacture most of food in the presence of sunlight

    c. Spongy layer--produces some food, contains air spaces

    d. Lower epidermis--hold and distribute air and carbon dioxide

e. Stomates--allow air and carbon dioxide to enter leaf, and oxygen, water vapor, and waste gases to leave

f. Guard cells--regulate the size of the stomates by expanding and contracting depending upon the amount of moisture

6. Green leaf as food factory

a. Photosynthesis--the leaf combines water, minerals, carbon dioxide, chlorophyll, and sunlight to make a simple sugar called glucose

E. Flowers--reproductive organs

1. Parts of a typical flower

a. Receptacle at the base of the flower; supports the other parts

b. Calyx--made up of leaf-like sepals; protects the flower when it is in the bud stage

c. Corolla--the ring of colorful petals; serves to protect the inner reproductive organs and to attract insects

d. Stamens are the male reproductive bodies.

e. Pistil is the female reproductive organ in the center of the flower

2. Stamen

a. The filament which supports the anther

b. The anther which contains the grains of pollen or male cells

3. Pistil

a. Stigma--sticky upper end to which pollen grains adhere

b. Style--passageway for pollen tubes

c. Ovary--which contains unfertilized egg cells called ovules

4. How are seeds produced?

a. Pollination

(1) Cross-pollination--the pollen from the stamen of a flower is transferred to the pistil of another flower of the same species

(2) Self-pollination--the pollen of a flower falls on a pistil of the same flower

b. After the pollen reaches the stigma of the pistil, it sends a tube down the style, and enters the ovary. Here the male cell combines with the female egg cell (ovule) and results in a fertilized egg. The fertilized egg develops into the seed.

F. Fruit

1. After ovules are fertilized, corolla and calyx dry, and the corolla falls off.

2. The ripened ovary plus the seeds is called the fruit.

3. Function

    a. To protect the seeds and to provide means of distributing them (seed dispersal) after the seeds have become mature.

G. Seed

1. Dispersal--specialized dispersal adaptations is for the seeds to find suitable environmental conditions for growth into new plants.

    a. Adequate food supply, moisture, and sunlight.

    b. Dispersed by wind, water, animals, expelled from a pod, and man or mechanical device.

2. Parts of a seed

    a. Seed coat--surrounds and protects the embryo within.

    b. Hilum--the point at which the seed was attached to the pod, and through which it received nourishment.

    c. Micropyle--a small opening through which the pollen tube, carrying the male cell, entered the ovule during fertilization, and through which water is absorbed for the young embryo.

    d. Embryo--young plant

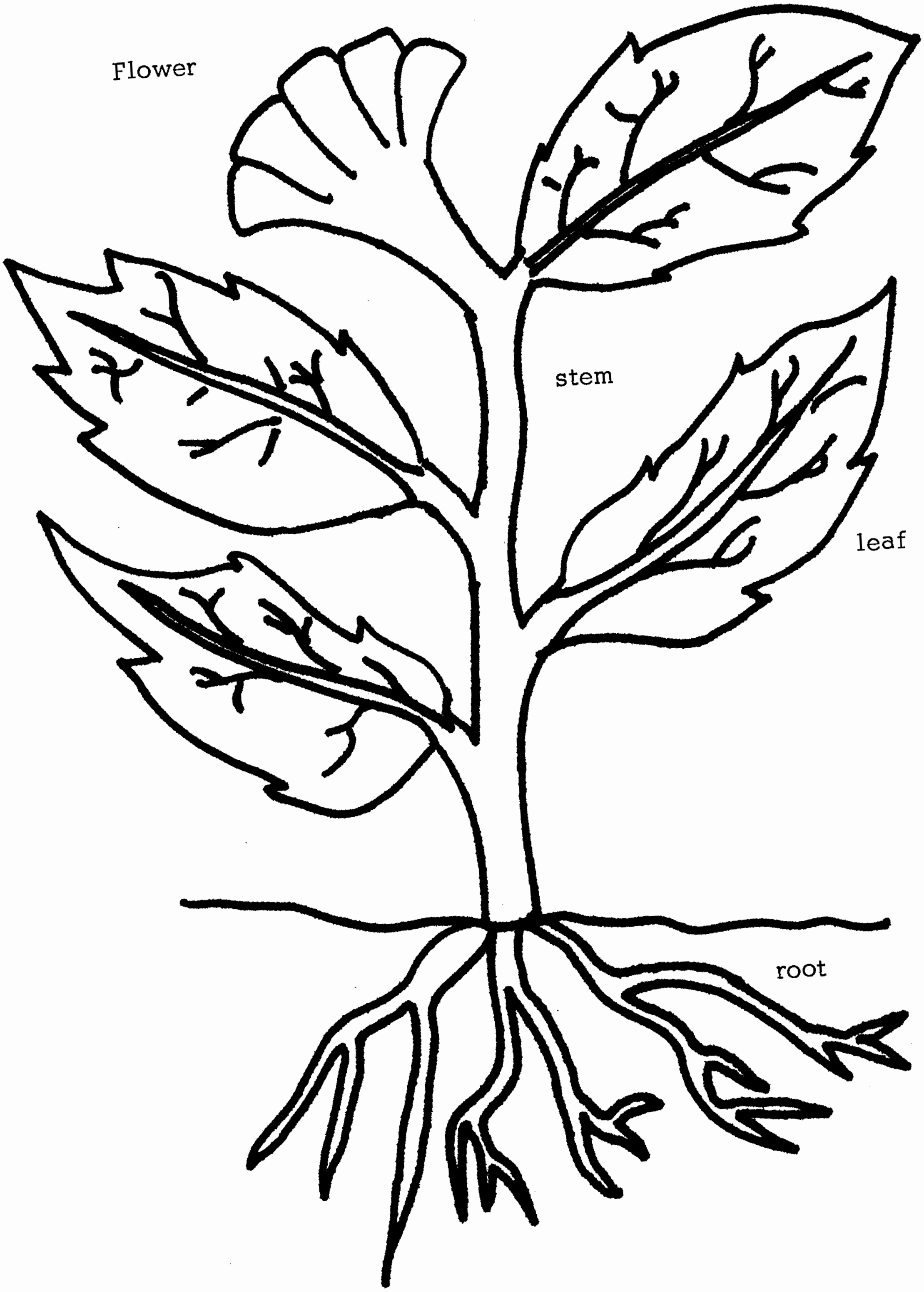
H. Vocabulary

tap roots	hydrotropism	leaflets	blade	fibrous roots
root cap	fibrous roots	osmosis	petiole	photosynthesis
epidermis	simple leaves	calyx	veins	compound leaves

receptacle	corolla	stamen	ovule	anther
dispersal	micropyle	pistil	filament	fertilize
seed coat	embryo	pollen	stigma	style
ovary	pollination	hilum	reproduction	
cross-pollination		self-pollination		

I. Activities

PLANT ORGANS



Student prepared explanation for each organ.

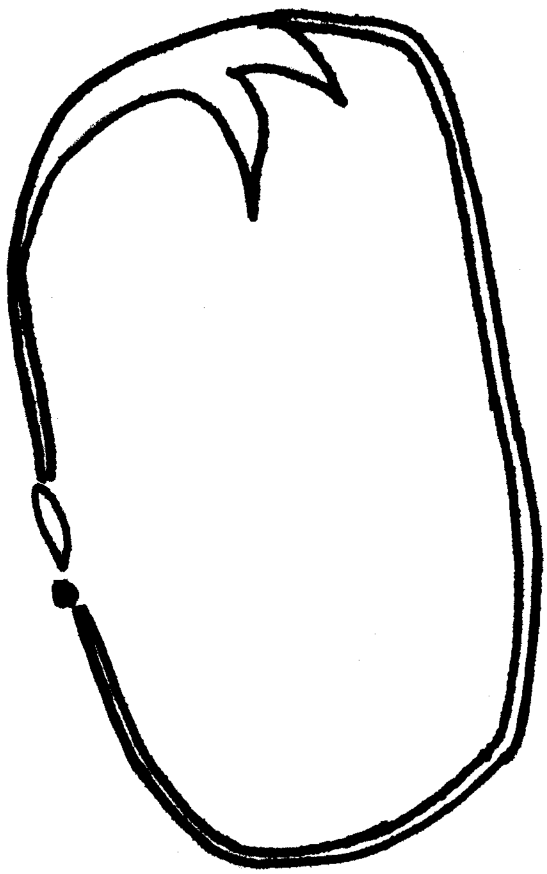
Flower or blossom: The flower is the plant's organ of reproduction. To reproduce, the flower must have pollen. To get the pollen, the flower has pretty petals to attract insects. The insects spread the pollen.

Stem: The stem brings water and minerals to the leaves from the roots.

Leaves: The leaves make the food for the plant. To do this, the leaves get water and minerals from the stem. Leaves also need sunlight, carbon dioxide, and chlorophyll. They make a food called glucose.

Root: The root takes in water and minerals from the soil. The root also holds the plant in place.

THE SEED



The seed takes these conditions to germinate:

____moisture____ and ____warmth____.

FILM: Seed Dispersal (MP-0241)

11 minutes, black and white, intermediate

The film shows the various ways in which seeds are dispersed by wind, water, animals, and mechanical devices.

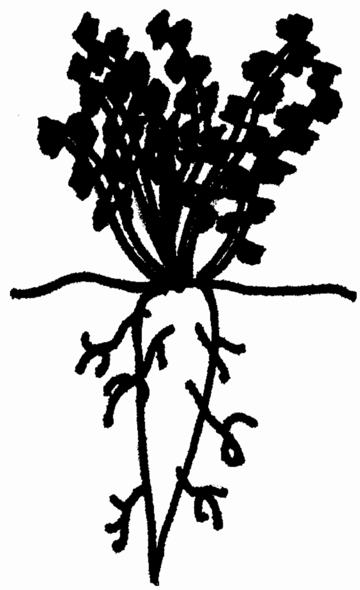
The students divided their papers into fourths. In each section, a picture was drawn showing one of the means by which seeds are dispersed.

WIND	
WATER	
ANIMAL	
MECHANICAL DEVICE	

ROOTS

Fibrous root--
Large threads growing down from the stem

Tap root--
Single large root with tiny hairs growing out of it.



ROOT USES

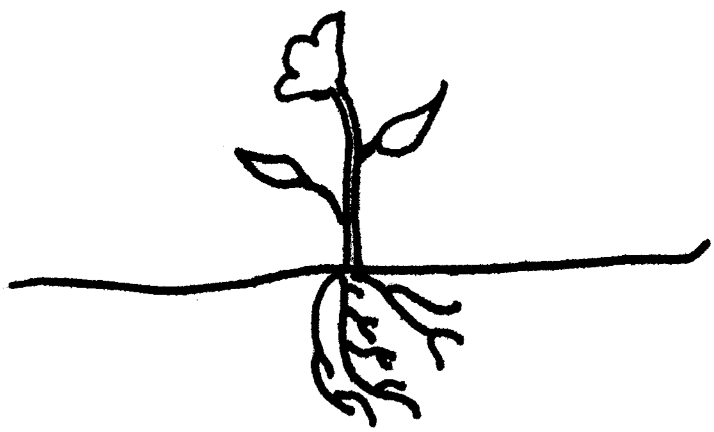
1. Support the plant.

2. Store the plant's food.

3. Bring water and minerals up to the leaf.

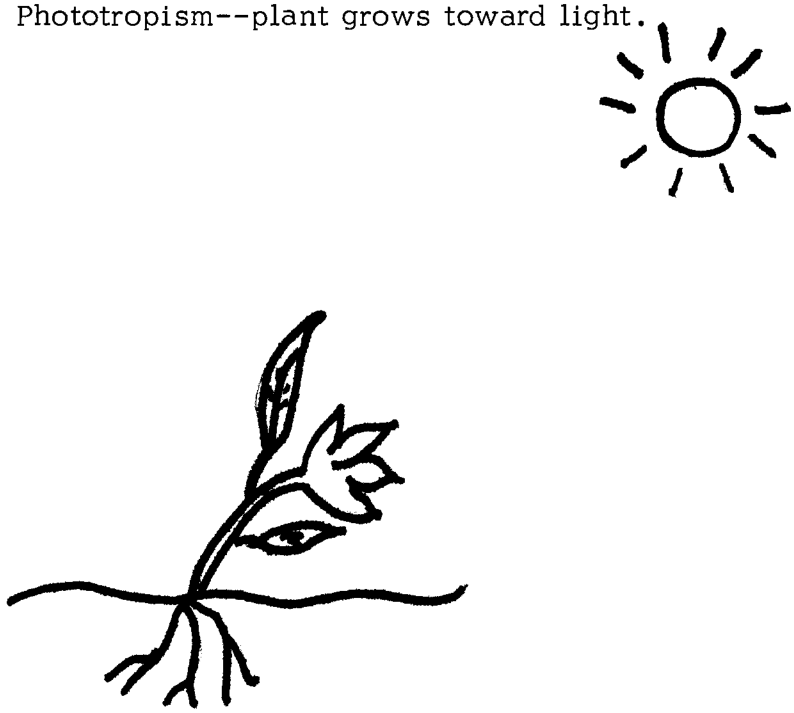
ROOTS

Hydrotropism--the roots grow towards water.

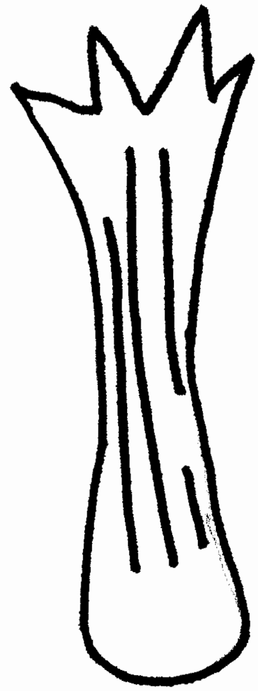


STEM

Phototropism--plant grows toward light.



STEM



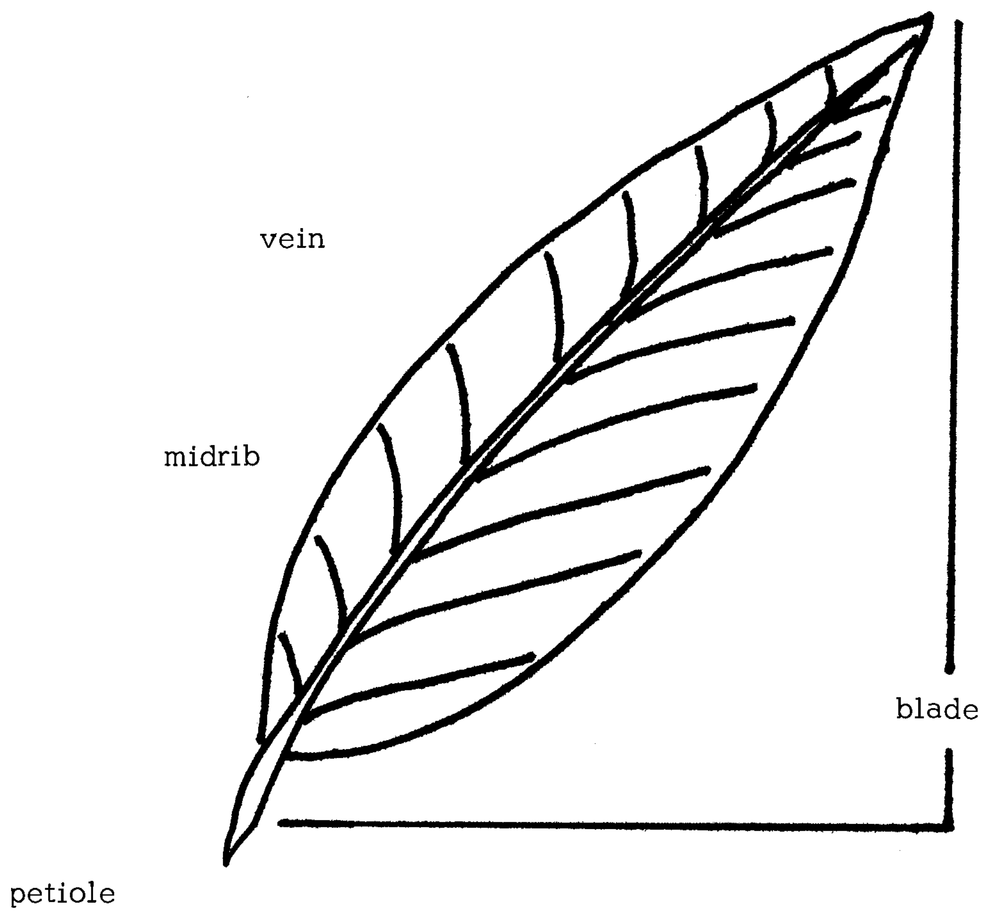
celery

Stem

1. Store food.
2. Connects root to leaf.
3. Brings water and minerals from the root to the leaves.
4. Holds the leaves up to the sunlight.

The stem is used for: wood (lumber), sugar, food, tar, turpentine, and latex.

PARTS OF A LEAF



vein--conductor of water and minerals

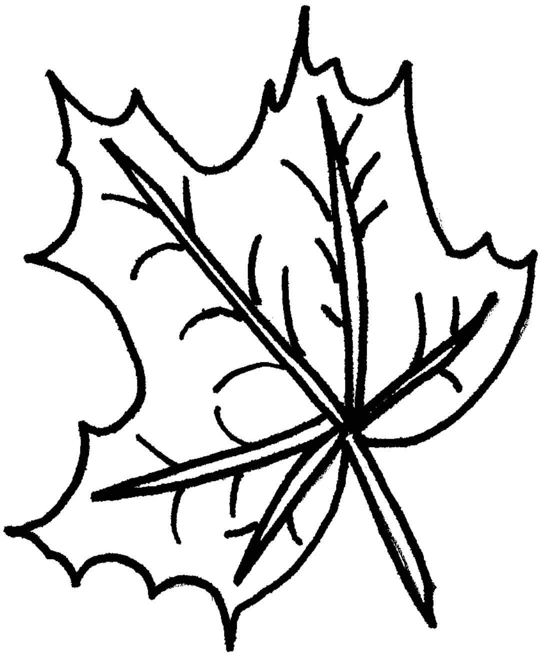
midrib--middle of the leaf

petiole--stem of the leaf

blade--broad flat part of a leaf

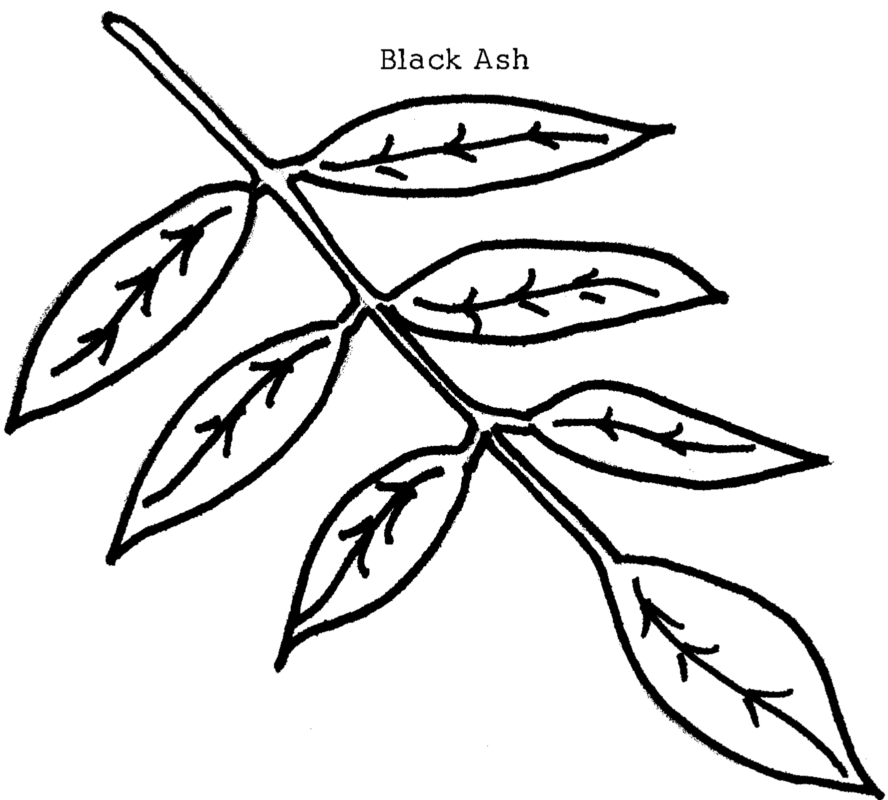
SIMPLE LEAF

Maple

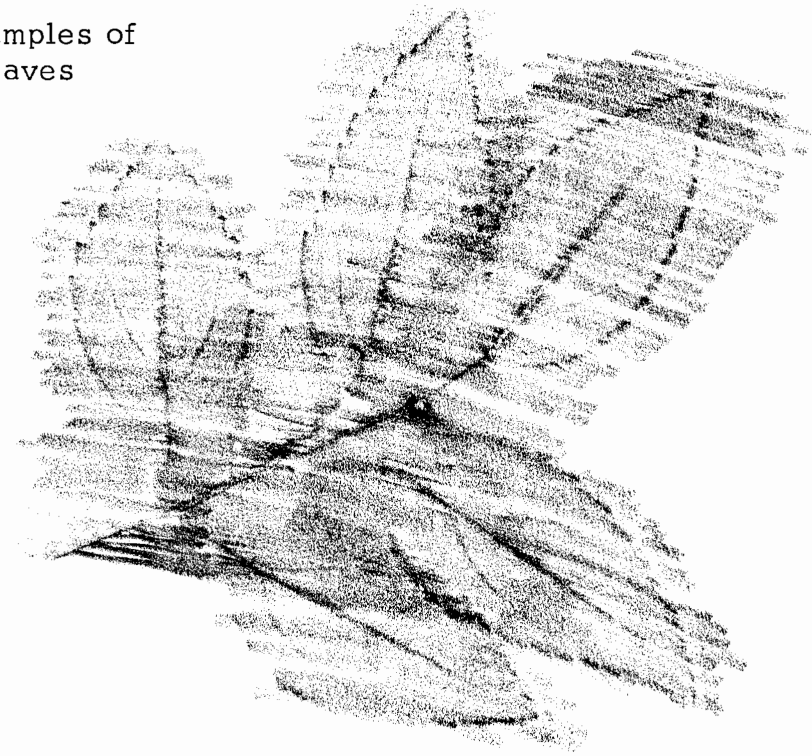


COMPOUND LEAF

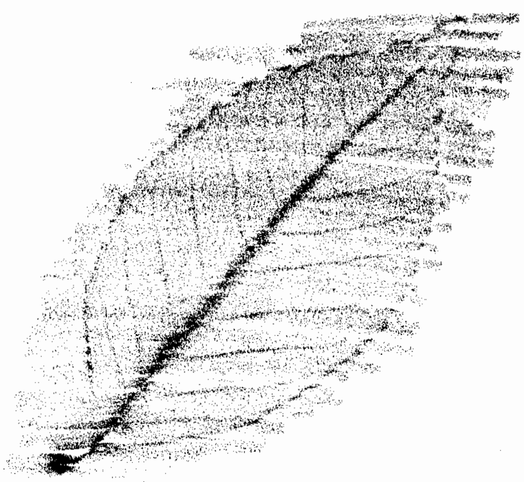
Black Ash

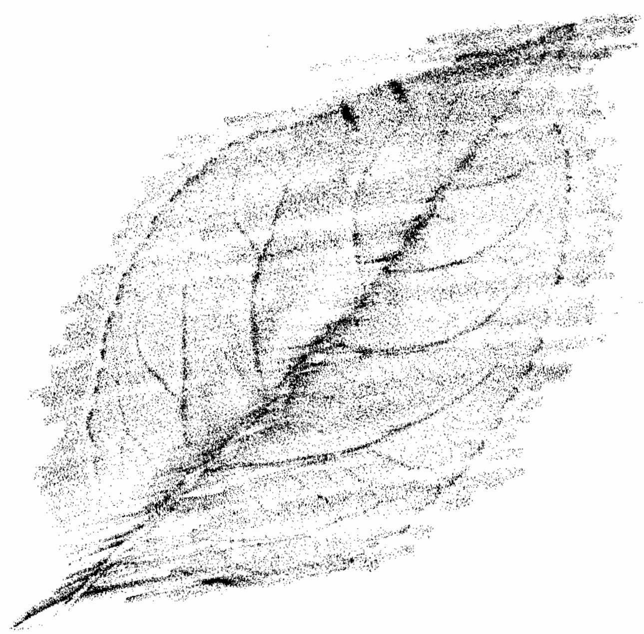


Students are to find examples of simple and compound leaves



compound leaf (Forsythia)

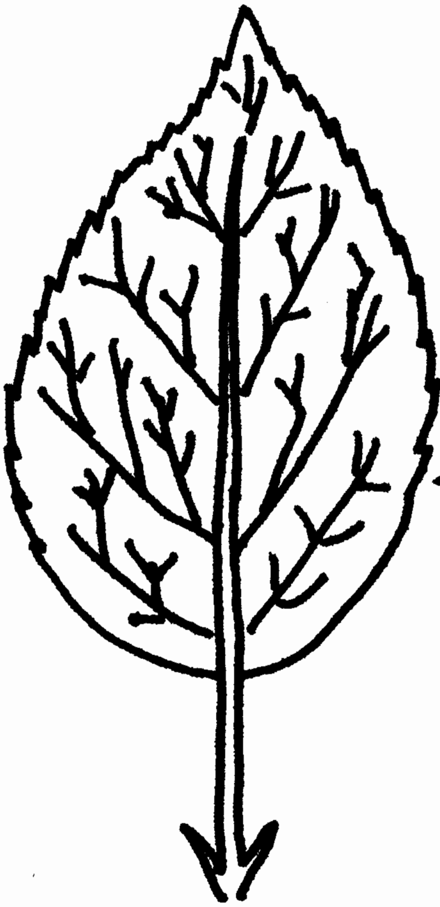




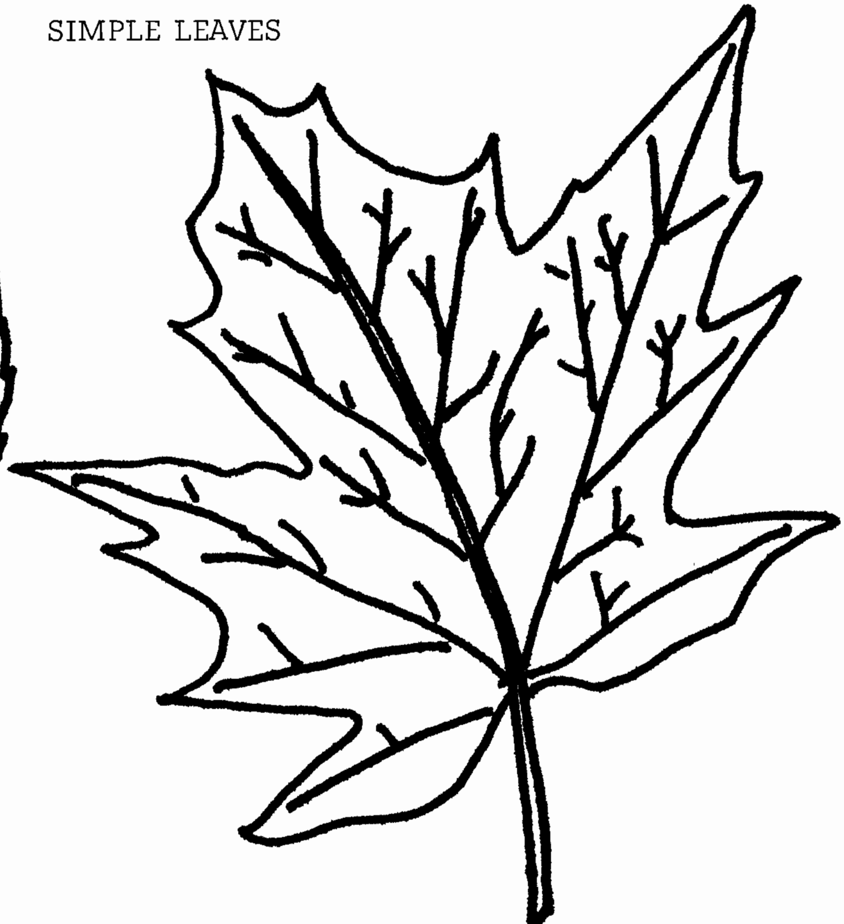
simple leaf (cherry)

simple leaf (apple)

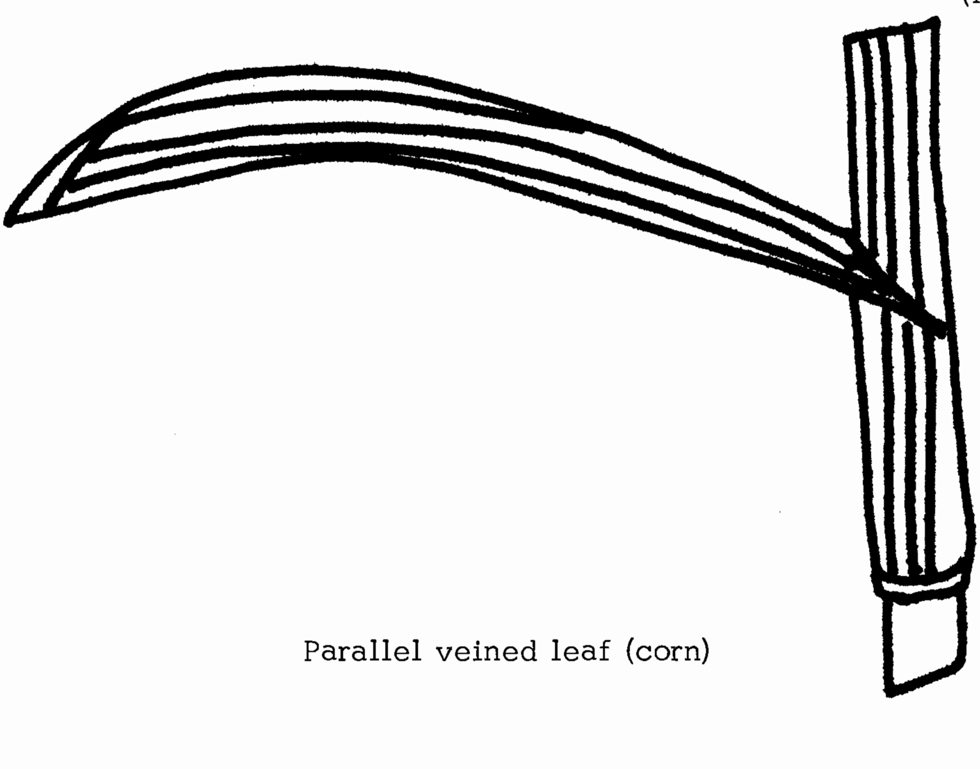
SIMPLE LEAVES



Pinnately veined leaf
(Apple)

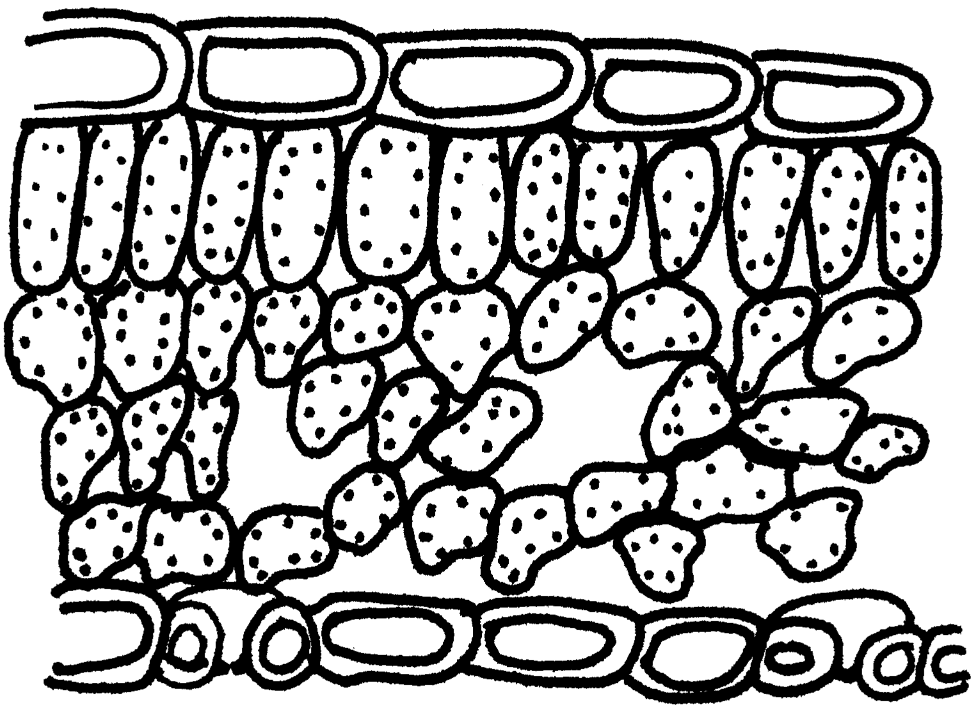


Palmately veined leaf
(Maple)



Parallel veined leaf (corn)

CROSS-SECTION OF A LEAF



How does the leaf manufacture food for the plant:

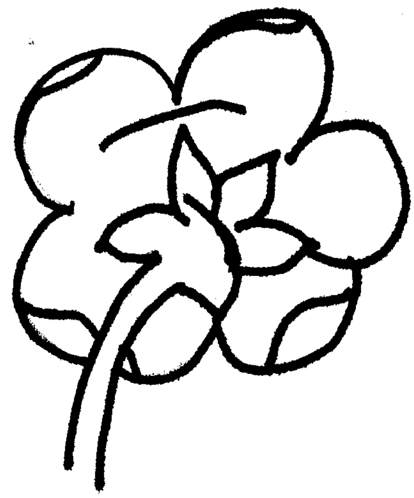
____

____

____

____

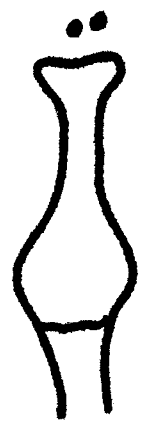
FLOWER



The colored parts of a flower are the petals. The petals together are called the corolla.

The green outside part is the calyx. It is made up of leaf-like parts called sepals.

The stem supports the blossom.

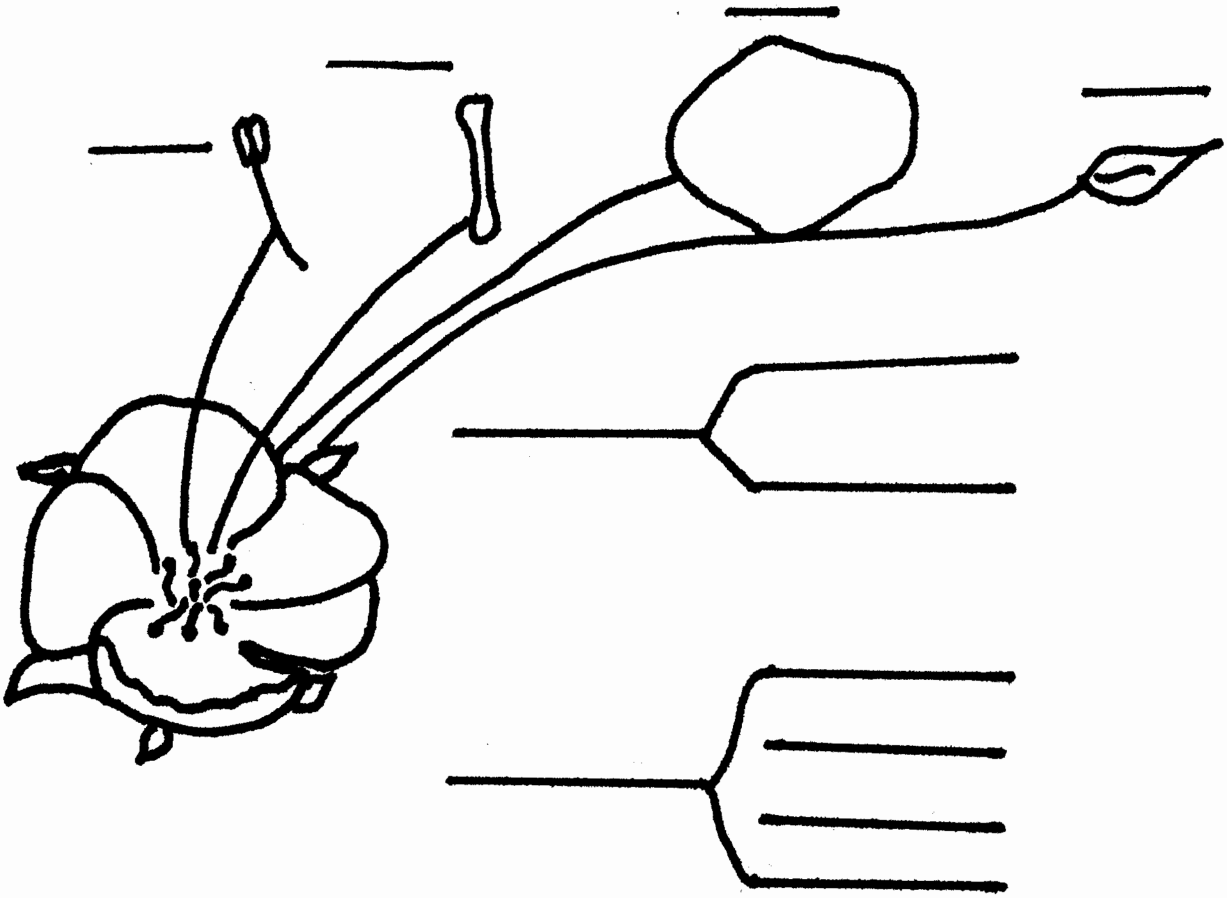


The petals or corolla are colorful to attract insects or birds so they will be pollinated. They give beauty also.

The calyx or sepals protect the delicate inner parts of the flower bud. They prevent insects from eating or crawling into the flower from below by bending backward or being sticky or bristly.

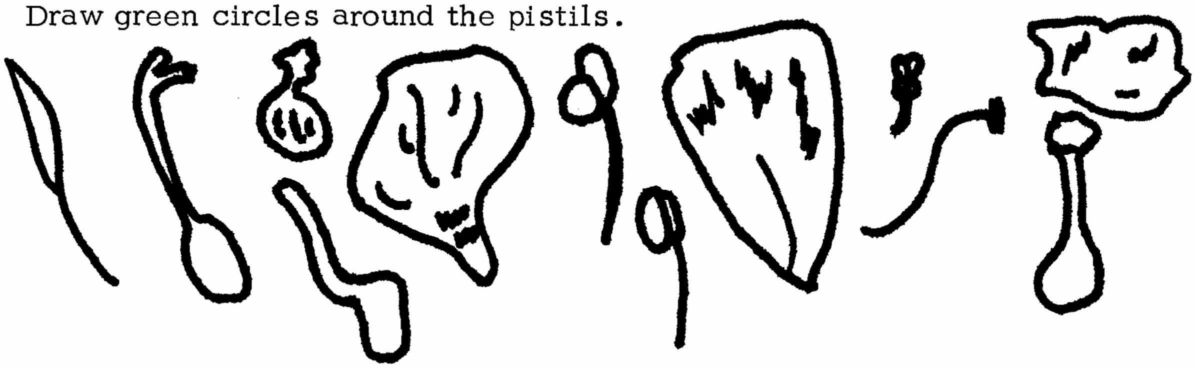
The pistil is in the center of the blossom. The top may be feathery, small, or sticky to hold pollen. It is the stigma. The fat part is the ovary and holds the ovules or egg cells that will develop into seeds. The long slender part connects the stigma and the ovary. The pollen drops down through a duct in the style to the ovary.

Name the four major parts of the flower.

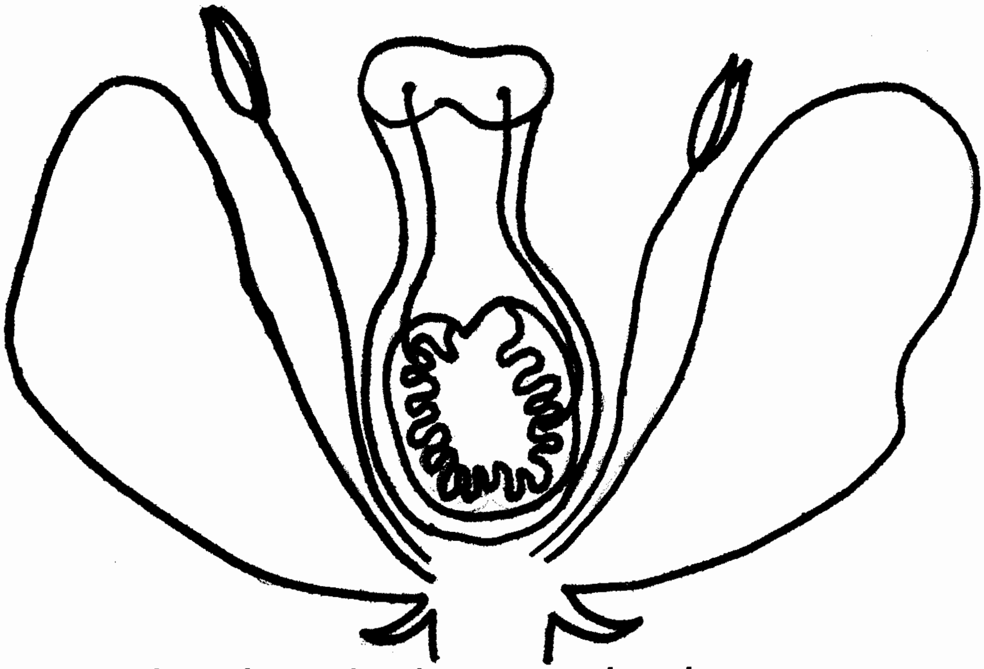


Rockrose

Draw yellow circles around the stamens.
Draw green circles around the pistils.



The flower parts with no circles around them are ______________________.



I. Choose the right word and cross out the others.

A. The ovules in flowers are found in their--pistils, petals, sepals, stamens.

B. Ovules are the beginnings of--petals, pistils, sepals, seeds.

C. Petals, Pollen grains, Sepals, Leaves--are also needed to make seeds form.

D. When a pollen grain joins an ovule, we say that the ovule has been--harmed, unfolded, fertilized.

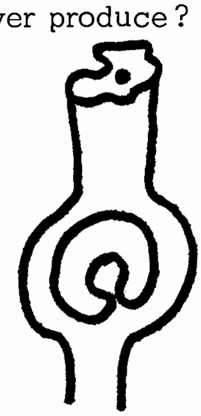
II. How many ovules can you see in the diagram at the top of the page?

____

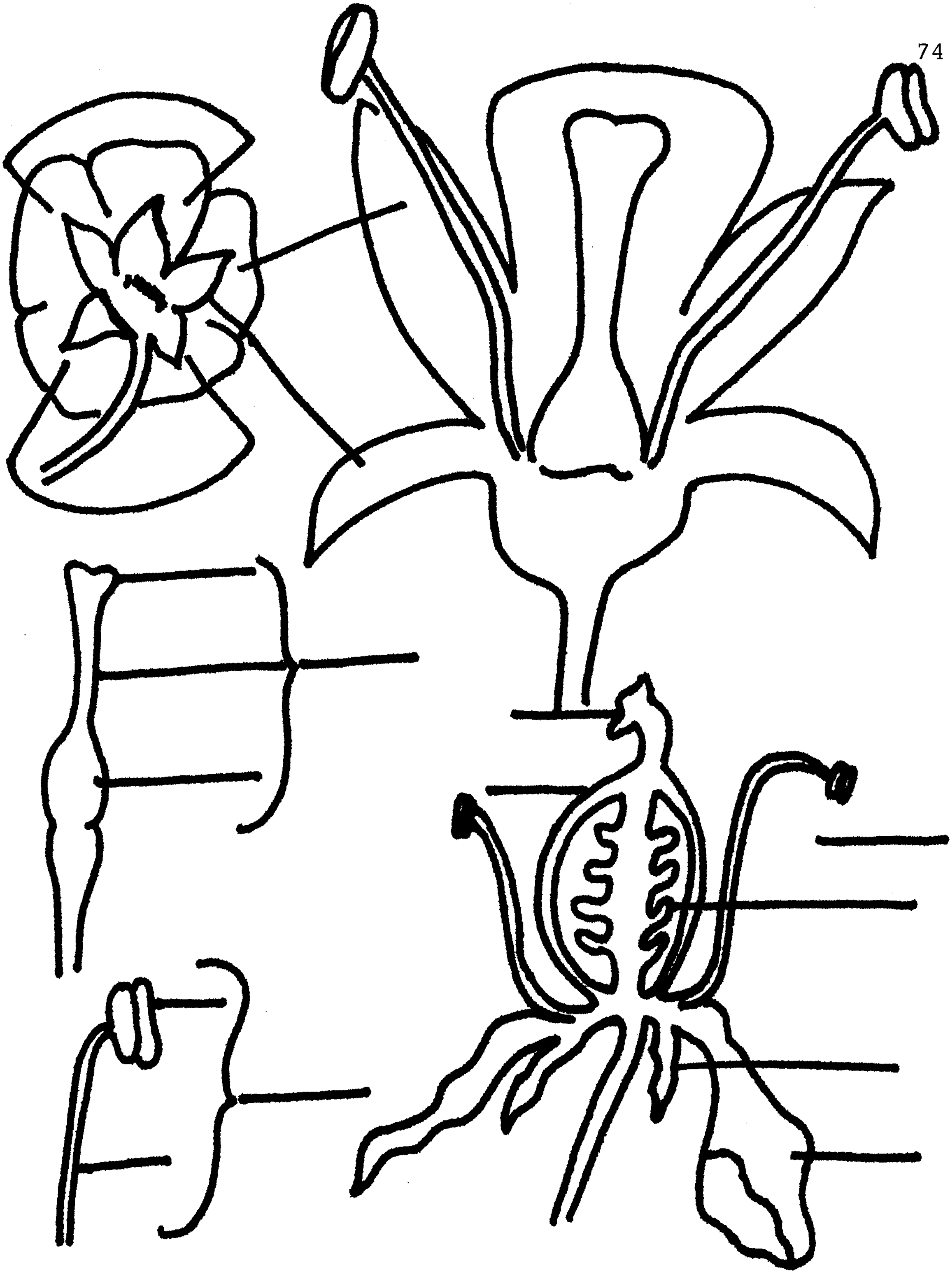
A. Suppose the living material from a grain of pollen reaches each ovule. How many seeds could this flower produce?

1 4 9 12 15 20 22 24

III. This diagram shows a pollen grain resting on the surface of the pistil of a flower. It shows an ovule in the bottom of the pistil.



A. Draw a tube from the pollen grain to the ovule.



Explain on a separate sheet of paper and using proper terminology, how an ovule becomes fertilized.

POLLINATION

Pollination is the transfer of pollen from the anther to the stigma.

A. Explain cross-pollination.

____

____

____

B. Explain self-pollination.

____

____

____

C. Explain what happens within the flower when the flower becomes pollinated.

____

____

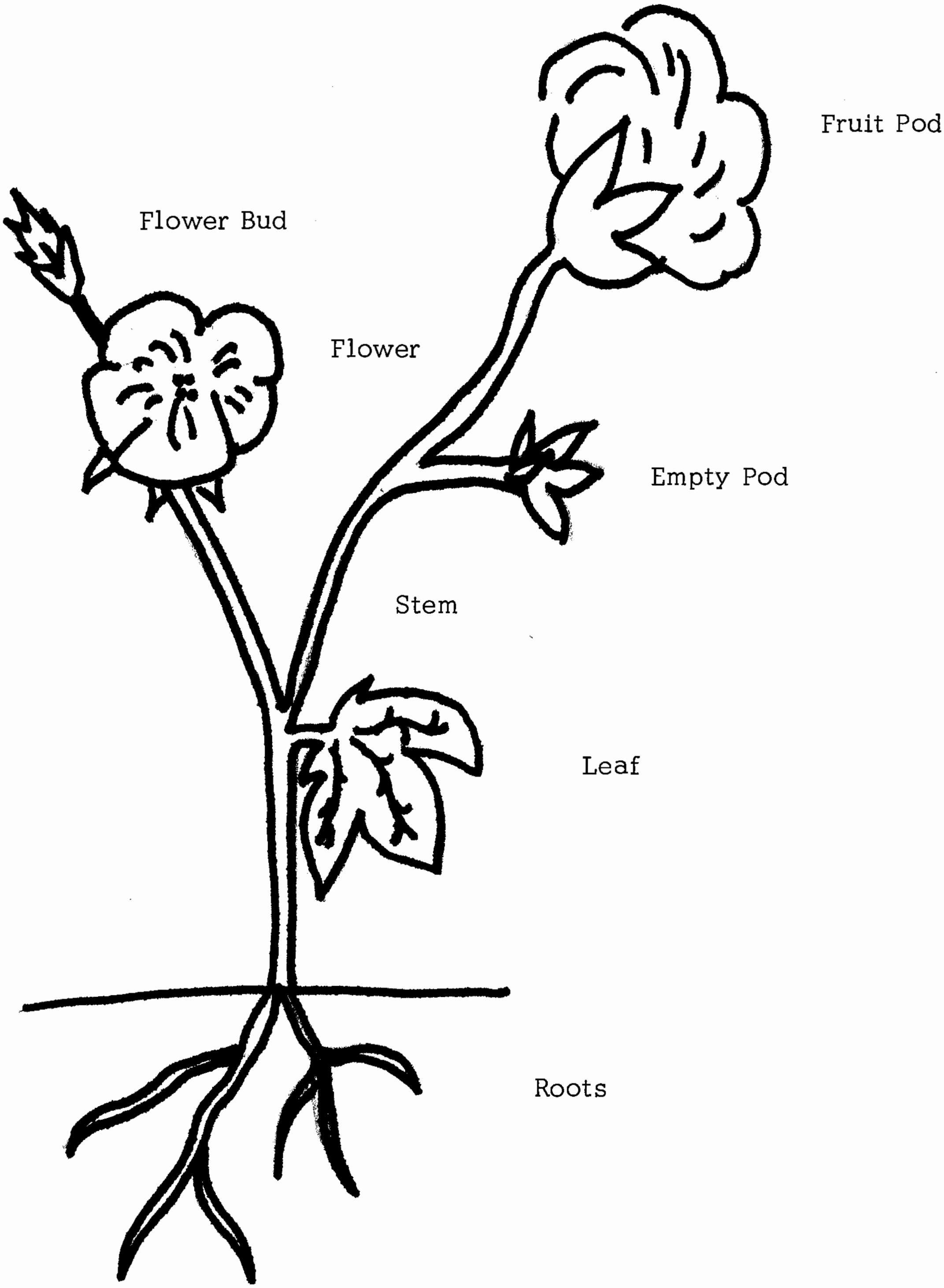
____

____

D. Diagram and label the sexual parts of a flower.

A TYPICAL FLOWER PLANT

Cotton Plant



Green Plants (Pp. 92-96) Name____________________

Fill these blanks with the correct words from this list.

osmosis	one	stem	oxygen	openings
ground	indented	blade	veins	food
plant	tap	indented	epidermis	sizes
useful	chlorophyll	phototropism	hydrotropism	photosynthesis

1. All green plants have a substance called chlorophyll.
2. With chlorophyll, plants can make their own food if light and water are present.
3. Roots hold a plant in the ground, serve as a means by which a plant gets water and minerals from the soil, and store food for the plant.
4. The process by which water and dissolved minerals move from the soil through the membranes of the root hair and into the plant is called osmosis.
5. The growth of roots toward water is called hydrotropism.
6. The response of parts of a plant to light is called phototropism.
7. The stem is the part of the plant that connects the roots to the leaves and supports the leaves, flowers, and fruit.
8. Stems store some food for the plant.
9. Many stems are useful to man.
10. There are many kinds, shapes, and sizes of leaves.
11. Simple leaves are all one part.

12. Compound leaves have their edges so far <u>indented</u> that many small leaves called leaflets are formed.

13. Leaves are arranged so that each one can get as much <u>light</u> as possible.

14. The <u>veins</u> conduct water and dissolved minerals into the leaf.

15. The upper and lower layer of cells in a leaf make up the <u>epidermis</u>.

16. Scattered throughout the epidermis are <u>openings</u> through which oxygen and carbon dioxide enter and leave the plant.

17. The process by which a plant uses carbon dioxide and water to make sugar in the presence of light is called <u>photosynthesis</u>.

18. Green plants not only make food, but they also supply <u>oxygen</u> to other living things.

19. <u>Tap</u> roots are single large roots which grow straight down and have many small roots growing out.

20. The broad, flat part of a leaf is called the <u>blade</u>.

The following films were used with the green plant section of the unit.

Gift of Green (MP-0537) 20 minutes, color, junior.

Explains the process of photosynthesis by means of animation. Shows how plants build food, particularly sugar, from water and air.

Growth of Flowers (MP-0144) 10 minutes, color, intermediate.

Time-lapse photography shows the growth of various plants and flowers as they sprout from the ground, emerge from the bud, and burst into full bloom. Includes roses, orchids, jack in the pulpits, daffodils, and iris.

Life Cycle of a Plant (MP-0226) 10 minutes, black and white, junior.

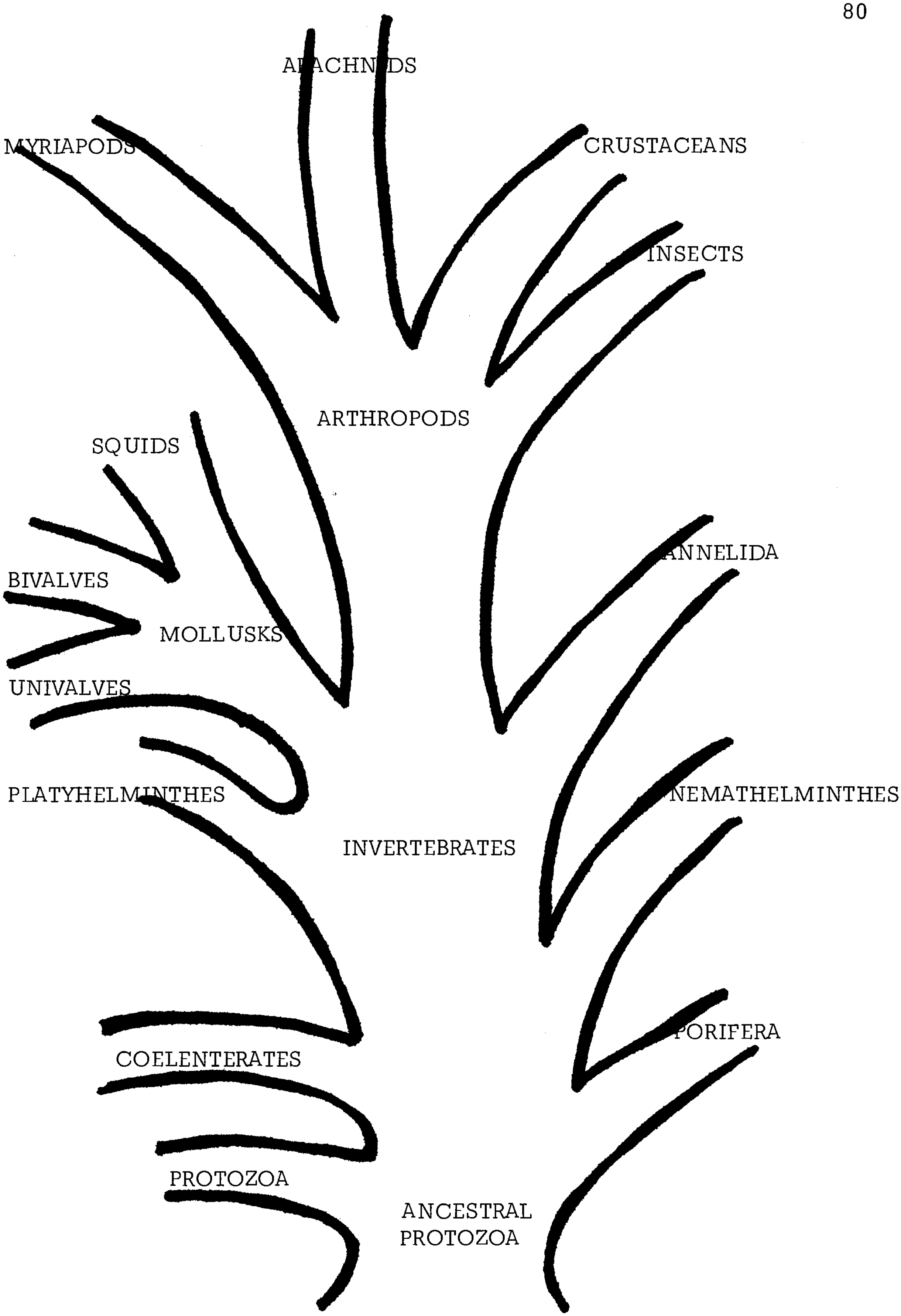
Traces growth from seed to mature plant, including pollination and fertilization by micro, time-lapse, animated diagram, photography.

Plants Make Food (MP-0178) 11 minutes, black and white, intermediate.

Process by which plants make food; functioning of roots, stems, and leaves; transforming of water, minerals, and carbon dioxide into foods; role of chlorophyll and sunlight.

Secrets of the Plant World (MP-0693) 15 minutes, color, intermediate.

Seed travel variety, time-lapse of growth budding and flowering of many plants.


ARACHNIDS
MYRIAPODS
CRUSTACEANS
INSECTS
ARTHROPODS
SQUIDS
ANNELIDA
BIVALVES
MOLLUSKS
UNIVALVES
PLATYHELMINTHES
NEMATHELMINTHES
INVERTEBRATES
PORIFERA
COELENTERATES
PROTOZOA
ANCESTRAL
PROTOZOA

ANIMALS

<u>Philosophy</u>: Study of animal growth and reproduction introduces terminology and concepts of human growth and reproduction naturally.

<u>Objective</u>: To begin the background for a study of human growth and reproduction.

<u>Approach:</u> Continuing study of the life cycle from plants to animals.

<u>Method</u>: Audio-visual aid materials, demonstrations, open discussion, independent research.

<u>Introduction of terminology</u>: The terminology will be introduced in each section of the unit.

I. The Animal Kingdom: Invertebrates

A. Animals which have no backbones or internal skeletons.

1. Protozoa--one-celled animals that live independently in water.

a. Ameba

(1) Irregular shape

(2) Moves from place to place slowly by extending projections of protoplasm (pseudopods) and "oozing its body after itself."

(3) Pseudopods surround food and form food vacuole.

(4) Oxygen taken out of water by osmosis through cell membrane and carbon dioxide removed from cell. (respiration)

(5) Excretion:

(a) Liquid wastes collected in contractile vacuole and excreted through cell membrane.

(b) Solid wastes left behind through cell membrane.

(6) Reproduction: by fission.

(7) Protection: no visible means.

b. Paramecium

(1) Constant shape--slipper-like.

(2) Thread-like projections of protoplasm (cilia) covering the outer surface of the cell membrane that wave back and forth rapidly propelling the animal through water.

(3) When the animal comes in contact with danger, dart-like projections called trichocysts are ejected through the membrane.

(4) Food particles are ingested through a groove in the protoplasm (oral).

(5) Waving cilia lining the groove push the food into a small depression called the gullet. Here a food vacuole is formed which is circulated through the

cell protoplasm by its natural flowing motion. Digestion occurs in the food vacuole. Digested food is absorbed into the rest of the cell.

(6) Liquid wastes are directed into the contractile vacuoles. They are eliminated through the cell membrane by contraction of the vacuoles. Undigested solids are expelled through a weak spot in the cell membrane called the anal spot.

(7) Reproduces by simple fission.

(8) Responds to external stimuli such as food, contact, light, heat, and their enemies.

c. Euglena

(1) Botanists consider it a simple plant because it contains chlorophyll bodies with which it manufactures its own food.

(2) Zoologists claim that it belongs to the animal kingdom for several reasons.

(a) It contains a contractile vacuole for collecting and eliminating liquid wastes.

(b) At one end of the cell there is a form of mouth and gullet into which it takes some food particles from the water.

(c) At the mouth region, there is a whip-like projection (flagellum) which lashes back and forth aiding in locomotion and food getting.

(d) Plant and animal may have a common ancestor.

d. Vocabulary

invertebrates	cilia	paramecium
Zoologists	flagellum	groove
protozoa	ameba	cyst
pseudopod		

e. Activities

Plant and Animal Similarities (pp. 98-99) Name______________

Fill in the blanks from the list of words below

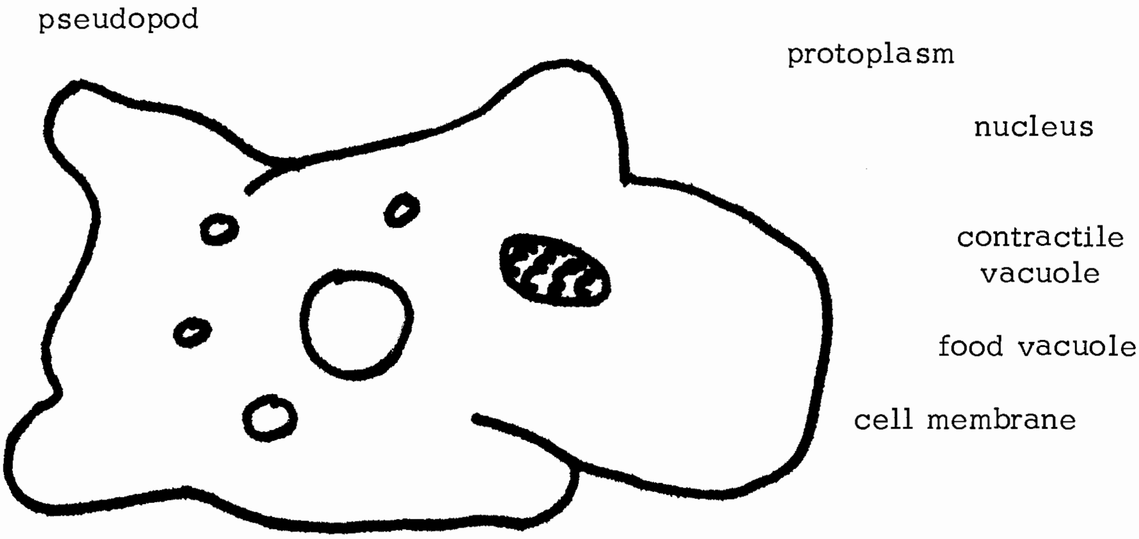
energy	waste	move	food	stimuli
nonliving	plants	senses	oxygen	grow
excreting				

1. All living things can __move__ themselves.
2. Both plants and animals respond to __stimuli__ .
3. Many animals receive stimuli through the __senses__.
4. Both plants and animals __grow__ -- plants throughout their lives and animals to a certain size.
5. Green plants make their food from __nonliving__ materials.
6. Animals get food from __plants__ or other animals.
7. Both plants and animals use __oxygen__ to get energy.
8. Animals need more __energy__ than plants; therefore, animals use more oxygen.
9. Animals use more different kinds of __food__ than plants.
10. Animals produce more kinds of __waste__ products than plants.
11. Animals have special body parts for __excreting__ wastes.

Student prepared plant and animal similarities.

Plants		Animals
anchored by roots stems and leaves move	move	move from place to place
light and water	respond to stimuli	sight, hearing, smell, taste, and touch
grow all through life	growth	certain size, then stop growing
makes its own food from non-living things	take in and digest food	can't make own food but eats plants or other animals that eat plants
plant uses carbon dioxide and gives off oxygen	oxygen	uses oxygen and gives off carbon dioxide
gives off oxygen	excretion	gives off carbon dioxide and non-living material
seeds	reproduce	eggs, born alive young

AMEBA



1. ___________ number of cells make up the Ameba's body.

2. The cell is a shapeless mass of ________________, the living, jellylike material in the cells of all living things.

3. The Ameba has no feet. How does the Ameba move?

____

____

4. Amebas eat tiny plant life such as bacteria, and other one-celled animals. How do the Amebas eat?

____

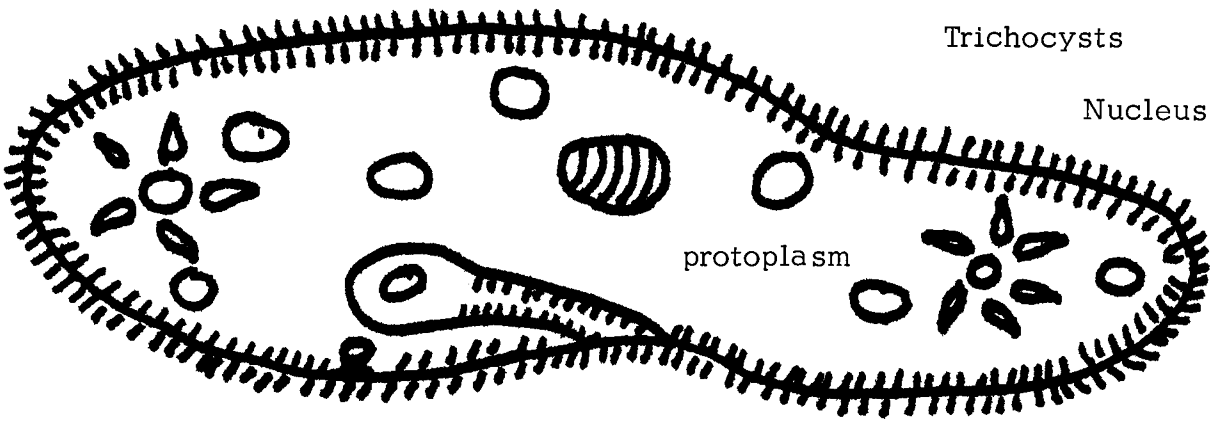
____

5. When the Ameba reaches a certain size, it reproduces. How does the Ameba reproduce?

____

____

PARAMECIUM



1. The paramecium is a more advanced type of ________ celled protozoa, is slipper-shaped, and ______________ in form.

2. Its body is covered with tiny projections of protoplasm called ______.

3. These projections have two main functions. List them.

____

____

4. Directly under the cell membrane is a series of dart-like projections called ________________ which are ejected through the membrane when the animal comes in contact with danger.

5. Paramecium eat tiny plant life such as bacteria and other one-celled animals. How do the Paramecium eat? Undigested solids are expelled through a weak spot in the cell membrane called the anal spot.

6. The paramecium reproduces by simple fission. Explain what fission is.

____

____

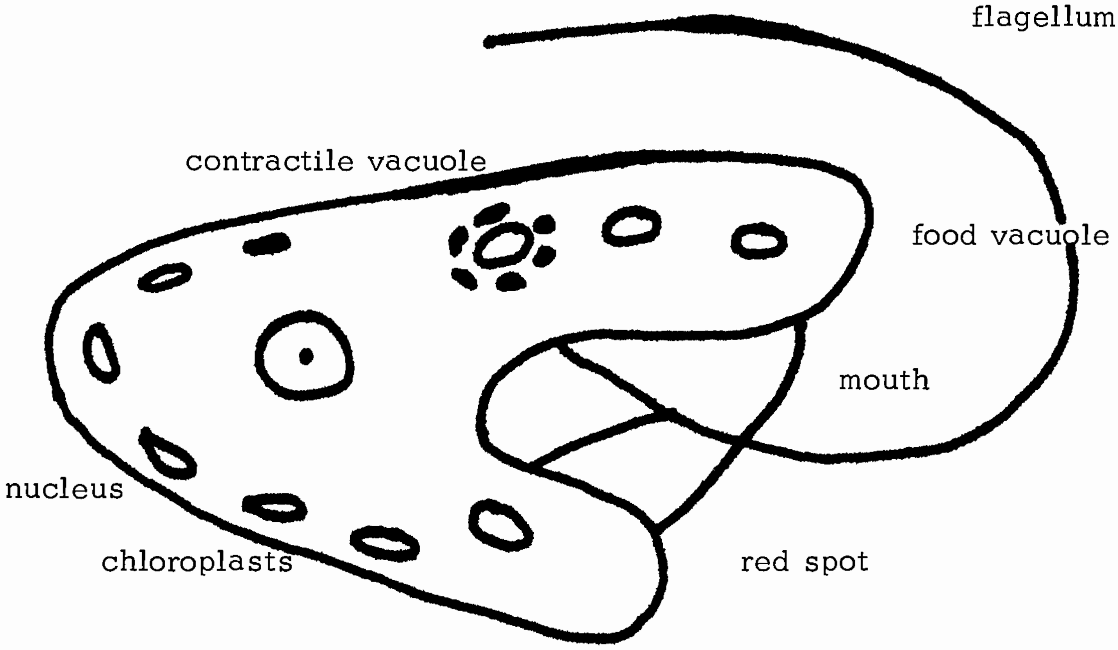
Protozoa are of extreme importance to the welfare of man. Since they are so numerous and live in water, they provide food for other water living animals useful to man as food--crayfish, fish; a source of oils--cod, halibut, whale; jewelry--natural and cultured pearls from oysters; and clothing--furs from beavers, seals, and others.

Some protozoa are helpful because they destroy bacteria in water that may be harmful to man; others are helpful in the decomposition of dead plants and animals, thus enriching the soil and avoiding cluttering of the earth.

Some protozoa are harmful because they cause decay of foods, tooth and gum decay and disease (pyorrhea), diseases of the intestinal tract (dysentery and diarrhea), malaria and African sleeping sickness.

7. The Paramecium hasn't nerve cells and yet it makes definite responses to food, contact, light, heat, and enemies. These responses are called ________________________.

EUGLENA



Botanists consider the Euglena a simple plant because it contains chlorophyll bodies with which it manufactures its own food.

Define the word botany ______________________________.

Zoologists, on the other hand, claim that it rightfully belongs to the animal kingdom. It contains a contractile vacuole for collecting and eliminating liquid wastes. At one end of the cell there is a form of mouth and gullet into which it takes some food particles from the water. At the mouth region, there is a whip-like projection called _______________ which lashes back and forth.

This whip-like projection has two functions. List them.

1. ____

2. ____

Define the word zoology ______________________________

Perhaps this bit of life (plant or animal) is proof that one-celled plants and animals have a common ancestor.

2. Porifera

a. Sponges

(1) Their bodies consist of two layers of cells surrounding a hollow interior which is the digestive cavity.

(2) The mouth, an opening into the digestive cavity, is surrounded by tentacles which are projections of the two-layered body.

(a) The function of the tentacles is to wave food into the mouth.

(b) Many of these animals expel stinging cells that paralyze smaller animals which they eat.

(3) These animals reproduce both asexually and sexually.

(a) Asexually--They reproduce by budding. The parent forms an outer growth which breaks off and forms a new individual

(b) Sexually--Male sperm cells and a female egg cell are produced. The sperm swims to the egg cell, fuse with it to form a fertilized egg which divides into a new many-celled individual.

(c) Also reproduce by regeneration; that is, the growth of a new individual from a piece of another that has been broken off or torn off by other animals or by forces of waves or currents.

b. Vocabulary

pores tentacles organism

c. Activities

3. Worms

   a. Platyhelminthes--flatworms

      (1) Fluke (parasite)

      (2) Tapeworm (parasite)

      (3) Planarian (free-living)

   b. Nemathelminthes--roundworms

      (1) Hookworm

      (2) Trichina

   c. Annelida--segmented worms

      (1) Earthworm

         (a) The long digestive tube is divided somewhat into mouth, pharynx, gullet, crop, gizzard, and intestine.

         (b) The circulatory system is a pair of tubes, one running the length of the dorsal (back) part of the soft body and the other, ventral (under). Five branches, called hearts, encircle the gullet part of the intestinal tract.

         (c) There appears the first evidence of nerve tissue in the form of a ganglion.

         (d) Breathe by osmosis through their moist skin.

         (e) Tube-like structure in each segment--liquid wastes are collected and excreted.

(f) An earthworm forces its way through soft earth with bristle-like appendages on the ventral side of every body segment. As it travels, it eats soil. The digestive system selects edible plant and animal matter from the soil and the remainder is passed out of the body in the form of castings.

d. Vocabulary

appendages   proboscis   parasites

e. Activities

4. Mollusks

   a. The members of this group have soft, unsegmented, rather shapeless bodies surrounded by a single or double covering called a shell. The shell is made of calcium.

   b. Clams, oysters, scallops, and mussels are called bivalves because of two shells attached at one point by a hinge of soft body muscle tissue.

      (1) Move by extending a muscular foot between the two shells.

      (2) Oyster--Pearl is an oyster's method of counteracting an irritation.

         (a) When a coarse grain of sand gets caught in the tender body tissue lining the oyster shell, the animal secretes a liquid called mother-of-pearl or nacre which forms smooth layers as it hardens around the disturbing sand grain.

   c. Snails are univalves because they have a single shell covering their soft bodies.

   d. Squids, cuttlefish, and octopuses are Mollusks without shells.

      (1) Cuttlefish and squids have a stiff blade beneath the mantle.

         (a) Blade helps support the soft body.

e. Vocabulary

mantle	siphon	tube feet

f. Activities

5. Arthropods

   a. Jointed legs

   b. Body divided into segments

   c. Exoskeleton

      (1) Chitin

      (2) Molting--shed exoskeleton and grow new one

   d. Four kinds of Arthropods

      (1) Myriapods--very many legged

         (a) Centipede

            i) Eats worms and insects

            ii) Poisonous fangs

            iii) One pair of legs to each segment

            iv) Fast moving animal

         (b) Millipede

            i) Eats decaying plants

            ii) Crawls into dark damp places

            iii) Harmless--no fangs

            iv) Two pair of legs to each segment

            v) Slow moving

      (2) Crustaceans--hard shelled

         (a) Five pairs of legs

         (b) Live in water

(c) The paired, segmented appendages of these water animals are modified either for walking, swimming, or for food getting and protection. There are usually four pairs plus a pair of large claws.

(d) Their bodies are divided into two sections covered by an exoskeleton. The hard shell serves as protection and support for the soft body parts under it.

(e) These animals breathe by means of gills that are usually found at the base of each walking leg.

(f) As soft body parts become too large for their shells, the shell splits open and soft animal crawls into a hiding place until a new exoskeleton has grown. Process is known as molting.

(g) All members of this group are equipped in the head region with antennae that are sensitive to changes of any kind--chemical or physical--in the surrounding environment.

(h) Animals are lobster, crab, crayfish, shrimp.

3. Arachnids--spiders

    a. Four pairs of legs.

    b. Spiders have no antennae.

    c. Extremely simple eyes.

    d. Spinnerets on the under surface of the abdomen of the female spider. These are small tubes connected with glands which manufacture and secrete the substance the spider spins her web with.

    e. Most spiders are beneficial to man because they feed on and rid him of insect pests.

    f. Black Widow spider and tarantula are poisonous.

4. Insects

    a. A body divided into three segments: head, thorax, and abdomen.

    b. A pair of antennae

    c. A hard exoskeleton

    d. Usually two pairs of wings

    e. Three pairs of segmented legs

    f. Breathing pores or openings on each side (spiracles)

    g. Compound, many-faceted eyes

    h. Life cycles

        (1) Life cycle of a butterfly

            (a) Complete metamorphosis

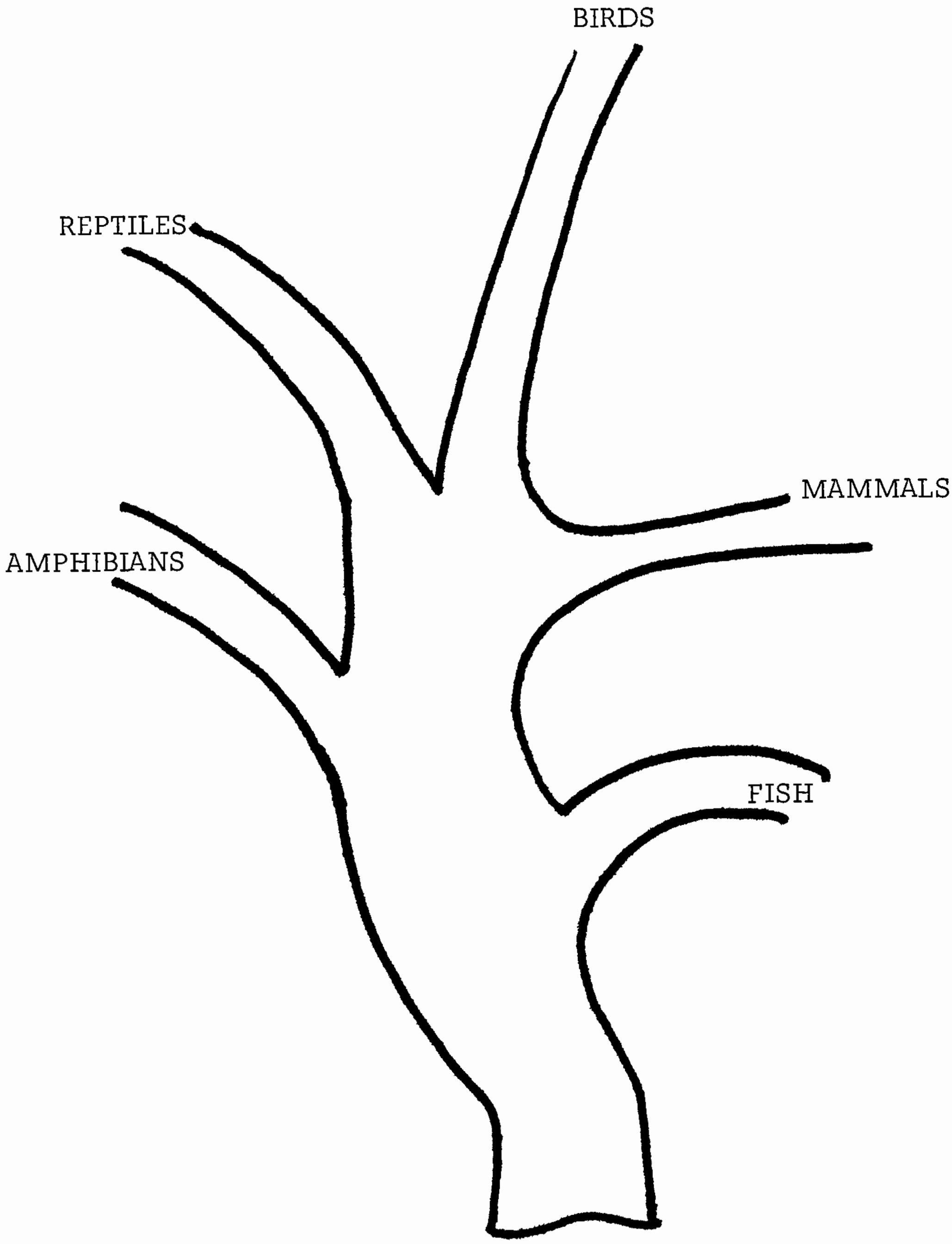
(2) Life cycle of a grasshopper

(a) Incomplete metamorphosis

e. Vocabulary

chitin	gills	abdomen
molting	head	antennae
thorax	spiracles	compound eyes
larva	pupa	metamorphosis
cocoon	nymphs	

f. Activities


BIRDS
REPTILES
MAMMALS
AMPHIBIANS
FISH

(4) Fins serve for steering, balancing, stopping, and reversing action.

(5) Air bladder in the body cavity helps the fish rise or sink and keep its balance.

(6) Gills--water enters the mouth, passes back over the gills through the gill coverings. As the water passes over the gills, oxygen from the dissolved air in the water is taken into the blood in the gills by the process of osmosis. From here it is carried by the blood circulated to all parts of the body. The waste gas carbon dioxide is carried from the body cells to the gills where it passes by osmosis into the water.

(7) Life cycle of a fish

(a) Eggs, fry, yolk sac becoming absorbed, fingerling.

2. Amphibians

a. Evidence of more advanced structure

(1) Three-chambered heart.

(2) Digestive tube is divided into esophagus, gullet, stomach, small intesting, large intestine.

(3) First appearance of pancreas gland.

(4) First appearance of spleen--regulates the blood.

II. The Animal Kingdom: The Vertebrates

A. Animals belonging to this group all have backbones at one stage of their lives.

B. Have an internal, long skeleton.

C. Have two pairs of appendages in the form of fins, wings, or legs.

D. Brain and entire nervous system, including the organs of sensation (eyes, ears, nose) are more highly developed in vertebrates.

E. Water-living vertebrates usually breathe by means of gills whereas land-living vertebrates breathe by means of lungs.

F. Muscular heart which pumps red blood through tubes (arteries, capillaries, and veins) which branch throughout the body.

G. Five classes of backboned animals

1. Fish--Pisces

a. Cold blooded--body temperature is the same as the surrounding waters at all times.

b. Internal skeleton

c. Adapted to water

(1) Anterior and posterior are well tapered to cut through water.

(2) Mucous substance covering the entire outside surface of body.

(3) Scales overlap and grow outwards toward the tail.

(5) All organs of digestive system are held in abdominal cavity.

(6) Well-developed brain, a spinal cord, and pairs of nerves.

(7) The organs of sight, hearing, smell, and touch are extremely sensitive to stimuli.

b. The metamorphosis of a frog.

(1) Starts with a mass of eggs covered by a transparent gelatinous substance for protection and buoyancy, laid by the female in the water. The male frog fertilizes the eggs just after they enter the water.

(2) After each egg is fertilized by a sperm cell, it develops into a tiny, legless tadpole with a yolk sac attached, similar to a newly-hatched fish.

(3) At this stage the tadpole breathes by means of external and then internal gills. The yolk sac and external gills become absorbed while the tadpole is developing a mouth with which to feed on tiny plants.

(4) As the tadpole grows, the hind legs appear first and the tail becomes shorter. (It is absorbed as food into the growing body.) The lungs begin to develop at the same time as the front legs appear. The

infant frog is now ready to come upon land to grow into a full sized adult and repeat the life cycle.

3. Reptiles
   a. Cold blooded animals adapted with lungs for breathing air on land.
   b. Appearance of four-chambered heart.
   c. Metamorphic stages of reptiles are simple.
      (1) The young develop into smaller adult forms from fertilized eggs.
      (2) Some reptiles bear their young alive.
4. Birds--Aves
   a. Presence of feather covering entire body except the beak and hind limbs.
   b. Wings--in most cases adapted for flying.
   c. Warm-blooded--maintain constant body temperature under normal conditions.
   d. Hollow bones make the bird light--adaptation for life in the air.
   e. Four-chambered heart.
   f. Breathes by lungs.
5. Mammals
   a. Most highly developed and structurally specialized vertebrate animals on earth (man belongs to this group).

b. All animals whose young are fed or suckled by milk from the mammary glands of the mother.

c. Mammals have hair or fur growing from the skin.

d. Warm blooded.

e. Breathe by means of lungs in every stage of life.

f. The young are born alive from tiny eggs fertilized within the body of the mother, and resemble the parents. The unborn embryo receives nourishment from the body of the mother.

g. Body is divided into three regions--head, chest, and abdomen.

h. The chest region is separated from abdomen by a muscular partition called the diaphragm.

i. Few offspring are born at one time.

j. There is parental care.

H. Vocabulary

ventral	mammals	reptiles	birds
dorsal	amphibians	fish	

I. Activities

INFORMATION SHEET

Characteristics of the Five Classes of Vertebrates

FISH

1. Fins are limbs adapted to steer the body through the water.

2. The tail is flattened; it pushes the body through the water.

3. Fish have gills through which they take the oxygen dissolved in the water. Oxygen passes into the blood vessels in the gills, and in this way enters the bloodstream of the fish. The blood then carries the oxygen to all the cells of the fish's body.

4. Fish have a slimy covering over a scaly skin. The scales overlap one another like shingles. As a fish grows, the scales increase in size.

5. An air bladder can be filled with air to make the fish go up in the water, or emptied of air to make it go down.

6. The fish has a heart with two chambers. One is for receiving blood from other parts of the body and is called auricle. The second chamber is for pumping blood to other parts of the body and is called the ventricle.

AMPHIBIANS

1. Amphibians have two pairs of legs. In frogs and toads, the hind legs are adapted for jumping. In salamanders, they are poorly developed, hardly able to hold up the body.

2. Only salamanders have a tail. Frogs and toads are tailless.

3. Amphibians have gills that function during the part of life that is spent in the water.

4. They have a moist skin without scales

5. They have a three-chambered heart, with two auricles and one ventricle.

6. They undergo a double metamorphosis during life. Amphibians change from gill breathers to lung breathers when they become adults. They also change from plant eaters to animal eaters.

7. Amphibians are cold-blooded.

REPTILES

1. The limbs of reptiles are poorly developed or missing.

2. The tail is well developed.

3. The gills are found only in the embryo reptile within the egg shell.

4. The skin is dry, tough, and horny, and usually covered with flat scales.

5. The reptile heart has four chambers--two auricles and two ventricles. In most reptiles, the ventricles are not completely separated from each other. The two ventricles are completely separated only in the crocodiles.

6. The young develop inside a shell which contains their food supply and a membrane through which they obtain oxygen from the air. (There are a few reptiles which give birth to living young.)

7. Eggs are laid on land, buried in soil or leaves. Heat from sun on the soil is necessary for them to hatch.

8. Several species have developed poisonous venom which is pumped into an enemy or prey which they bite.

9. Reptiles are cold-blooded.

BIRDS

1. The forelimbs are wings adapted for flying.

2. The hind limbs are adapted for many purposes.

3. The jaws are extended to form many kinds of bills adapted for many types of jobs.

4. The body is covered with feathers.

5. Scales are found only on the legs.

6. Birds maintain a fairly constant temperature.

7. The tail is well developed in flying birds.

8. The heart has four distinct chambers. There is a complete circulation of oxygen-rich blood from the lungs out to the body, and oxygen-poor blood from the body cells back to the lungs for a new supply of oxygen.

9. The eggs are laid in nests and incubated by the warm body of a parent.

10. The young are mostly helpless at hatching and receive a great deal of parental care.

11. The bones of birds are hollow and air filled; thus the body is lighter, adapting it even more fully for flight.

<u>MAMMALS</u>

1. Mammals have four limbs adapted for many uses.

2. They have jaws with well-developed teeth.

3. Their bodies are covered with hair.

4. Their skin is relatively smooth and adapted for regulation of body temperature. This is done by sweating.

5. They maintain a fairly constant warm temperature.

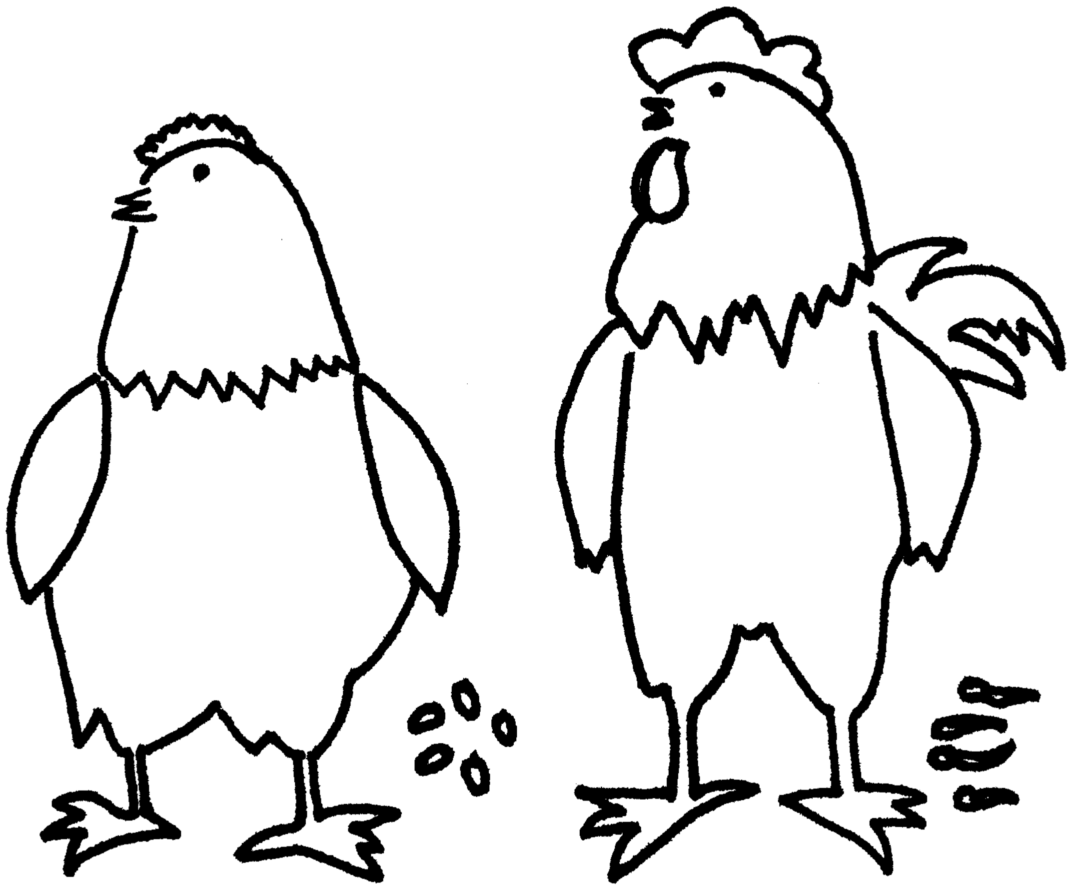
6. Gill slits occur only in the embryo (young before birth).

7. Mammals have a heart with four chambers.

8. A diaphragm separates the chest from the abdomen.

9. Eggs are tiny and developed within the body of the female.

10. The young are born alive and fed with milk produced by mammary glands in the female.



Mother chickens are called hens and have eggs. The fathers are called roosters and have sperm. The rooster's sperm must join with the hen's egg to make a baby chick.

To make this happen, the hen and rooster use the openings under their tails. The rooster climbs on the hen's back and places his opening against hers. Then his sperm moves into the opening in the hen's body. The sperm swims up from the opening toward the eggs. Some eggs are entered by a sperm and some are not. But an egg can be entered only by one sperm. When the sperm enters the egg, a change takes place. This is called fertilization. The fertilized egg develops into a baby chick. In one or two days the hen lays the eggs into the nest. The egg comes out the same opening the sperm went in.

The mother hen sets on the egg in a nest and keeps it warm. After about 21 days, the egg hatches, and out comes a new baby chick.

When the egg is fertilized, many changes take place. One and a half days after fertilization the chick's heart is formed and beating. In two and a half days the head is almost developed. In four days the eyes and limb buds can be seen. Every day for 21 days the animal develops further until it is ready to hatch.

For a classroom project, place two dozen fertile chicken eggs in a commercial incubator or a homemade one. Secure a bottle of rubbing alcohol to be used as a preservative for the chick embryos. Starting on the third day of incubation, carefully break open an egg. Gently remove the embryo from the yolk and put it in a small bottle of preservative (baby food jars will work nicely for this). Continue breaking one every day for eighteen days. Observe the changes that occur in the embryonic development from egg to chick.

INCUBATOR

Materials needed: 2 cardboard boxes, insulating material, light bulb on cord, thermometer, pan, fertile eggs.

You can build an incubator for the eggs in your classroom. Start building it several days before you plan to buy the eggs because it may take you a few days to adjust the temperature.

The cardboard boxes should be of two different sizes. Put one inside the other and pack the space between them with insulating material, such as wool. Suspend the light bulb inside the inner box. Start with a 40-watt bulb. After it has been on for a full day, check the temperature on a thermometer which you have placed in the box, away from the light bulb and in the place where you plan to put the eggs. If the temperature is over 103 degrees Fahrenheit, replace the bulb with one of lower wattage. If the temperature is lower than 103 degrees Fahrenheit, use a stronger bulb. Keep testing bulbs until you find one which keeps the temperature steady between 101° and 103° F. for a full day. The amount of insulation can also be adjusted to vary the temperature.

Secure fertile chicken eggs from a nearby hatchery. Turn the eggs every day by hand. They need a humid environment so keep a small pan of water in the incubator.

The following films were used with the animal unit.

<u>Fish Are Interesting</u> (MP-0188) 10 minutes, color, intermediate. Presents examples of various kinds of fish to show the distinction between bony fishes and shark-like fishes, and the two groups of bony fishes--soft-rayed and spiney-rayed.

<u>Flatworms--Plathelminthes, Unit III Animal Life</u> (MP-0660) 16 minutes, color, senior. Live micro photography shows organization and function of body, compares with primitive forms, demonstrates regeneration polarity, anterior-posterior gradient and dominance.

<u>Frog, The</u> (MP-0015) 10 minutes, black and white, intermediate. Life cycle of a frog, condenses embryonic frog development to a few seconds. Narrative and pictures. Demonstrates tadpole state changes.

<u>Reptiles Are Interesting</u> (MP-0185) 10 minutes, color, intermediate. Groups of reptiles identified and the characteristics of all are listed. Values and cautions regarding reptiles are observed.

<u>Snakes</u> (MP-0107) 10 minutes, color, intermediate. Illustrates the life habits and adaptations of representative species, showing their equipment for locomotion, sensation, nutrition, and self-protection.

<u>What Is An Amphibian</u> (MP-0763) 11 minutes, color, senior. Structure, life processes, adaptations, morphosis; why study of amphibians has contributed to knowledge of embryology and development.

What Is A Mammal (MP-0762) 14 minutes, color, senior. Structural and behavioral characteristics, ecological adaptations of mammals, comparisons with reptiles, their evolution, variety, and distribution.

What Is A Reptile (MP-0764) 18 minutes, color, senior. Representative kinds of the four orders, characteristics, reproduction, and evolution. Reasons for successful evolution and survival. Characteristics and behavior of a wide variety of reptiles.

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RESOURCE AGENCIES FOR GUIDES, MANUALS, AND MATERIALS ON SEX EDUCATION

Child Study Association of America, Inc.
9 East 89th Street
New York, New York 10028

Sex Information and Education Council of the U. S. (SIECUS)
1790 Broadway
New York, New York 10019

American Academy of Pediatrics
1801 Hinman Avenue
Evanston, Illinois 60204

American College of Obstetricians and Gynecologists
Committee on Maternal Health
79 West Monroe Street
Chicago, Illinois 60603

American School Health Association
Committee on Guidance in Sex Education
515 East Main Street
Kent, Ohio 44240

American Social Health Association
1790 Broadway
New York, New York 10019

School Health Education Study
National Education Association
1201 Sixteenth Street, N. W.
Washington, D.C. 20036

The American Institute of Family Relations
5287 Sunset Boulevard
Los Angeles, California 90027

Family Life Publications
Box 6725 Durham
Durham, North Carolina

National Council on Family Relations
Publishes The Journal of Marriage and the Family
1219 University Avenue, Southeast
Minneapolis, Minnesota 55414

American Association for Health, Physical Education, and Recreation
1201 Sixteenth Street, N. W.
Washington, D.C. 20036

School Health Education Study
1507 M. Street, N. W.
Room 800
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St. Louis, Missouri 63118

Abingdon Press
Nashville, Tennessee 37203

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Chicago, Illinois 60625

Christian Educational Service
P. O. Box 87
Nashville, Tennessee

Glen Cove Public Schools
Box S
Glen Cove, New York 11542

Group for the Advancement of Psychiatry
104 E. 25th Street
New York, New York 10010

Kimberly Clark
Neenah, Wisconsin 54956

Personal Products Company
Box 6-9
Milltown, New Jersey 08850

Planned Parenthood
501 Madison Avenue
New York, New York 10022

Tampax Incorporated
Educational Department
161 East 42nd Street
New York, New York 10017

American Home Economics Association
1600 Twentieth Street, N. W.
Washington, D.C.

American Medical Association
535 North Dearborn Street
Chicago, Illinois

Maternity Center Association
48 East 92nd Street
New York, New York 10028

General Learning Corporation
3 East 54th Street
New York, New York 10022

San Diego City Schools
Health Services Department
San Diego, California

Chapter 4

CONCLUSION

Long before a child is able to ask questions, he is given information of many kinds. By his parents' actions, their voice tones, and the way they handle him--without meaning to--they exert an influence on his attitudes toward himself and his family. The parents did their best to help make the child feel that the world is a warm and friendly place. Before he could talk he may have learned that wanting to know about some things pleased and wanting to know about other things did not.

A child begins to ask questions when he is two or three years old. Many parents are embarrassed by these questions or are uninformed as to how to answer them. Some just cannot get themselves to answer. They change the subject or say to the child that he will be told when he is "old enough to understand."

Other parents, resolutely "modern," may seize this as an opportunity to deluge their child with all the facts, not realizing that telling too much at one time confuses a child and keeps him from asking questions later on, when he is ready to understand more.

A child's early questions about where he came from have nothing to do with sex, as adults understand it. He may have his own special wonderings, but what he needs are some simple facts told in a way that he can understand. It is during these young years that the school's responsibility is greatest. Sex education must be presented with specific planning in a total curriculum approach. The earlier a planned curriculum approach can be started, the better. The formation of proper attitudes must come about early. With the development of proper attitudes, segregation of the sexes is unnecessary.

Many times the words "Sex Education" scare people--students and instructors alike. If the sex education program could be incorporated in a science program, where discussion and planned work could come naturally in a sequence of plant and animal development, students accept it as a matter of course with knowledge being gained without embarrassment.

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