植物解剖学实验:英文

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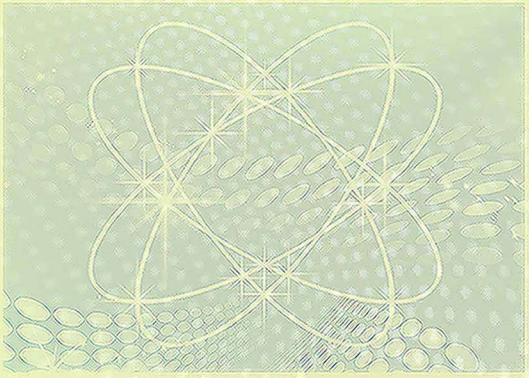

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植物解剖学实验

（英文版）

Plant Anatomy Experiment

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Preface

Botany is a fundamental course for the specialty of biology. The objectives of the course are to have students know morphological characteristics and functions of plant cells, tissues and organs, and master basic knowledge and skills of morphological anatomy associated with vegetative and reproductive organs after students complete the course. Students are required to have a preliminary understanding of various plant groups and their relationships. These will lay a foundation for students to learn Plant Taxonomy, Plant Physiology, Plant Ecology, Plant Resources, Genetics, Cytology, Molecular Biology, etc. in the future. Through the study of Botany, it is expected that students will grasp the current tendency of botanical research at home and abroad, have the capacity of referring to references themselves, and strengthen their enthusiasm about plant sciences. It is hoped that study of Botany will lay a foundation for students to have the potential to become an internationally professional biologist with a wide view.

The numerous questions which young people ask about plants are best answered by themselves. No other method gives right answers so quickly and satisfactorily. In this book, familiar utensils and familiar plants will be used in the experiments simplified as far as could. This book may be used by both teachers and pupils. In order to get the knowledge in the classroom and out of it, some notes should be kept, but the note-taking should not be made a burden. The following items have been found useful.

（1）There must be a very interesting question that most students are interested in, which can't be a task the teacher gives.

（2）How to answer the question? The method should be creative whether it is by observation or by experiment.

（3）We should choose the right and typical plant material as a sample to do the lab.

（4）The time and the frequency of observation must be decided exactly and rationally.

（5）Never forget to add the control experiments.

（6）The results should be concise and clear, and the data should be listed in table if necessary.

（7）Information should be obtained from the lab and it will provoke new questions and experiments.

Where each experiment is to be done by each individual, a laboratory is necessary. Where each is to be done by a group or action of the class, only a limited space is needed. Where each is done by the class as a whole, a single shelf in front of a window and a drawer beneath it used to hold the utensils will suffice.

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Introduction

Ⅰ. Experimental General Rules

The scientific laboratory is a place of adventure and discovery. Some of the most important events in scientific history have happened in laboratories. The antibiotic powers of penicillin were discovered in a laboratory. The plastics used today for clothing and other products were first made in a laboratory.

One of the first things any scientist learns is that working in the laboratory can be an exciting experience. However, the laboratory can also be quite dangerous if proper safety rules are not followed at all times. In order to make yourself for a safe year in the laboratory, read over the following safety rules. Then read them a second time. Make sure you understand each rule. If you do not, ask your teacher to explain any rules you are unsure of.

1. Dress codes

(1) Many materials in the laboratory can cause eye injury. To protect yourself from possible injury, always wear safety glasses whenever you are working with chemicals, burners, or any substance that might get into your eyes.

(2) Laboratory coats should also be worn whenever you work with chemicals or heated substances.

（3）Tie back your long hair in order to keep it away from any chemicals, burners, and candles, or other laboratory equipment.

（4）Any article of clothing or jewelry that can hang down and touch chemcials and flames should be removed or tied back before you work in the laboratory. Sleeves should be rolled up.

（5）Sandals will not protect the feet.

2. General safety rules

（1）Read all the directions for an experiment several times. Follow the directions exactly as they are written. If you are in doubt about any part of the experiment, ask your teacher for assistance.

（2）Never perform activities that are not authorized by your teacher. Always obtain permission before "experimenting" on your own.

（3）Never handle any equipment unless you have specific permission.

（4）Take extreme care not to spill any material in the laboratory. If spills occur, ask your teacher immediately about the proper clean-up procedure. Never simply pour chemicals or other substances into the sink or trash container.

（5）Never eat or drink in the laboratory. Wash your hands before and after each experiment.

（6）There should be no loud talking or playing in the laboratory.

（7）When performing a test in a lab, make sure the work area has been cleared of purses, books, jackets, etc.

（8）Know the location and use of all the safety equipment (goggles, aprons, eyewash, fire blankets, fire extinguishers, etc.).

（9）Read your book before coming to class and be aware of all

the safety precautions.

(10) Never work alone in the lab.

3. Heating and fire safety

(1) Again, never use any heat source such as a candle or burner without wearing safety goggles.

(2) Never heat any chemical that you are not instructed to heat. A chemical that is harmless when cool can be dangerous when heated.

(3) Always maintain a clean work area and keep all the materials away from flames. Never leave a flame unattended.

(4) Never reach across a flame.

(5) Make sure you know how to light a burner. (Your teacher will demonstrate the proper procedure for lighting a burner.) If the flame leaps out of a burner towards you, turn the gas off immediately. Do not touch the burner. It may be hot. And never leave a lighted burner unattended!

(6) Always point a test tube that is being heated away from you and others. Chemicals can splash or boil out of a heated test tube.

(7) Never heat a liquid in a closed container. The expanding gases produced may blow the container apart, injuring you or others.

(8) Never pick up any container that has been heated without first holding the back of your hand near it. If you can feel the heat on the back of your hand, the container may be too hot to handle. Always use a clamp or tongs when handling hot containers. Hot glassware looks the same as cool glassware.

4. Using chemicals safely

（1）Never mix chemicals for the "fun of it." You might produce a dangerous, possibly explosive substance. No unauthorized experiments should be performed.

（2）Never touch, taste, or smell any chemical that you do not know for a fact is harmless. Many chemicals are poisonous. If you are instructed to note the fumes in an experiment, always gently wave your hand over the opening of a container and direct the fumes toward your nose. Do not inhale the fumes directly from the container.

（3）Use only those chemicals needed in the activity. Keep all the lids closed when a chemical is not being used. Notify your teacher when chemicals are spilled.

（4）Dispose of all the chemicals as instructed by your teacher.

（5）Be extra careful when working with acids or bases. Pour such chemicals over the sink, not over your work bench.

（6）When diluting an acid, always pour the acid into water. Never pour water into the acid.

（7）Rinse any acids off your skin or clothing with water. Immediately notify your teacher of any acid spill.

（8）Never pipette by mouth.

（9）Be sure you use the correct chemical. Read the label twice.

（10）Do not return any excess back to the reagent bottle.

（11）Do not contaminate the chemical supply.

（12）Keep combustible materials away from open flames (alcohol, carbon disulfide, and acetone are combustible).

（13）Do not use the same spoon to remove chemicals from two different containers. Each container should have a different

spoon.

(14) When you remove the stopper from a bottle, do NOT lay it down on the desk, but place the stopper between your two fingers and hold the bottle so the label is in the palm of your hand, so drips won't ruin the label, etc. Both the bottle and the stopper will be held in one hand. Be sure and rinse any drips that might have gotten on the outside of the bottle.

(15) Be careful not to interchange stoppers from two different containers.

(16) Replace all the stoppers and caps on the bottles as soon as you finish using them.

(17) Mercury spills must be cleaned up immediately. Use the new mercury sponge clean up kits put out by various companies.

5. Using glassware safely

(1) Glass tubing should never be forced into a rubber stopper. A turning motion and lubricant will be helpful when inserting glass tubing into rubber stoppers or rubber tubing. Your teacher will demonstrate the proper way to insert glass tubing.

(2) When heating glassware, use a wire or ceramic screen to protect the glassware from the flame of a burner.

(3) If you are instructed to cut glass tubing, always fire polish the ends immediately to remove sharp edges.

(4) Never use broken or chipped glassware. If glassware breaks, notify your teacher and dispose of the glassware in the proper trash container.

(5) Never eat or drink from laboratory glassware. Always thoroughly clean glassware before putting it away.

6. Using sharp instruments

（1）Handle scalpels or razor blades with extreme care. Never cut any material towards you; always cut away from you.

（2）Notify your teacher immediately if you are cut in the laboratory.

（3）Properly mount dissecting specimens to the dissecting pan before making a cut.

7. Electrical equipment rules

（1）Batteries should never be intentionally shorted. Severe burns can be caused by the heat generated in a bare copper wire placed directly across the battery terminals. If a mercury type dry cell is shorted, an explosion can result.

（2）Never deliberately shock yourself or another person. Susceptibility to shock and possible resulting injury is unpredictable because of many physical and physiological variables.

（3）Turn off all the power when setting up circuits or repairing electrical equipment.

（4）Never use such metal articles as metal rulers, metal pencils or pens, nor wear rings, metal watchbands, bracelets, etc. when doing electrical work.

（5）When disconnecting a piece of electrical equipment, pull the plug and not the wire.

（6）Use caution in handling electrical equipment which has been in use and has been disconnected. The equipment may still be hot enough to produce a serious burn.

（7）Never connect, disconnect, or operate a piece of electrical equipment with wet hands or while standing on a wet floor.

8. End-of-experiment rules

(1) When an experiment is completed, always clean up your work area and return all the equipment to its proper place.

(2) Wash your hands after every experiment.

(3) Make sure all the candles and burners are turned off before leaving the laboratory. Check that the gas line leading to the burner is off as well.

9. Other safety rules

(1) Do not use hair spray or hair mousse during or even before coming to a laboratory class. These are highly flammable and might cause automatic ignition when in close proximity to a heat source.

(2) Synthetic fingernails are also highly flammable and should not be worn in the lab.

Ⅱ. Experiment Report Formats

Department of Biologic Resource and Environmental Sciences

(Plant Anatomy Experiment)

Name: Class:

Number: Date:

Experiment title:

Experiment purpose	
Materials instrument reagent	
Methods:	
Plotting:	
Results and analysis:	
Remark and grade: Faculty adviser: Month day, year:	

Ⅲ. Variables in the Experiment

Scientists use an experiment to search for cause and effect relationships in nature. In other words, they design an experiment so that changes to one item cause something else to vary in a predictable way.

These changing quantities are called variables. A variable is any factor, trait, or condition that can exist in differing amounts or types. An experiment usually has three kinds of variables: independent, dependent, and controlled.

The independent variable is the one that is changed by the scientist. To ensure a fair test, a good experiment has only one independent variable. As the scientist changes the independent variable, he or she observes what happens.

The scientist focuses his or her observations on the dependent variable to see how it responds to the change made to the independent variable. The new value of the dependent variable is caused by and depends on the value of the independent variable.

For example, if you open a faucet (the independent variable), the quantity of water flowing (dependent variable) changes in response — you observe that the water flow increases. The number of dependent variables in an experiment varies, but there is often more than one.

Experiments also have controlled variables. Controlled variables are quantities that a scientist wants to remain constant, and he must observe them as carefully as the dependent variables. For example, if we want to measure how much water flow increases when we open a faucet, it is important to make sure that the water

pressure (the controlled variable) is held constant. That's because both the water pressure and the opening of a faucet have an impact on how much water flows. If we change both of them at the same time, we can't be sure how much of the change in water flow is because of the faucet opening and how much because of the water pressure. In other words, it would not be a fair test. Most experiments have more than one controlled variable. Some people refer to controlled variables as "constant variables."

In a good experiment, the scientist must be able to measure the values for each variable. Weight or mass is an example of a variable that is very easy to measure. However, imagine trying to do an experiment where one of the variables is love. There is no such thing as a "love-meter." You might have a belief that someone is in love, but you cannot really be sure, and you would probably have friends that don't agree with you. So, love is not measurable in a scientific sense; therefore, it would be a poor variable to use in an experiment.