Unit 1: Introduction to Biology

Sections	Learning competencies
1.1 Definition of Biology 1.2 Why do we study Biology? 1.3 The scientific method 1.4 Tools of a Biologist 1.4.1 Laboratory tools 1.4.2 Field tools 1.5. Handling and using of light Microscope 1.5.1 Parts and function of light microscope 1.5.2 Handling and using microscope 1.6. General Laboratory Safety Rules	• Define Biology • Explain why Biology is studied? • Plan a biological investigation using the scientific method • Identify some common tools of a Biologist • Utilize a microscope • Execute general laboratory safety rules

1.1 Definition of Biology

Objectives

At the end of this section, the student will be able to:

- *define Biology*
- *explain the relation of biology and other subjects*

Key Terms

Biology: came from two Greek words bios means life, and logos meaning study.

Biology is the scientific study of life or living things.

What does it mean to be "alive"?

It seems very difficult to objectively define life in a simple sentence. But, we recognize life mainly by common characteristics shared by living systems.

Activity 1.1: THINK-PAIR-SHARE

Write down the common properties of living things that distinguish them from non-living things and compare your answer with other students.

Living things:

- are composed of one or more cells
- are complex and highly ordered
- can respond to stimuli, grow, reproduce, etc.
- transmit genetic information to their offspring
- need the energy to accomplish work
- can maintain relatively constant internal conditions (homeostasis)
- are capable of evolutionary adaptation to the environment .etc.

What is a scientific study?

Biologists study about living things using a scientific method that involves asking questions, suggesting possible answers; and testing for the validity of the answers through experimentation. This scientific

Activity 1.2: Group work

Make a group of students and discuss how the knowledge of biology can be applied in the fields of agriculture, medicine, food processing, food preparation, preparation of beverage etc. and present it to your class.

study follows the study of structures and processes that we can verify observe and measure, either directly or indirectly with the help of tools and technology, such as microscopes.

What relationships does Biology have with other fields of natural sciences?

The study of biology is a point of merging information and tools from all natural sciences. For example information about naturally occurring elements in living organisms, chemical bonding, molecules, acids ,bases and other related things can be studied using the tools and principles of chemistry. Other scientific concept like conversion of radiant energy into organic molecules by photo-synthesis is studied with the knowledge of chemistry and Physics.

1.2 Why do we study Biology?

Objectives

At the end of this section, the student will be able to:

- *explain why biology is studied*
- *give examples of biological application*

Attention

Application of Biology in our day to day life:

- Wine-making, the brewing, the baking of bread and the production of cheese all depend on fermentation processes brought about by yeasts, other fungi and bacteria, or enzymes from these organisms.
- Antibiotics, such as penicillin, are produced by mould fungi or bacteria.
- The production of industrial chemicals such as citric acid or lactic acid needs bacteria or fungi to bring about essential chemical changes.
- Sewage disposal depends on bacteria in the filter beds to form the basis of the food chain that purifies the effluent.
- Discovery of the structure of DNA and forensic analysis of DNA samples from crime scenes.

Human beings have an inborn curiosity about the natural world that leads them to study about living organisms and their habitats. Studying biology helps to understand how living things work, how they function and interact with the environment. Biology touches our everyday life in many ways. For example, biologists have discovered drugs that are used to treat different human diseases. Many biologists are working on problems that critically affect our lives, such as how our animals and plants body work, how ecosystems work, how advancements in genetics and cell biology are transforming to medicine and agriculture, as well as the use of forensics biology to investigate crime, Furthermore, studies how ecology is helping societies evaluate environmental issues, such as global warming, how fermentation is used to produce alcoholic drinks such as beer and wine. In addition, biological studies are used in treating patients suffering from AIDS, tuberculosis, and some types of cancer.

1.3. The Scientific Method

Objectives

At the end of this section, the student will be able to:

- *explain about scientific method*
- *explain about the meaning of hypothesis*
- *practice about formulating hypothesis*
- *practice doing scientific experiment and drawing a bar graph*

Biology is a science of inquiry.

What comes to your mind when you hear the word science?

Biologists are always curious about why things happen or how things happen. By asking questions and seeking science-based responses known as the scientific method, they come up with new theories to explain new findings. The scientific method involves a series of steps that guide scientists through such scientific investigations. Biologists study the living world by posing questions about it. The general steps of the Scientific methods are:

Observation

The scientific study begins with careful observations (often a problem to solve) that leads to a question. The observations can be made either directly (e.g. using your sense organs) or indirectly using scientific tools such as microscopes.

Asking Questions

The observations usually lead the scientist to ask questions (inquiry).

Forming of a hypothesis

A hypothesis is proposed scientific explanations (possible answers) for a set of question (s).To solve a problem, one can propose several hypotheses. Scientific hypotheses should be testable.

Testing the hypothesis

Hypothesis can be tested through experimentation. Any scientific experiment must have the ability to be duplicated because the "answer" the scientist comes up with (whether it supports or rejects the original hypothesis) can't become part of the scientific knowledge unless other scientists can perform the same experiment and achieve the similar results. If a hypothesis is not supported by experimental data, one can propose a new hypothesis.

Making conclusions about the findings

Scientists consider their original hypotheses and ask whether they could still be right in light of the new information gathered during the experiment. If so, the hypotheses can remain as possible explanations for how things work. If not, scientists reject the hypotheses and try to come up with alternate explanations (new hypotheses) that can explain what they've seen.

Communicating the findings

When scientists complete some work, they write a paper that explains exactly what they did and the results they obtained. Then, they submit the paper to a scientific journal in their field. In addition, the findings

Key Terms

Hypothesis: is a proposed scientific explanation

will be printed in scientific journals and assist teachers and students in the field.

Example of a hypothesis testing in everyday life

Suppose you want to use your torch (hand lamp) to find a missing pen in your bedroom. When you switch the torch on, it is not working. The following flow chart will illustrate hypothesis testing for a torch that doesn't work.

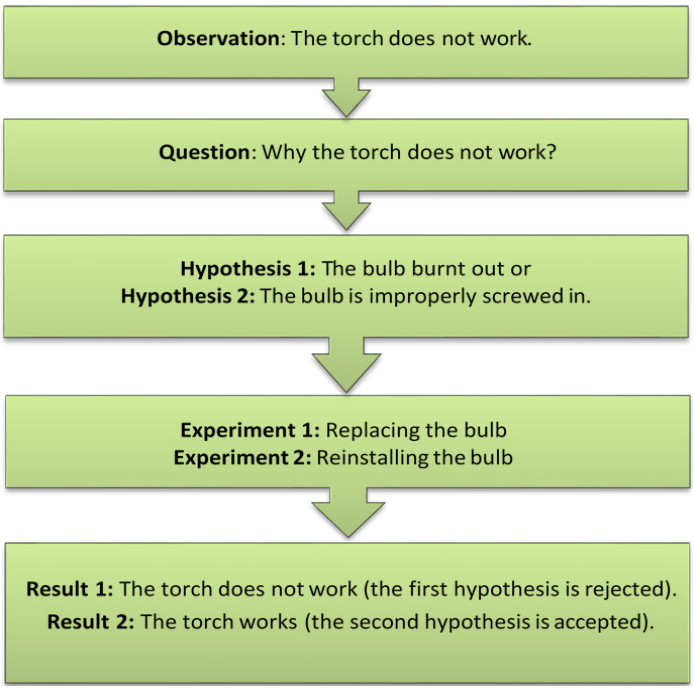

Figure 1.1. Application of the scientific method to common problems in our surroundings

Activity 1.3: Application of Scientific Method

Objective: To determine the importance of temperature for seed germination,

1. Form a group
2. Germinate bean seeds at different temperatures like:-
   - Group one in room temperature.
   - Group two in colder place like outside your room or in refrigerator
   - Group three in hotter place like inside the kitchen
3. Then give your possible hypothesis for the differences in germination.
4. Measure the times of germination and length of the seedlings for the different groups
5. Draw a bar graph based on the result of your experiment using X axis for measurement of time /hour of germination (1st day of germination, 2nd day of germination, 3rd day of germination etc.) and at Y axis indicate the length of the germinated plants. (You can measure the length of your germinating plants using ruler).
6. Interpret the results and conclude the result
7. Report your result to your friend in your class

1.4 . Tools of a Biologist

Objectives

At the end of this section, the student will be able to:

- *identify the major tools of biologists*
- *describe the functions of the identified biologist tools*

Activity 1.4. Class work

Write down the names of the tools used by biologists and compare your answer with your partners.

Biologists use different types of tools in the laboratory and field for scientific investigations. Some of the tools are used for measuring, some are used for observation and some are used for culturing microorganisms.

1.4.1. Laboratory tools of biologist

Hand lens

Most cells cannot be seen with the naked eye. A hand lens has a higher magnification than our naked eye. It consists of a convex lens fixed within a circular metallic loop and is attached to a metallic or wooden handle.

The main function of hand lens is to provide an enlarged image of the object placed under it. But hand lens is not sufficient to observe the detail in cells. There is a need for providing high magnifications tools such as microscope.

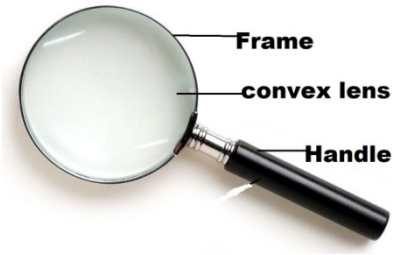

Figure 1.2 Hand lens

Activity 1.5: Laboratory Activity

Objective: To study the magnification and focusing of radiation using hand lens

Materials hand lens, Pieces of paper

1. Draw a dot on the piece of the paper.
2. Observe the dot using a hand lens.
3. What happened? Did the dot get bigger than the original size? Why?
4. Bring the hand lens to where the sun light is available.
5. Put the piece of paper under the hand lens and stay for some minute.
6. What happened to the paper? Why?

Attention

The important function of microscope is magnification and resolution.

Magnification is the number of times larger an image is, than the real size of the object. Resolution can be defined as the ability to distinguish between two separate points

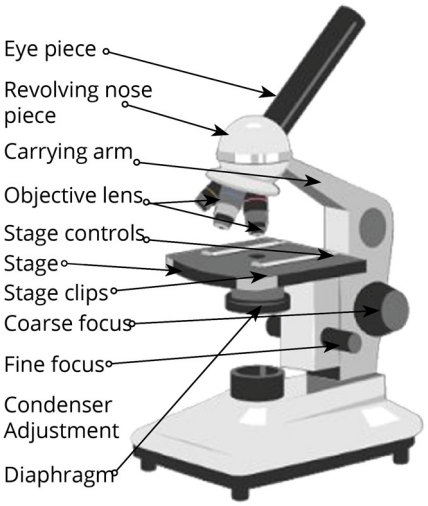

Figure 1.3. Light microscope

The Microscope

One of the most important tools of the biologist is a microscope. A microscope is an instrument used to study objects that are too small to be seen with a naked eye. The microscope magnifies the image of small objects making them visible to the human eye. For example, microscopes are used to observe the shape of bacteria, fungi and parasites.

There are several kinds of microscopes. The major types are:

- light microscope and
- electron microscope

A light microscope is called light microscope because it uses a beam of light to view specimens. There are two types of light microscopes, Simple light microscope which consists of a single lens while a **compound light microscope** consists of two or more glass lenses.

Activity 1.6 Classwork

How many lens does hand lens have? Discuss with your friend next to you.

A compound light microscope is the most common microscope used in biology. It consists of two lens systems (a combination of lenses) to magnify the image of an object up to 2000x. Each lens has a different magnifying power. A compound light microscope with a single eye-piece is called monocular; one with two eye-pieces is said to be binocular.

When we observe an image under light microscope, light rays are focused on to the image on a microscope slide. This Light which transmitted through the specimen is then focused by two types of lenses known as eye and objective lens. The enlarged produced by these two lenses. A compound light microscope magnification is the product of eye and objective lenses, ×10 eyepiece and ×40 objective, the total magnification is ×400.

Electron microscopes on the other hand use a beam of electrons (instead of a beam of light) and electromagnets (instead of glass lenses) to enlarge the image of an object. These microscopes provide a higher magnification than light microscopes and are used for observing extremely small microorganisms such as viruses.

Key Terms

Microscope: is an instrument used to observe and study objects that are too small to be seen by the naked eye. It magnifies the image of small objects.

Light microscope: the microscope uses a beam of light to view specimens.

Electron microscopes: the microscope uses a beam of electrons (instead of a beam of light) and electromagnets (instead of glass lenses) to enlarge the image of an object.

Activity 1.7: Classwork

Fill the following table by calculating the exact magnification.

Eye lens magnification	Objective lens magnification	Total lens magnification
X5		X500
X10	X40	
	X100	X1000

Activity 1.8: Practical Activities

In this section, you will learn how light microscope magnifies objects by eyepiece and objective microscope.

Objective: To study the total magnification of a light microscope

Materials needed for this activity: a microscope, microscope slides, cover slips

A. Take a piece of paper and make sure it is transparent
B. Write letter C or P on the paper
C. Put the paper on the stage of microscope
D. Use low power objective move the paper from side to side till you get a clear focus/image
E. Draw the letter that you observe. What difference have you seen between the letter on the paper and the image under the microscope? Why?
F. Replace/move the low power objective with middle power objective
G. What do you see? What makes this difference?

Glass slides and cover slips: The microscope slides are used to support an specimens being examined under the microscope.

Figure 1.4. Glass slide and cover slides

The cover slips are the small square or circle shaped thin glass sheets that are used to cover specimens on the glass slide to protect from further addition of any chemical or dirt and it is also used to protect the microscope and prevent the slide from drying by locking the moisture. Cover slides provide better view under the microscope.
Although the tool most closely associated with a biologist is the microscope, there are several common tools used by biologists in the laboratory and on field.

Autoclave: is the equipment used to sterilize (kill microorganisms) different biological samples. An *autoclave* sterilizes contaminated materials including culture media, and bacterial spores by exposing them to high temperatures and highly pressurized steam.

Figure 1.5. Autoclave

Attention

Culturing is the procedure used to grow microorganisms in a controlled environment. Many microorganisms reproduce very quickly. Culturing of micro-organisms also have important function like in medicine (Penicillin) and for food (beverage) preparation. Wine and beer making uses culturing on a large scale, as it does in cheese making, biofuel production, and many other endeavors.

There are many ways of killing microorganisms, including chemical disinfectants, flame, dry or wet heat, ultraviolet light, and ionizing radiation such as X-rays or gamma rays. The problem is, some bacteria form spores, which are resistant to chemical disinfectants, including bleach. In these situations, it is very important to use autoclaving which kill microorganisms as well as their spores.

Figure 1.6. A Bacteriological incubator

Incubator*:* is a device used to maintain a specific environment for culturing. An incubator is an instrument that maintains the temperature best suited for the growth of different types of microorganisms.

Petri dishes: are flat dishes with a matching cover of a slightly larger diameter. They are available in glass and plastic form. Petri dishes are used with gelling culturing media, such as agar, and placed in the autoclave to sterilize it.

Figure 1.7. Petri dishes

Figure 1.8. Test tubes

Culture tubes: are available in a huge range of sizes, shapes, materials, and so on. They are used to culture microorganisms. Culture tubes may be used with solid (gel) culturing media or with liquid (broth) culturing media, and then placed in the autoclave for sterilization.

Figure 1.9. flasks

Flasks: is an apparatus having a flat bottom and a long narrow neck, which allows easy mixing of the solution without spilling out the content **.** it is also used to gently heat the content inside with a gentle swirling motion of the flask . **It** is essentially a large-volume culture tube that is used only with broth media and flasks are used to produce large populations of microorganisms. They are available in a variety of shapes and sizes

Balance: is useful for making up solutions accurately, weighing specimens, and so on.

Figure 10. Balance

Figure 1.11. Dropper

Dropper: A dropper consists of a glass tube that has a small opening at one end and is attached to a vacuum rubber bulb at the other end. A dropper is used when it is required to control the amount of solution being added to a reaction.

Tongs

Tongs are metallic scissors-shaped laboratory instruments. It is used to Lifting or picking up hot objects such as heated crucible, beakers, dishes, or flasks.

Figure 1.12. Tongs

Dissecting Tool Kit

Dissecting Tool Kit is used to dissect animals such as frogs, fetal pigs, mice, etc. It consists of all the necessary tools required to carry out the process of dissection such as a catheter, groove probe, scalpel, surgical scissors (straight and curved), mayo scissors (straight and curved), dissecting forceps (with and without teeth), dissecting pin, etc.

Figure 1.13 dissecting kit

Dissecting pan

Dissecting pan is equipment is used as a pan on which the specimen is kept while it is being dissected to study its internal organs.

Figure 1.14 dissecting pan

Crucible

Crucible is a small container made up of ceramic or metal which is able to withstand high temperatures, and therefore, it is generally used to melt elements.

Figure 1.15. Crucible

Beaker

Beaker is a cylindrical glass container used for making up solutions, holding hot or cold water or ice baths, and so on.

Figure 1.16. Beakers

Hotplate

Hotplate is useful for heating solutions, making up an agar culturing medium, and so on.

Figure 1.17 Hot plate

Figure 1.18. pH mete

pH meter is used to measure the pH (acidity or basicity) of substances.

Thermometer is an instrument that measures the temperature of substances.

Figure 1.19. Thermometer

Forceps are used to hold or pick up small objects. They are available in a variety of shapes and sizes.

Figure 1.20. Forceps

Figure 1.21. Spatula

Spatula

A spatula is used for mixing substances into a solution, stirring the solution, and scrapping objects. It is shaped like a spoon

Figure 1.22. Wash bottles

Wash Bottles

Wash bottles which are mainly used to rinse various laboratory materials. Wash bottles are flexible in nature that allows the user to adjust the water pressure as per the need by squeezing the bottle accordingly.

Bunsen burner or alcohol burner

This apparatus produces a single open flame and it is used for heating and sterilization purposes in the various experiments conducted in labs.

Figure 1.23. Bunsen burner

Figure 1.24. Insect net

1.4.2. Field tools

Insect nets –It is insect collecting nets which is composed of some sort of net bag made of cloth or fine mesh that is attached to a wire loop, which is attached to a wooden or metal pole.

Fishing net is a net used for fishing. Nets are devices made from fibers woven in a grid-like structure. Some fishing nets are also called fish traps. Fishing nets are usually meshes formed by tying a relatively thin thread.

Figure 1.25. Fish net

1.5. Handling and using a light Microscope

Objectives

At the end of this section, the student will be able to:

- *handling the microscope*
- *use the microscope*

Most microscopes have several different powerful lenses attached to them, allowing the viewer to inspect the content at more than 100 times its actual size. Biology as modern science would not exist without the microscope, and good microscopes are essential for day-to-day activities for most biologists. In addition to their importance, microscopes are extremely expensive, therefore it is very important to know the function of all structures of microscope and handle the device properly before we are using it in the laboratory.

1.5.1. The parts and function of the light microscope

Microscopes are generally made up of structural parts for holding and supporting the microscope and its components and the optical parts which are used for magnification and viewing of the specimen images. This section define the parts of a microscope and the functions they perform to enable the visualization of specimens.

1. Eyepiece

Eyepiece is the part found at the top of the microscope and is used to look through the microscope. It is also named as the ocular. Its standard magnification is 10x with an optional eyepiece having magnifications from 5X to 30X.

2. Eyepiece tube

Eyepiece tube is the eyepiece holder. It carries the eyepiece just above the objective lens. In some microscopes such as the binoculars, the eyepiece tube is flexible and can be rotated for maximum visualization.

3. Objective lenses

Objective lenses are major lenses that further magnify the specimen at different intensities with multiple objective lenses. Mostly they have a magnification power of 40x-100X.

4. Arm

Arm is a holder connected to all components that function as a support for the microscope so that the microscope can be used properly.

5. Body tube
Body tube connects the eyepiece to the objective lenses.

6. Nose piece
Nose piece is rotating mount that holds many objective lenses.. It is movable hence it allows to change the magnification.

7. The Adjustment knobs
The Adjustment knobs are knobs that are used to focus the microscope. There are two types of adjustment knobs i.e. fine adjustment knobs and coarse adjustment knobs.

Fine adjustment: regulate the distance between object and objective, to achieve the necessary sharpness. The fine focus moves the stage only minimally

Coarse adjustment: Brings specimen into general focus. Coarse adjustment also moves the stage to adjust the difference between the object and the objective. The function of the coarse focus is to capture the exact distance roughly and quickly.

8. Stage
Stage is the section in which the specimen is placed for viewing.

9. Stage clip

Stage clip acts as a holder for the object plate and ensures that it doesn't fall out of place accidentally.

10. Aperture
Aperture is a hole on the microscope stage, through which the transmitted light from the source reaches the stage.

11. Microscopic illuminator
Microscopic illuminator is the microscopes light source, located at the base. It is used instead of a mirror. It captures light from an external source of a low voltage of about 100v.

12. Condensers
Condensers are lenses that are used to collect and focus light from the illuminator into the specimen. They are found under the stage next to the diaphragm of the microscope. They play a major role in ensuring clear sharp images are produced with a high magnification of 400X and above.

13. Diaphragm
Diaphragm is also known as the iris. It is found under the stage of the microscope and its primary role is to control the amount of light that reaches the specimen. It's an adjustable apparatus, hence controlling the light intensity and the size of the beam of light that gets to the specimen.

14. Base

Base is the very bottom part. Base serves to accommodate all parts of the light microscope.

1.5.2 Handling and using a light microscope

- Be very careful when removing the Microscope from the cabinet.
- Carry the microscope properly, always grip the microscope by the arm and put your hand beneath its base. Hold the microscope upright at all times. Do not bump it against anything.
- Make sure that the slide is clean and dry before putting it on the stage.
- Put the slide on the stage, with the most promising region exactly in the middle of the hole in the stage that the light comes through.
- Always focus on low power (4X objective) first even if eventually you need high power magnification.
- Focus with the larger coarse-focusing knobs first, then when you have nearly got the image in focus make it really sharp using the smaller fine-focusing knobs.
- If you want to increase the magnification, move the slide so the most promising region is exactly in the middle of the field of view and then change to a higher magnification lens.
- Use immersion oil only with the 100X objective (oil immersion lens) in place.
- Use only one drop of oil.
- Always focus by moving the lens and the specimen further apart, never closer to each other.
- Never touch the surfaces of the lenses with your fingers or anything else.
- Lower the stage and then remove the slide when you are done.
- Always clean the microscope when you are done. (use a lens paper and the alcohol)
- Always place the 4X objective over the stage and be sure the stage is at its lowest position before putting the microscope away.
- Always turn off the light before putting the microscope away.
- Always return the microscope to the correct cabinet.
- Always place the oculars toward the back of the cabinet
- Always wrap the cord correctly before putting the microscope away.

1.6. General Laboratory Safety Rules

Objectives

At the end of this section, the student will be able to:

- *explain about laboratory safety rules*
- *identify the major laboratory safety rules*

Safety is the condition of being protected from harm or other danger. Safety can also refer to the control of recognized hazards in order to achieve an acceptable level of risk. Laboratory safety is important before we do any activities in the laboratory:

- working carefully in the laboratory,
- dealing with minor problems before they become major problems,
- keeping safety constantly in mind are some of the safety rules.

Figure 1.26. Dress and safety for the laboratory

Activity 1.9

Look at the picture on the figure 1.26 and discuss in groups:

1. Why goggles and laboratory coats used?
2. Why is hair tied back?
3. List some safety rules

Important general laboratory safety rules are

1. Following the instructions:

It is critical to read and listen the laboratory procedure and be familiar with all the steps, from start to finish. It is very important to know how to use all of the lab equipment before you begin.

2. Knowing the location of safety equipment

It is mandatory to have a fire extinguisher and first-aid kit readily in the laboratory. It's important to know the location of the safety equipment and how to use it. It's a good idea to periodically check equipment to make sure it is in working order. Review lab safety signs and look for them before starting an experiment.

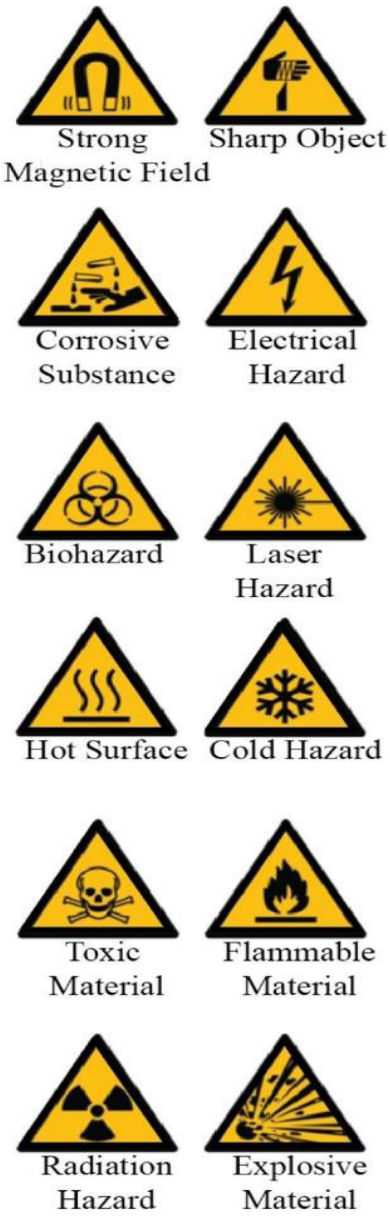

Figure 1.27. Signs for general laboratory safety rules

3. Dressing for the laboratory

It is important to wear protective cloths including a laboratory coat, safety goggles, gloves, hearing protection, long pants, a long-sleeve shirt, and leather shoes or boots that fully cover your feet(NO sandals). Wear a disposable respirator mask when you handle chemicals that are toxic. The dressing procedure should be based on the nature of the experiment.

4. Never eat or drink in the laboratory.

Don't eat or drink in the science laboratory. It is forbidden to store food or beverages in the same refrigerator that contains experiments, chemicals, or cultures.

5. Never taste or sniff chemicals.

Avoid tasting or smelling chemicals or biological cultures. Tasting or smelling some chemicals can be dangerous or even deadly. The best way to know what's in a container is to label it and read before use, so get in the habit of making a label for glassware before adding the chemical.

6. Act responsibly in the laboratory.

Never randomly mixing chemicals to see what happens. It may result an explosion, fire, or release of toxic gases.

7. Cleaning the experiment area in the laboratory and storing the waste properly.

Every laboratory session should begin and end with your glassware, chemicals, and laboratory equipment clean and stored properly.

8. Handling chemicals properly

Wear a disposable respirator mask when handle chemicals that are toxic. Never allow laboratory chemicals to contact your bare skin.

9. Know what to do with laboratory accidents

If someone burn or if he exposed to chemical immediately flood the burned area with cold tap water for several minutes to minimize the damage done by the burn.

10. All laboratory personnel should place emphasis on safety and chemical hygiene at all times:

Never leave containers of chemicals open. All containers must have appropriate labels. Unlabelled chemicals should never be used.

Unit Summary

- Biology is the scientific study of living things.
- Living organisms interact with themselves and the environment at all levels of biological organizations.
- Biological inquiry depends on a *scientific method. Scientists follow a method* while performing scientific experiments and writing up the results.
- By following the scientific method carefully, scientists make sure that their conclusions are based on observations and that other scientists can repeat their experiments.
- The steps for scientific method includes: observations, questions, hypothesis, experiment, conclusion (result) and communication with other Scientists.
- Biologists use different types of tools in the laboratory and field. Some of the tools are used for measuring, some are used for observation and some are used for culturing microorganisms. Of all the tools, the most important scientific tools of the biologist is a microscope. A microscope is an instrument that is used to see very small objects by a process called magnification.
- Laboratory safety is mainly important before we do any activities of the laboratory. Working carefully in the laboratory, dealing with minor problems before they become major problems, keep safety constantly in mind, and chances of any problems you have will be very minor ones.

Review Questions

I. Choose the correct answer for the following questions

1. Which of the following is not a property of life?
   a. populations of organisms rarely change over time.
   b. living things exhibit complex but ordered organization.
   c. organisms take in energy and use it to perform all of life's activities.
   d. organisms reproduce their own kind.
2. Which of the following is the correct procedure of scientific method?
   a. Experiment conclusion application Question observation
   b. Question observation experiment analysis prediction result
   c. Observation question hypothesis prediction, experiment results conclusion
   d. Observation question opinion conclusion hypothesis
3. Hypothesis in biology is best described as
   a. possible explanation of an observation.
   b. an observation that supports a theory.
   c. a general principle that explains some aspect of life.
   d. an unchanging statement that correctly predicts some aspect of life.
4. Which of the following is not the correct method of handling chemicals
   a. wearing a disposable respirator mask when handling chemicals that are toxic.
   b. never allow laboratory chemicals to contact your bare skin.
   c. never put chemicals open
   d. return and pour the unused (left over) chemicals to its original container.

II. Write short answer for the following questions

5. Write the main difference between light and Electron microscope
6. Write the function of the following common laboratory tools.

Types of tools	Function
Flasks	
Test tubes	
Wash bottle	
Dropper	
Test tube rack	
Spatula	
Dissecting Pan	
Wash bottle	
Mortar and pestle	

11. Look at the following laboratory safety signs and write their meaning

12. Why does a microscope have several objective lenses?

13. What will happen to the field of view in a microscope as you close the diaphragm? Explain your answer

14. Why should you always focus a microscope by moving the objective lens away from the specimen?

15. Explain the importance of adding oil immersion when using high power objective? How?