

Exercise

1. Which branch of Biology focuses on the study of the function of cells?

✓b) **Physiology** (Note: "Function of cells" is better related to Physiology, while Cytology deals with cell structure. But if this is about function *within* cells, another interpretation might suggest Cytology. However, based on NCERT/Pakistani board context, "Physiology" is likely intended for function.)

2. The study of the processes of heredity and variation in living organisms is known as:

✓b) **Genetics**

3. Insulin made through bacteria is an example of the technique of:

✓b) **Biotechnology**

4. Heart pumps, stomach digests food, and kidneys excrete wastes. This is studied under:

✓a) **Physiology**

5. Which branch of Biology involves the study of the classification of organisms?

✓a) **Taxonomy**

6. Which step comes between making hypothesis and doing experiments?

✓a) **Making deductions**

7. Which of the following is NOT a characteristic of the scientific method?

✓c) **Hypothesis will always be correct**

8. Choose the correct sequence of steps of the scientific method:

✓a) **Observations - hypothesis - deduction - experiments**

9. People who slept near smoky fire had less chance from malaria. Why?

✓c) Mosquitoes cannot tolerate smoke and are repelled

10. Experiments are very important in the scientific method because a researcher:

✓b) Disproves many hypotheses and gets some hypothesis proved

B. Write short answers

1. Define the following branches of Biology:

- **Genetics:**
The study of how traits (like eye color or height) are passed from parents to children through genes.
 - **Anatomy:**
The study of the structure and parts of the body, like bones, muscles, and organs.
 - **Palaeontology:**
The study of fossils to learn about the plants and animals that lived a long time ago.
 - **Marine Biology:**
The study of animals and plants that live in oceans, seas, and other saltwater bodies.
 - **Pathology:**
The study of diseases—how they start, what causes them, and how they affect the body.
-

2. Which branch of Biology involves the study of the development of organisms from fertilization to birth or hatching?

✓Embryology

Embryology studies how a baby (or young organism) develops inside the mother, starting from a fertilized egg until it is born or hatched.

3. How is the profession of medicine and surgery different from animal husbandry?

- **Medicine and Surgery:** Focus on treating and curing diseases in **humans**.
 - **Animal Husbandry:** Involves caring for and raising **animals** like cows, goats, chickens, etc., mainly for food, milk, or farming.
-

4. Differentiate between Morphology and Physiology:

Morphology Study of **shape and structure** of living things (what they look like).

Physiology Study of how the **body works**, like how the heart beats or how food is digested.

5. What is Computational Biology?

Computational Biology uses **computers and software** to study biology. It helps scientists understand genes, proteins, and diseases by doing calculations and analyzing data.

6. What is the role of observation and experimentation in the scientific method?

- **Observation** is when scientists carefully watch and note what happens in nature.
 - **Experimentation** is when they **test** their ideas to find out if they are correct. Together, they help scientists make **new discoveries** and check if their thinking is right.
-

1. Link the study of Biology with that of Physics, Chemistry, Statistics, Geography, Economics, and Computer Science.

Biology connects with many other subjects:

- **Physics** helps us understand body movements, how the heart pumps blood, or how light helps plants make food.
 - **Chemistry** explains what our body is made of and how food is digested.
 - **Statistics** is used to count and study results in experiments. It helps in understanding diseases in a population.
 - **Geography** tells us how living things live in different places and how climate affects them.
 - **Economics** shows the value of animals, plants, and medicines made from them.
 - **Computer Science** helps us store biological data, like human genes, and study it with special software.
-

2. Explain how the study of Biology can lead to different professional studies.

Biology is the base for many careers:

- **Doctor** (studies human body and diseases)
- **Veterinarian** (treats animals)
- **Pharmacist** (makes and gives medicines)
- **Botanist** (studies plants)
- **Zoologist** (studies animals)

- **Microbiologist** (studies tiny organisms like bacteria)
- **Genetic Engineer** (works with DNA to make new crops or cure diseases)

So, studying biology can lead to many different jobs in science and health.

3. Science is a collaborative field in which scientists work together to share knowledge. Prove this statement by giving examples.

Scientists often work together:

- In 2020, during **COVID-19**, scientists from different countries shared their research to make vaccines quickly.
- **Malaria research** was done by many scientists like Laveran, Ross, and others. One scientist's discovery helped the next one.
- In **Human Genome Project**, scientists from different countries worked together to read all human genes.

This shows that sharing knowledge helps science grow faster.

4. How a hypothesis is converted to theory, law, and principle?

- A **hypothesis** is an idea or guess based on observation.
- Scientists **test** it many times through experiments.
- If results are always the same, it becomes a **theory**.
- If a theory is always true in every situation, it becomes a **law**.
- A **principle** is a general rule based on many laws or theories.

Example: Hypothesis → Theory of Gravity → Law of Gravity

5. What are the basic steps a scientist adopts in order to solve a scientific problem?

The steps are:

1. **Observation** – Notice something.
 2. **Question** – Ask a question about it.
 3. **Hypothesis** – Make a guess (possible answer).
 4. **Experiment** – Test the hypothesis.
 5. **Result** – Record what happened.
 6. **Conclusion** – Decide if the guess was right.
 7. **Report** – Share the findings with others.
-

6. Describe the work of different scientists in discovering the cause of malaria.

- **Laveran (1880)** – First saw malaria parasites in human blood.
- **Ronald Ross (1897)** – Found that mosquitoes carry malaria parasites.
- **Grassi and others** – Proved that female *Anopheles* mosquitoes spread malaria.

Together, they discovered that malaria is caused by a parasite and spread by mosquitoes.

7. Write a descriptive note on the experiments performed by Ross.

- Ronald Ross studied malaria in birds.
 - He allowed mosquitoes to bite infected birds.
 - Later, he found malaria parasites in the mosquitoes.
 - This proved that **mosquitoes carry malaria**.
 - His work helped scientists understand how malaria spreads and how to control it.
-

D. Inquisitive Questions

1. Why is it important to classify biology into different branches such as botany, zoology, and microbiology? How can specialization benefit scientific research?

Biology is a big subject. It's easier to study when we divide it:

- **Botany** = study of plants
- **Zoology** = study of animals
- **Microbiology** = study of tiny organisms

When scientists **specialize**, they learn deeply and make better discoveries. For example, a microbiologist can focus on bacteria and help find new antibiotics.

2. How can a scientist apply the scientific method to confirm an observation that a certain plant species grows more quickly in shady places than in direct sunlight?

A scientist can use these steps:

1. **Observation:** The plant grows better in shade.
2. **Hypothesis:** The plant grows faster in shade than in sunlight.
3. **Experiment:** Plant seeds in both sun and shade.
4. **Data Collection:** Measure plant growth after some days.
5. **Conclusion:** See which group grew faster.
6. **Report:** Share the findings.

This way, the scientist can prove or reject the idea using the scientific method.