

CLASS 9 • BIOLOGY

Chapter 1 Exercise Solutions

The Science of Biology

15

QUESTIONS SOLVED

6 MCQs

4 Short Answers

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CSS & PMS FOUNDATION SERIES

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The Science of Biology — full exercise, solved & explained

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✓ Every MCQ is highlighted, ticked, and explained · ✓ Short & detailed answers written exam-style for CSS/PMS foundation standard · ✓
Reference: scholareye.xyz

A**Select the Correct Answer****1**

Heart pumps blood, stomach digests food, and kidneys excrete wastes. The statement comes from:

a) Physiology**b) Anatomy****c) Morphology****d) Histology**

Why: Physiology is the branch of Biology that studies the **functions** of body parts and organs — how the heart pumps, how the stomach digests, how kidneys excrete. Anatomy studies internal structure, Morphology studies external form, and Histology studies tissues under the microscope — none of these describe "function."

A**Select the Correct Answer****2**

Which step comes between making a hypothesis and doing experiments?

a) Making deductions



b) Making observations

c) Summarizing results

d) Analysing data

Why: The scientific method flows as: Observation → Hypothesis → **Deduction** → Experiment → Conclusion. After forming a hypothesis, a scientist makes a logical deduction — "if my hypothesis is true, then this specific result should occur" — and only then designs and runs the experiment to test that deduction.

A**Select the Correct Answer****3****Which of the following is NOT a characteristic of the scientific method?****a)** It relies on evidence**b)** It involves formulating hypotheses**c)** Hypothesis will always be correct ✓**d)** It requires rigorous testing

Why: A hypothesis is only a proposed, testable explanation — it is never assumed to be automatically correct. Genuine science demands that every hypothesis survive rigorous, repeated testing against evidence; many hypotheses are disproved. Claiming a hypothesis "will always be correct" contradicts the very spirit of scientific enquiry, so option (c) is NOT a real characteristic.

A**Select the Correct Answer****4****Choose the correct sequence of steps of the scientific method.****a)****Observations -
hypothesis -
deduction -
experiments** **b)**Observations -
hypothesis - law -
theory**c)**Hypothesis -
observations -
deduction -
experiments**d)**Law - theory -
deduction -
observations

Why: Science always begins with careful **observation** of a phenomenon, from which a scientist proposes a **hypothesis**. A logical **deduction** is drawn from that hypothesis, and finally an **experiment** is designed to test the deduction. This observation → hypothesis → deduction → experiment order is the standard scientific method.

A**Select the Correct Answer****5**

People who slept near a smoky fire had less chance of suffering from malaria. Why?

a) Smoke kills *Plasmodium* in their blood

b) Fire increases temperature and *Plasmodium* kills in

c) **Mosquitoes cannot tolerate smoke and are repelled** ✓

d) Smoke kills *Plasmodium* present in mosquito

Why: Smoke does not kill the malaria parasite (*Plasmodium*) at all — it acts on the **mosquito vector**. Female *Anopheles* mosquitoes, which transmit malaria while biting, are repelled by smoke and avoid areas where it lingers. Fewer mosquito bites meant fewer chances of the parasite being transmitted, which is exactly the clue that helped scientists like Ronald Ross link mosquitoes to malaria.

A Select the Correct Answer

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

a) Always gets correct results

b) Disproves many hypotheses and gets some hypothesis proved ✓

c) Is sure that he will prove the hypothesis

d) Gets a chance to work in the laboratory

Why: Experiments are the test of truth in science. A researcher cannot know in advance whether a hypothesis is right — experimentation objectively proves some hypotheses correct while disproving and eliminating many others, which is how reliable scientific knowledge is built. Options (a) and (c) wrongly assume the outcome in advance, and (d) misses the actual purpose.

B**Write Short Answers**

1 Define the following branches of Biology: Genetics, Anatomy, Palaeontology, Marine Biology, Pathology.

- **Genetics** — the branch of Biology that studies heredity: how characteristics and traits are passed from parents to offspring through genes.
- **Anatomy** — the branch that studies the internal structure of the bodies of organisms, such as the arrangement of organs and organ systems.
- **Palaeontology** — the branch that studies fossils and extinct life forms to understand the history and evolution of life on Earth.
- **Marine Biology** — the branch that studies organisms living in oceans and other saltwater ecosystems, and how they interact with their marine environment.
- **Pathology** — the branch that studies diseases: their causes, nature, development, and effects on the body.

2

Differentiate between Morphology and Physiology.

Morphology is the branch of Biology that deals with the **external form, shape, size, and structure** of an organism — for example, the shape of a leaf or the colour and size of a bird's feathers.

Physiology, on the other hand, deals with the **functions** performed by the parts of an organism's body — for example, how the heart pumps blood or how the lungs carry out gas exchange.

In short: Morphology asks "what does it look like?" while Physiology asks "how does it work?"

B Write Short Answers

3 What is Computational Biology?

Computational Biology is a modern, interdisciplinary branch of Biology that uses **mathematics, statistics, and computer science** to analyse and interpret large, complex biological data sets — such as DNA sequences, protein structures, and genomes.

It helps scientists model biological systems, predict how molecules behave, and solve problems in genetics and medicine far faster than traditional laboratory methods alone, and is central to fields like genome sequencing and bioinformatics.

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

Observation is the starting point of the scientific method — a scientist carefully notices a phenomenon or pattern in nature, which raises a question and leads to a proposed **hypothesis** (a possible explanation).

Experimentation then tests that hypothesis under controlled conditions. It provides objective, repeatable evidence that either supports or disproves the hypothesis, turning a guess into reliable scientific knowledge. Without observation there is no question to investigate, and without experimentation there is no way to confirm or reject the answer — together they make Biology an evidence-based science rather than guesswork.

C**Write Answers in Detail****1****Explain how the study of Biology can lead to different professional studies.**

Biology is an extremely broad science, and its many branches open the door to a wide range of professional and career paths:

- Studying **Anatomy and Physiology** in depth leads to careers in **Medicine** — as doctors, surgeons, and physiotherapists.
- Studying **Genetics** leads to careers in genetic counselling, biotechnology, and genetic engineering.
- Studying **Pathology and Microbiology** leads to careers as pathologists, lab technologists, and pharmacists who diagnose and fight disease.
- Studying **Marine Biology** leads to careers in oceanography and fisheries research.
- Studying **Palaeontology** leads to careers in museums, geology, and evolutionary research.
- Studying **Computational Biology and Bioinformatics** leads to careers in data science and biotechnology industries.

In this way, a strong foundation in Biology equips a student with the specialised knowledge needed to enter professions in healthcare, research, agriculture, environmental science, and biotechnology.

● SECTION C • WRITE ANSWERS IN DETAIL

2 How is a hypothesis converted into a theory, law, and principle?

A **hypothesis** begins as a tentative, testable explanation of an observation. As it is tested through repeated experiments by different scientists, and consistently supported by evidence, it gains credibility and strength through this progression:

- **Hypothesis** → a single proposed explanation, not yet widely tested.
- **Theory** → once a hypothesis has been tested repeatedly under many different conditions and is supported by a large, consistent body of evidence, it becomes a theory — a well-substantiated explanation of a set of facts (e.g. the Theory of Evolution).
- **Law** → if the theory describes a pattern that is found to hold true without exception, under all tested conditions, it may be elevated to a scientific law — a statement of an unvarying relationship (e.g. Laws of Inheritance).
- **Principle** → a fundamental rule or law that is so well established it is used as a foundational basis for further scientific reasoning and applications.

Each step upward represents an increase in the amount of supporting evidence and the confidence the scientific community places in the explanation.

● SECTION C • WRITE ANSWERS IN DETAIL**3 What are the basic steps a scientist adopts in order to solve a scientific problem?**

A scientist typically follows these systematic steps of the scientific method:

- **1. Observation** — carefully noticing and recording a phenomenon or pattern in nature.
- **2. Defining the problem** — framing a clear, specific question that arises from the observation.
- **3. Formulating a hypothesis** — proposing a possible, testable explanation for the observation.
- **4. Making a deduction** — logically predicting what result should occur if the hypothesis is true.
- **5. Experimentation** — designing and carrying out controlled experiments to test the deduction.
- **6. Analysing data** — collecting and interpreting the results obtained from the experiment.
- **7. Drawing a conclusion** — accepting, rejecting, or modifying the hypothesis based on the results.
- **8. Communicating results** — publishing the findings so other scientists can verify and build upon them.

This cycle may be repeated many times, with the hypothesis refined at each stage, before an idea gains the status of a theory or law.

● SECTION C · WRITE ANSWERS IN DETAIL

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

The discovery of the cause of malaria was a gradual process built on the work of several scientists over decades:

- **Early observation:** for centuries, people had noticed that malaria was more common near swamps and stagnant water, and that sleeping near smoky fires seemed to reduce cases — clues that pointed toward the air or insects, long before the real cause was known.
- **Charles Louis Alphonse Laveran (1880):** a French army surgeon who first observed the malaria parasite, *Plasmodium*, inside the red blood cells of a malaria patient under the microscope, proving malaria was caused by a parasite and not "bad air" as previously believed (the old "miasma" theory).
- **Sir Ronald Ross (1897-1898):** a British doctor working in India who carried out the decisive experiments proving that the *Anopheles* mosquito was the vector (carrier) that transmitted the *Plasmodium* parasite from an infected person to a healthy one through its bite, completing the picture of how malaria actually spreads.

Together, Laveran's discovery of the parasite and Ross's discovery of the mosquito vector explained both the cause and the transmission of malaria, forming the foundation of modern malaria control.

● SECTION C · WRITE ANSWERS IN DETAIL

Write a descriptive note on the experiments performed by Ross.

Sir Ronald Ross's work on malaria is a classic example of the scientific method in action:

- **Observation:** Ross observed that malaria cases were strongly associated with mosquito-infested regions, and that people who avoided mosquito bites (e.g. by sleeping near smoky fires) rarely developed malaria.
- **Hypothesis:** he proposed that the *Anopheles* mosquito was responsible for transmitting the malaria parasite from one person to another.
- **Experiment:** Ross fed mosquitoes on the blood of malaria patients and then dissected them at different time intervals. In 1897, he found *Plasmodium* parasites developing inside the stomach wall of an *Anopheles* mosquito that had fed on an infected patient, proving the parasite completes part of its life cycle inside the mosquito.
- **Further testing:** he went on to show, using birds infected with a related parasite, that mosquitoes could transfer the parasite from an infected bird to a healthy one purely through their bite — confirming mosquitoes as the transmission vector.
- **Conclusion:** his experiments proved conclusively that mosquitoes transmit malaria, work for which he was awarded the Nobel Prize in Physiology or Medicine in 1902.

Ross's experiments remain one of the most cited case studies of the scientific method: observation, hypothesis, experimentation, and conclusion working together to solve a real-world medical problem.



Exercise Complete!

15 questions solved and explained — from MCQs to detailed answers — to help you master Chapter 1 of Class 9 Biology for your school exams and future CSS/PMS preparation.

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