Grade 10 Biology

CBC NOTES | Terms 1, 2 and 3 - notes for 10 topics

IN EVERY TOPIC

- What you will learn, the key words and key terms explained.
- Clear notes under headings and subheadings, with labelled pictures and step-by-step procedures.
- Comparison tables, and advantages and disadvantages where methods are compared.
- Key points to remember, then structured questions to practise.
- All the answers and a glossary at the back.

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A TASTE OF THE FIRST TOPIC

Introduction to Biology

Every time you wash your hands, take a vaccine, plant certified seed or drink pasteurised milk, you are using Biology. In this topic we learn what Biology is, how it is used in everyday life, the main fields of study in Biology and the careers each one leads to. We also look at what should, and what should not, decide the career you choose.

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Strand 1.0 Cell Biology and Biodiversity | Term 1

1.1 Introduction to Biology

WHAT YOU WILL LEARN

By the end of this topic you should be able to:

- explain the application of Biology in everyday life
- relate fields of study in Biology to career opportunities
- illustrate the careers related to fields of study in Biology

KEY WORDS

Biology, organism, botany, zoology, ecology, taxonomy, biotechnology, genetics, career.

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1. What Biology is

Biology
The scientific study of living things (organisms): their structure, how they work, how they grow and reproduce, and how they relate to each other and to their environment.

Organism
Any living thing, for example a bean plant, a goat, a mushroom or a bacterium.

The word comes from two Greek words: bios (life) and logos (study). Biologists study organisms of every size, from bacteria too small to see without a microscope to elephants and baobab trees.

How we know something is living

All living things carry out the same life processes. A car moves and burns fuel, and a fire "grows", but only living things carry out all of them and only living things are made of cells.

Characteristics of living things

Life process	Meaning
Nutrition	Making or taking in food
Respiration	Breaking down food to release energy
Excretion	Removing waste products made in the body
Movement	Changing position of the body or its parts
Growth	A permanent increase in size and mass
Reproduction	Producing new individuals of the same kind
Sensitivity (irritability)	Detecting and responding to changes in the surroundings

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2. Applications of Biology in everyday life

Biology is not only a school subject. Its knowledge is used every day by families, farmers, health workers, industries and the government.

Health

- Knowing how germs spread leads to hand washing, safe drinking water, proper toilets and vaccination.
- Doctors and laboratory technologists use Biology to diagnose diseases (blood tests, scans) and to treat them with medicines.
- Knowledge of a balanced diet helps families prevent malnutrition, such as kwashiorkor and anaemia.

Agriculture and food

- Breeders produce high-yielding, drought-tolerant crop varieties and better animal breeds.
- Farmers control pests, weeds and diseases using knowledge of their life cycles.
- Microorganisms are used to make yoghurt (mala), cheese, bread and fermented porridge; food is preserved by stopping their growth.

Environment

- Knowing how organisms depend on each other helps us conserve forests, wildlife, wetlands and water catchments.
- Biology explains the harm done by pollution, deforestation and overfishing and guides how to prevent it.

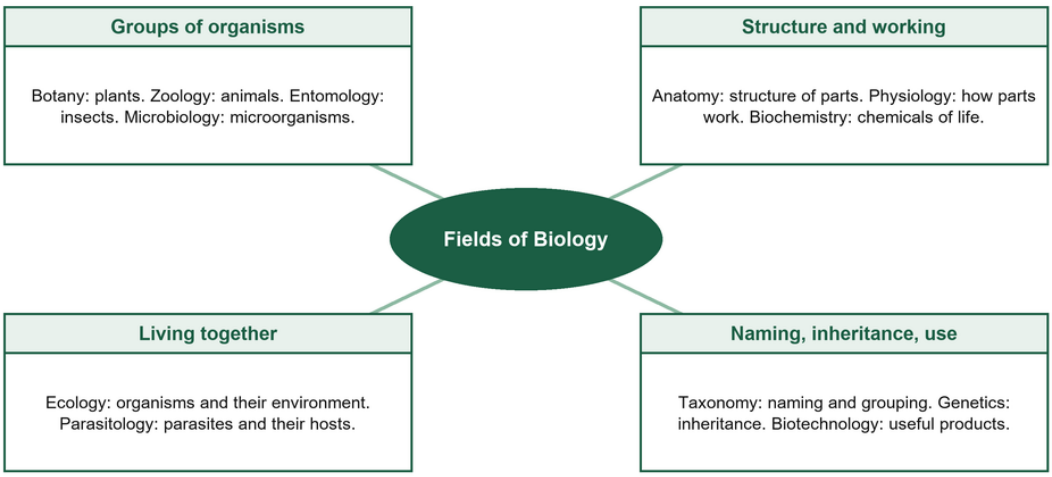
Industry and biotechnology

- Living things are used to make biogas, medicines, vaccines, enzymes for washing powders, and alcoholic drinks.
- Bacteria are used to treat sewage and to make insulin for people with diabetes.

> **REMEMBER**
> When asked for applications, give a real example for each one, not just the area. "Health: vaccination against measles" earns the mark; "health" alone may not.

3. Fields of study in Biology

Biology is so wide that it is divided into fields (branches). Each field studies one part of life in depth. The fields overlap: a study of how a maize leaf is built and how it makes food belongs to both botany and physiology.



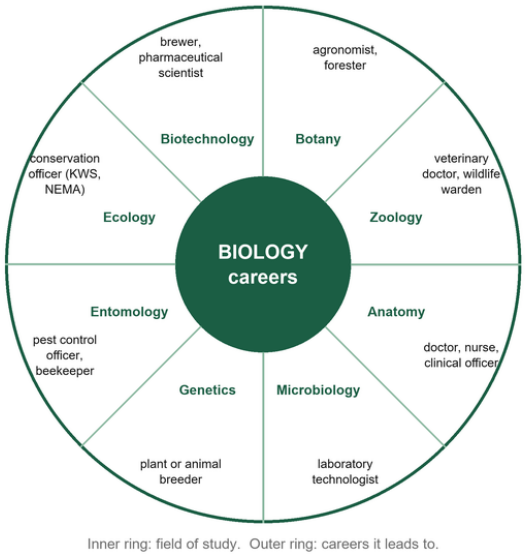
The twelve fields of Biology named in the syllabus, in four groups

Fields of study in Biology

Field	What it studies	Example of work
Botany	Plants	Studying how tea bushes grow on the highlands
Zoology	Animals	Studying the behaviour of elephants in Amboseli
Taxonomy	Naming and classifying organisms into groups	Giving a new frog species a scientific name
Anatomy	Structure (body parts and where they are)	Learning the parts of the human heart
Physiology	How body parts work	How kidneys clean blood
Ecology	Organisms and their environment	How Lake Naivasha fish depend on water plants
Biochemistry	Chemicals and chemical reactions in living things	How enzymes digest food
Biotechnology	Using organisms or their parts to make products	Making biogas, vaccines or yoghurt
Genetics	Inheritance and variation	Breeding maize that resists drought
Parasitology	Parasites and their effects on hosts	Studying malaria parasites and ticks
Microbiology	Microorganisms (bacteria, viruses, fungi, protozoa)	Testing milk for harmful bacteria
Entomology	Insects	Controlling fall armyworm and desert locusts

4. Careers related to Biology

Each field of Biology leads to careers. Many of them are found in Kenyan hospitals, farms, research institutes (such as KEMRI and KALRO), conservation bodies (such as KWS and NEMA) and industries.



A career wheel: fields of study in the inner ring, careers in the outer ring

Fields and the careers they lead to

Field	Careers
Botany	Agronomist, forester, horticulturist, herbalist
Zoology	Veterinary doctor, wildlife warden, livestock officer, fisheries officer
Anatomy and physiology	Medical doctor, nurse, clinical officer, physiotherapist, pharmacist
Microbiology	Medical laboratory technologist, food technologist, brewer
Genetics	Plant or animal breeder, genetic counsellor, forensic scientist
Entomology and parasitology	Pest control officer, public health officer, beekeeper (apiculturist)
Ecology	Environmentalist, conservation officer, park ranger
Biotechnology and biochemistry	Pharmaceutical scientist, biotechnologist, food scientist

Making a career wheel from local materials

1. Cut a large circle from used cardboard (a box or a carton).
2. Draw a small circle in the centre and divide the ring into equal sections with a ruler.
3. Write a field of Biology in the inner part of each section.
4. Write two or three careers for that field in the outer part.
5. Pin a pointer (a strip of card and a bottle top) at the centre so it can turn, and present the wheel to the class.

5. Choosing a career

Factors that should influence a career choice

- Interest: what you enjoy doing and learning about.
- Ability: what you are good at and the subjects you perform well in.
- Personality and values: for example, liking to help sick people, or to work outdoors.
- Opportunities: the training available and the jobs that exist.

Factors that should not decide a career

- Gender: a girl can be a surgeon or an engineer; a boy can be a nurse.
- Culture: old beliefs that some jobs are only for some communities.
- Disability: many people with disabilities succeed in science careers.
- Home environment: coming from a rural or urban area does not limit what you can become.
- Stereotypes: fixed ideas such as "Biology is only for those who want to be doctors".

> **THINK ABOUT IT**
> Talk to people who already work in a career that interests you (a resource person such as a nurse, a veterinary officer or an agricultural officer). Ask what they studied and what a normal day looks like.

Biology matters to everyone, whatever career they choose: it helps us stay healthy, grow and store food well, care for the environment and make wise decisions.

KEY POINTS TO REMEMBER

- Biology is the scientific study of living things and how they relate to each other and to the environment.
- Biology is applied in health, agriculture and food, the environment, and industry and biotechnology.
- Its main fields are botany, zoology, taxonomy, anatomy, physiology, ecology, biochemistry, biotechnology, genetics, parasitology, microbiology and entomology.
- Each field leads to careers, such as nurse, veterinary doctor, agronomist, laboratory technologist and conservation officer.
- Interest and ability should guide career choice; gender, culture, disability, home environment and stereotypes should not.

ANSWER THESE

1. Define Biology. (1 mark)

2. State three ways in which the study of Biology is applied in agriculture. (3 marks)

3. Name the field of Biology that studies: (a) insects (b) the naming and grouping of organisms (c) how body parts work (d) inheritance. (4 marks)

4. Distinguish between anatomy and physiology. (2 marks)

5. For each field, name one career: (a) microbiology (b) ecology (c) zoology. (3 marks)

6. State two factors that should influence a learner's choice of career and two that should not. (4 marks)

7. A learner says, "Only boys should become veterinary doctors." Explain why this is wrong. (2 marks)

8. Explain how Biology helps to prevent the spread of cholera in a community. (3 marks)

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1.2 Scientific investigations in Biology

WHAT YOU WILL LEARN

By the end of this topic you should be able to:

- identify apparatus and materials used for collecting, processing and preserving specimens
- collect, process and preserve specimens for biological studies using improvised and conventional apparatus

KEY WORDS

specimen, pooter, pitfall trap, sweep net, Tullgren funnel, herbarium, preservative, mounting, label.

Biologists cannot carry every living thing into the classroom, and many organisms are only found in certain places or seasons. So they collect specimens, process them and preserve them for study. In this topic we learn the apparatus used to collect plants and small animals, how to improvise it, how to make a herbarium, how to preserve animals, and how to plan and carry out a specimen collection project.

1. Specimens and the rules of collecting

Specimen

A whole organism, or part of one, collected and kept for study.

Preservation

Treating a specimen so that it does not rot and keeps its shape and features for a long time.

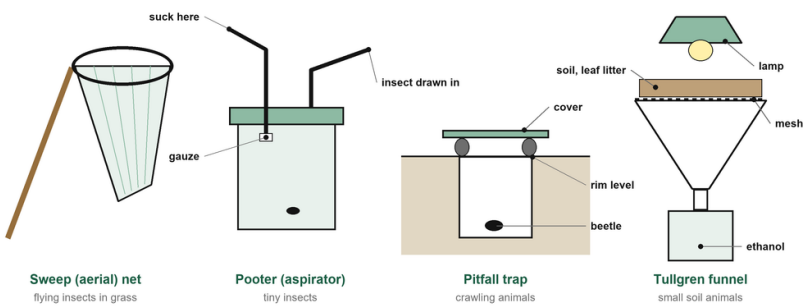
Why specimens are collected and preserved

- To identify and classify organisms.
- To study and compare their structures in class and in research.
- To keep a record of the organisms found in a place at a given time (biodiversity).
- To show learners organisms they may never see alive, such as rare or seasonal ones.

Rules in the field

- Collect only what you need; never take rare or protected species.
- Do not destroy the habitat: replace stones and logs you turn over.
- Work in groups and under the teacher's supervision; do not handle unknown animals or plants with bare hands.
- Wear gloves and covered shoes, and wash your hands afterwards.
- Record every specimen: what it is, where and when it was found, its habitat and who collected it.
- Return live animals you do not need to where you found them.

2. Apparatus for collecting small animals



Four common pieces of collecting apparatus