

# **Biology Syllabus**

## **Grades 7 and 8**

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## Introduction

Biology is a life science that allows students to acquire knowledge and understanding about themselves and the organisms in their environment. It allows students to appreciate the harmony, contrast, and beauty of nature around them. Biology as an experimental science involves critical thinking, reasoning and problem solving in everyday contexts.

The Biology syllabus for grades 7 and 8 is built upon the new curriculum framework for Ethiopian schools and on the needs assessment conducted prior to revision work. The syllabus has also considered international content standards for a similar age and grade level of learners. The specific objectives and contents are derived from the minimum learning competencies designed for the two grade levels. Agriculture, technology and AIDS are integrated in a much broader manner in response to the recommendations of the needs assessment. The needs assessment has indicated areas in the curriculum where contents are too difficult for children and grade levels where contents are overloaded. This syllabus has removed some difficult contents and retained others by simplifying them. The content overload has also been addressed by limiting details of contents and reducing the highly prescriptive methodology. Large content details and highly prescriptive methodology were proved to result in big volumes of textbooks which teachers found difficult to complete in an academic year.

In general, the main changes that are made during the revision of the biology curriculum revolved around:

- Addressing content overload
- Addressing content difficulty
- Strengthening active learning
- Integrating technology
- Integrating agriculture
- Considering international standards
- Strengthening horizontal and vertical relationships
- Strengthening relationships with TVET and further education
- Ensuring relevance of contents to the life and need of students and
- Organizing teaching around learning competencies

The learning competencies developed are based on 3 broad outcomes that were developed and defined for the areas knowledge, skills and values and attitudes. They read as follows:

Competency Area	Broad competencies
<b>Knowledge</b>	<b>Constructing biological knowledge</b> The learner will know and be able to interpret and apply biological, technological and environmental knowledge.
<b>Skills</b>	<b>Biological investigation</b> The learner will be able to use confidently scientific methods to conduct biological experiments and to investigate biological phenomena and solve problems in biological, technological and environmental context.
<b>Values &amp; attitudes</b>	<b>Biology, Society and Environment</b> The learner will be able to demonstrate interest and appreciation on the relationships between biology, technology, society and environment.

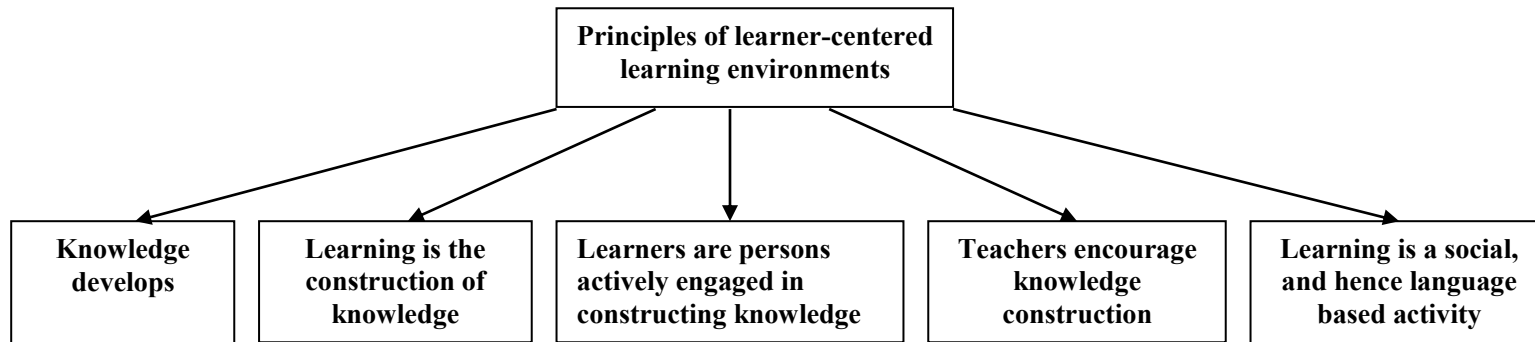
The developed competencies relate directly to these broad outcomes. The approach is based on the constructivist theory of teaching and learning. Constructivism underpins the concept of Competency Base Education. This education strategy supports teaching and learning in different environments. Constructivism emphasizes on two important dimensions:

- Learners actively acquire existing human knowledge (language, cultural wisdom, technical skills, school disciplines etc.) as their own system of knowing.
- Learners actively construct their own novel ways of knowing in the face of unfamiliar problems.

Therefore: Learners construct and re-construct knowledge. This is an active process of the learner and, thus gaining knowledge must be a learner-centered process. The learner-centered approach challenges both learners and teachers. The constructivist learning theory is very obvious since the knowledge of human kind was developed in this way: People engaged in understanding, explaining and working in the real world. The construction of knowledge is individual. Every learner, in particular the child as a learner, undergoes a process of acquiring knowledge. Knowledge is invented and re-invented. Therefore, knowledge cannot be transmitted from the teacher to the learner; it is re-constructed by the learner engaged in a culture of learning in school.

The main principle of constructivism in the classroom is to create an environment that gets learners engaged in the processes and development of thinking (cognition). To learn means to think about life, culture and work in increasingly complex ways in order to act more and more competently. A school (especially the classroom) is a particular important learning environment, because it makes systematic learning possible. The principles of learner-centered learning are summarized in the following diagram.

The new curriculum framework for Ethiopian schools has allotted three periods per week for grades 7 and 8 biology. Even though the academic calendar is made up of 40 weeks, the syllabus is prepared for 34 weeks (102 periods) creating a wider chance for teachers to use about six extra weeks for tasks of helping students that need further assistance and even for revision and student projects . In addition to getting more relaxed time for activities this also ensures that the curriculum be covered rightly in the academic year. The distribution of periods for each unit and sub-unit of each grade level is indicated in the table at the end of this introduction. It should be noted that periods allocated for the sub-units of each unit, throughout the syllabus, are proposed leaving a room for teachers' freedom of using them flexibly. A teacher who finished the content before the allocated time could freely use the remaining periods for the succeeding content and so on.



The above diagram shows that ONE; Knowledge is a body of information, ideas and practices that change and develop over time; TWO: the construction of knowledge is closely related to the activities in the classroom which include reasoning and critical thinking, problem-solving, retrieval, understanding and use of information, relating learning to one's existing knowledge, belief and attitudes, and thoughtful reflection on experience. THREE: Only a person that is enabled to engage actively in learning can be considered as a learner. This happens individually and collectively. FOUR: Teachers have to emphasize on authentic and meaningful tasks in real-world settings. This will enable the learners to construct context- and content-dependent knowledge. And FIVE: Constructivist learning environments support collaborative construction of knowledge through social negotiation and dialog between learner and teacher and among learners. Therefore language plays an important role and should be given particular attention.

The curriculum framework has clearly indicated that continuous assessment should be part of the teaching learning process and be done using oral, written and practical work. Therefore, this syllabus expects teachers to conduct continuous assessment throughout each term in the form of classroom exercises (written or oral), tests, homework/assignments, assessment of practical and field works, reports of project activities and personal inventories. In this syllabus, at the end of each unit, are given assessment descriptions, based on competencies, in order to help teachers focus their continuous assessments around them and make sure whether the ones set as standard competencies are achieved or not. In the assessment, the statement "minimum requirement level" should not be misleading the should be understood as the "standard level" should not be misleading and should be understood as the "standard level". Students working at the standard level are expected to achieve the competencies set for the grade level successfully. Teachers should give special considerations for those who are working above and below the standard levels by encouraging the ones that work above the standard and by giving extra attention for those who work below the standard.

This syllabus is not the only curricular material for biology. It is preceded by the flow chart and the minimum learning competencies (MLCs) and is expected to be succeeded by students textbook, students' workbook, teachers guide, and practical activities manual. **The flowchart** is a document that

presents the contents listed in a sequence that gives a guideline on the topics to be taught and arranging them in such a way that they build on each other in a spiral progression. The flowchart begets the MLC. **The MLC** is a document that indicates the minimum that a student must learn in each grade level in terms of content and skills and it builds on the themes or competency areas identified for the subject. The MLC begets the syllabus. **The syllabus** is a document that is preplanned, preordained, pre-sequenced, inventory of specifications that serves as a road map to teachers, students and textbook writers. It is made up of unit outcomes, competencies, contents, and hints for teaching and assessment. The syllabus begets the students' textbook and workbook and to the teachers guide and practical activities manual. **The textbook** is a standard book used in schools for a given subject and grade level and which serves as a primary learning instrument for students. **The workbook** is a booklet used by a student in which answers and workings may be entered besides questions and exercises. The booklet is designed in such a way that it has enough spaces for solving problems or recording activities. **The teacher's guide** is a book for the teacher that consists of written instructions for the teacher giving specific directions for teaching the various parts of a lesson. **The practical activities manual** is a manual for the teacher giving instructions on the 'how to' of conducting experiments and simple activities inside and outside the classroom, preparing equipments and chemicals, arranging and performing field trips and visits, making teaching aids and constructing models.

Finally, it should be underlined that the key players in the proper implementation of the biology curriculum are not only students and teachers. Parents, school management, community and government (both central and regional) have important roles. Parents should provide opportunities for their children to practice at home the knowledge and skills they have learnt at school. They should give necessary advice and supervision of their activities. The school management should provide moral and material support for biology activities in the school such as plot of land for agricultural activities and establishing linkages between the community, relevant institutions and activities initiated by the subject such as tree planting. The community should avail community resources for the teaching of biology especially when students are required to demonstrate active participation in community undertakings.

*Biology Syllabus: Grades 7 and 8*

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This document of grades 7 and 8 biology syllabuses was developed by a workshop (January 8- May 8, 2008) held at the premises of the Curriculum Framework Development Department of the MOE and at which 12 teachers

from nine regions of the country participated. Following is a list of team of experts and teachers who developed this document:

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**Allotment of Periods  
for Units and Sub-units of Biology  
Grades 7 and 8**

Grade	Unit	Sub-unit	Number of Periods	
			Sub-unit	Total
7	Unit 1: Biology and Technology	1.1 What is biology?	2	10
		1.2 Industries that utilize biological knowledge	2	
		1.3 Relevance of biology to society	2	
		1.4 Biology and technological innovations	2	
		1.5 Values in biology education	2	
	Unit 2: Cell Biology	2.1 Microscope and its use	5	13
2.2 The cell		3		
2.3 Looking at cells		4		
2.4 Cell type, shape and size		1		
Unit 3: Human Biology and Health	3.1 The muscular and skeletal system	10	15	
	3.2 Human dentition	5		
Unit 4: Plants	4.1 Diversity of plants	3	25	
	4.2 Flowering plants	22		
Unit 5: Animals	5.1 Diversity of animals	2	23	
	5.2 Life histories of some insects	4		
	5.3 Some economically important insects	6		
	5.4 Social insects	11		
Unit 6: Environment	6.1 Habitats	3	16	
	6.2 Studying a habitat	8		
	6.3 Food relationships	5		
8	Unit 1: Biology and Technology	1.1 Biology for development	3	7
		1.2 Technological products used in biology	4	
	Unit 2: Cell Biology	2.1 Looking at unicellular organisms	5	23
2.2 Single celled organisms		12		
2.3 levels of organization in multi-cellular organisms		6		
Unit 3: Human Biology and Health	3.1 The reproductive system	14	24	
	3.2 HIV and AIDS	10		
Unit 4: Plants	4.1 Food manufacture in green plants	7	17	
	4.2 Growing trees	10		
Unit 5: Animals	5.1 Keeping farm animals	13	13	
Unit 6: Environment	6.1 Ecosystem	3	18	
	6.2 Biological associations	3		
	6.3 physical factors of the ecosystem	12		





# **Biology Grade 8**

**General Objectives of Grade 8 Biology**

**1. To develop understanding and acquire knowledge of:**

- the role of technology in biology, technological products used in biology, functions of these technological products and the contribution of biology for development
- the structure, habitat, locomotion, nutrition, reproduction and importance of some unicellular organisms
- types and functions of cells, tissues, organs, and systems and organism as the highest level of organization
- the reproductive structures, the primary and secondary sexual characteristics of males and females, and the process of fertilization
- birth control methods and the effects and prevention of some common reproductive health problems
- the local, national and global distribution of HIV and AIDS, and its impacts in the society and express
- photosynthesis, its light and dark phases and its summary equation
- the steps followed in growing trees and the advantages of indigenous trees over exotic trees
- the importance of caring for farm animals, their products, the methods of preparing and storing food and sheltering for farm animals
- the ruminant stomach and why farm animals regurgitate
- the pregnancy periods of some farm animals and the special care given to their young
- the causes, symptoms, transmission and prevention of some common diseases of farm animals
- ecosystems, the differences between them, and the adaptations of plants and animals to each ecosystem
- some types of biological association, examples of organisms for each type
- soil as a physical factor of the ecosystem, how it is formed, its different types, and the causes and methods of prevention of soil erosion
- water as a physical factor of the ecosystem, the importance of water, the water cycle and the methods of conservation of water

**2. To develop skills and abilities of:**

- using a hand lens and a microscope to observe unicellular organisms
- assertiveness, decision making, and problem solving skills as life skills that help to prevent HIV
- conducting a simple experiment to confirm that plants produce food by photosynthesis
- Investigate the water, humus and air contents of soil and particle size and water retention through simple experiment
- demonstrating the steps followed in growing trees and in caring for them as they grow

**3. To develop the habit and attitude of:**

- curiosity, love, freedom, honesty, respect, co-operation, tolerance, humility, reasoning, and openness as values of learning biology as a science
- willingness to give care and support to PLWHA
- assertiveness, decision making, and problem solving skills as life skills that help to prevent HIV
- willingness to participate in tree growing projects

**Unit 1: Biology and technology (7 periods)**

**Unit Outcomes:** Students will be able to:

- explain biology’s contribution to development
- explain the role of technology in biology, list some technological products used in biology and tell the functions of these technological products.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• explain how biology contributes to our country’s development</li> <li>• explain the role of technology for the progress of biology</li> <li>• list at least seven technological products used in biology</li> <li>• tell the functions of some technological products used in biology</li> </ul>	<p><b>1. Biology and technology</b></p> <p><b>1.1 Biology for development (3 periods)</b></p> <ul style="list-style-type: none"> <li>• Role of biology in community health, agriculture, food production and other areas</li> </ul> <p><b>1.2 Technological products used in biology (4 periods)</b></p> <ul style="list-style-type: none"> <li>• Microscope, thermometer, binoculars, stethoscope, sphygmomanometer, incubator, refrigerator</li> </ul>	<p>Students should identify and discuss the ways in which biology and areas related to biology have important roles within their community. These should include:</p> <ul style="list-style-type: none"> <li>• Health care – clinics, doctors, hospitals</li> <li>• Agriculture – use of agro-chemicals, selective breeding</li> <li>• Food production – provision of nutrients</li> <li>• Improvement of the environment – tree planting, conservation of wildlife, reduction of disease</li> <li>• Natural products – remedies, cosmetics</li> </ul> <p>Let the students research on the roles of biology for development by interviewing different people and offices from their locality and present their findings to the class.</p> <p>Students should discuss how studies in biology are helped by a variety of technological devices. Students should make a list of such devices and explain how each is used. These should include:</p> <ul style="list-style-type: none"> <li>• Microscope and hand lens – to see detail beyond what is possible with the unaided eye</li> <li>• Thermometer – to measure temperature</li> <li>• Binoculars – to observe animals in the field</li> <li>• Stethoscope – to listen to the heart beat</li> <li>• Sphygmomanometer – to measure blood pressure</li> <li>• Incubator and water bath – to keep things at a constant temperature</li> <li>• Refrigerator – to keep chemicals and samples cool so they do not go off</li> <li>• Freezer – to store specimens</li> <li>• Balance – to measure mass</li> </ul> <p>Students should demonstrate that they are able to use a range of technological products by carrying out simple procedures such as:</p> <ul style="list-style-type: none"> <li>• Measuring the temperature of a sample of water</li> <li>• Measuring the mass of an organism</li> <li>• Observing a specimen under a microscope</li> </ul>

*Biology: Grade 8*

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
		<ul style="list-style-type: none"><li>• Observing birds or other animals in the field</li><li>• Measuring a person's heart rate</li><li>• Measuring a person's blood pressure</li></ul>

**Assessment**

The teacher should assess each student's work continuously over the whole unit and compare it with the following description, based on the competencies, to determine whether the student has achieved the minimum required level.

**Students at minimum requirement level**

A student working at the minimum requirement level will be able to: explain biology's contribution to development; explain the role of technology in biology, list some technological products used in biology and tell the functions of these technological products.

**Students above minimum requirement level**

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

**Students below minimum requirement level**

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

**Unit 2: Cell biology (23 periods)**

**Unit Outcomes:** Students will be able to:

- use hand lenses and microscopes to observe unicellular organisms and name some unicellular organisms
- describe the structure, habitat, locomotion, nutrition, reproduction and importance of some unicellular organisms
- name different types of cells, tissues, organs, and systems and state their functions
- describe organism as the highest level of organization.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• use hand lenses and microscopes to observe unicellular organisms</li> <li>• name amoeba, paramecium, euglena, bacteria and yeast as unicellular organisms</li> </ul> <ul style="list-style-type: none"> <li>• describe the structure, habitat, locomotion, nutrition, reproduction and importance of amoeba, paramecium, euglena, bacteria and yeast</li> </ul>	<p><b>2. Cell biology</b></p> <p><b>2.1 Looking at unicellular organisms (5 periods)</b></p> <ul style="list-style-type: none"> <li>• Observing unicellular organisms using live or preserved specimens</li> <li>• yeast, euglena, paramecium, amoeba, bacteria</li> </ul> <p><b>2.2 Single celled organisms (12 periods)</b></p> <ul style="list-style-type: none"> <li>• Amoeba (structure, habitat, nutrition, reproduction, locomotion, importance)</li> </ul>	<p>Students should be aware that there are many unicellular organisms. Many of these are too small to be seen with the unaided eye so they must be viewed using a hand lens or a microscope.</p> <p>Students should examine and draw a number of unicellular organisms including:</p> <ul style="list-style-type: none"> <li>• Amoeba, Paramecium, Euglena, Yeast, Bacteria</li> </ul> <p>Students should appreciate that at the unicellular level the traditional differences between plants and animals do not apply. For example, euglena is able to move – like an animal – but contains a chloroplast – like a plant. Students could discuss whether it is better classified as an animal or a plant.</p> <p>Students should understand that unicellular organisms like this are not classified as plants or animals but in different kingdoms. In the case of euglena, in the kingdom protocista.</p> <p>Students should know that amoeba is a single celled organism found in mud at the bottom of ditches and ponds.</p> <p>Students should be able to draw and label the parts of amoeba including:</p> <ul style="list-style-type: none"> <li>• Nucleus, Cytoplasm, Contractile vacuoles, Food granules</li> </ul> <p>Students should know that amoeba is able to move by forming pseudopodia as a result of the flow of cytoplasm. It feeds on bacteria and microscopic algae which are engulfed by pseudopodia and form a vacuole in the cytoplasm. Enzymes are released into the vacuole and the food is digested.</p> <p>Students should appreciate that amoeba reproduces asexually and there are two mechanisms for this.</p> <p>Binary fission:</p> <ul style="list-style-type: none"> <li>• Occurs every few days when conditions are favourable</li> <li>• Amoeba stops moving and becomes rounded</li> <li>• The nucleus divides in two and each part takes some cytoplasm with it forming two daughter cells</li> </ul> <p>Sporulation:</p>

Competencies	Contents	Suggested activities
	<ul style="list-style-type: none"> <li>Paramecium (structure, habitat, nutrition, reproduction, locomotion, importance)</li> </ul>	<ul style="list-style-type: none"> <li>Occurs when conditions are unfavourable e.g. drought</li> <li>A thick covering or cyst surrounds the amoeba</li> <li>Whilst in the cyst it may divide many times</li> <li>When conditions become favourable the cyst ruptures and the amoeba are released</li> </ul> <p>Students should be able to draw the sequence of events that occurs in each mechanism.</p> <p>Students could observe the movement of amoeba with the aid of a microscope.</p> <p>Students should know that paramecium is a single celled organism, shaped rather like a shoe print, which is found in fresh water ditches and ponds.</p> <p>Students should be able to draw and label the parts of paramecium including:</p> <ul style="list-style-type: none"> <li>Nucleus, Cytoplasm, Contractile vacuoles, Oral groove</li> </ul> <p>Students should know that paramecium is able to move by spinning around its long axis due to the rhythmic movement of cilia. It feeds on bacteria which are drawn into the oral groove and carried to the cytosome by the action of cilia. The food is digested by enzymes as it passes around the cytoplasm.</p> <p>Students should appreciate that paramecium reproduces both asexually and sexually.</p> <p>Asexual reproduction – binary fission</p> <ul style="list-style-type: none"> <li>This mode of reproduction is more common</li> <li>The nucleus of the paramecium divides in two and each part takes some cytoplasm with it forming two new individuals</li> </ul> <p>Sexual reproduction – conjugation</p> <ul style="list-style-type: none"> <li>Two paramecium come together and are joined at the oral surfaces by cytoplasm</li> <li>The meganuclei break up and disappear</li> <li>The micronucleus in each organism divides into four. Three of these disappear and the remaining one divides into two</li> <li>One micronucleus from each organism migrates into the other organism and unites with the remaining micronucleus forming a zygotic nucleus in each organism</li> <li>The organisms separate and the nucleus in each divides into eight</li> <li>Each organism undergoes binary fission twice to form four new individuals</li> </ul> <p>Students should be able to draw the sequence of events that occurs in both asexual and sexual reproduction.</p> <p>Students could observe the movement of cilia surrounding paramecium with the aid of a microscope.</p> <p>Students should know that euglena is a single celled organism which is oval shaped and has a single flagellum. It is in fresh water ditches and ponds, particularly those contaminated by urine and faeces.</p> <p>Students should be able to draw and label the parts of euglena including:</p>
	<p>Euglena (structure, habitat, nutrition, reproduction, locomotion, importance )</p>	

Competencies	Contents	Suggested activities
	<ul style="list-style-type: none"> <li data-bbox="516 670 831 792">• Bacteria (structure, habitat, nutrition, reproduction, locomotion, importance)</li>   <li data-bbox="516 1273 831 1365">• Yeast (structure, habitat, nutrition, reproduction, locomotion, importance)</li> </ul>	<ul style="list-style-type: none"> <li data-bbox="871 215 1929 634">• Nucleus, Cytoplasm, Contractile vacuoles, Chloroplast, Flagellum Students should know that euglena is able to move in a wave-like motion as it spins around its long axis due to the lashing of the flagellum against the water. Euglena has a chloroplast and produces its own food by photosynthesis. Students should appreciate that euglena reproduces asexually only. Asexual reproduction – binary fission               <ul style="list-style-type: none"> <li data-bbox="871 410 1205 435">• The euglena stops moving</li> <li data-bbox="871 444 1570 469">• The nucleus divides into two and a second flagellum forms</li> <li data-bbox="871 479 1929 537">• The cytoplasm divides along the length of the organism, with a nucleus and flagellum on each side</li> <li data-bbox="871 547 1266 571">• Two new organisms are formed</li> </ul>               Students could observe the movement of euglena by the whipping of the flagellum with the aid of a microscope.             </li>   <li data-bbox="871 662 1929 1081">Students should know that there are many different kinds of bacteria but they have certain generalised features. Some bacteria exist as individuals while others group together. Bacteria are found in a variety of habitats both outside and inside other organisms. Students should be able to draw and label the parts of a bacterium including:               <ul style="list-style-type: none"> <li data-bbox="871 797 1661 821">• Nuclear material, Cell wall, Cytoplasm, Slime envelope, Flagellum</li> </ul>               Students should appreciate that bacteria have no nucleus but a knot of nuclear material. Bacteria are able to move due to the motion of flagella. Bacteria reproduce asexually by binary fission:               <ul style="list-style-type: none"> <li data-bbox="871 927 1230 951">• The bacterium stops moving</li> <li data-bbox="871 961 1327 985">• The nuclear material divides into two</li> <li data-bbox="871 995 1929 1053">• The cytoplasm divides along the length of the organism, with nuclear material on each side.</li> <li data-bbox="871 1063 1241 1088">• Two new bacteria are formed</li> </ul>               Students could research the different bacterial forms:               <ul style="list-style-type: none"> <li data-bbox="871 1127 1257 1151">• Cocci, Bacilli, Vibrios, Spirilla</li> </ul>               Students should appreciate that some bacteria can cause diseases in people. They could find out more about such diseases including:               <ul style="list-style-type: none"> <li data-bbox="871 1224 1352 1248">• Cholera, Pneumonia, Typhoid, Syphilis</li> </ul> </li>   <li data-bbox="871 1279 1929 1372">Students should know that yeast is a single-celled fungus. It is found naturally on the skins of fruit such as grapes and is also found in fermented dough. Students should be able to draw and label a yeast cell, showing the nucleus.</li> </ul>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>• name different types of cells</li> <li>• state the functions of different types of cells</li> </ul>	<p><b>2.3 levels of organization in multi-cellular organisms (6 periods)</b></p> <ul style="list-style-type: none"> <li>• Cell (type, function)</li> </ul>	<p>Students should appreciate that since yeast is a fungus, it has no chlorophyll and therefore cannot obtain its own food by photosynthesis. Nutrition in yeast involves the breakdown of glucose in the absence of air. This is sometime called alcoholic fermentation since alcohol (ethanol) is one of the products:</p> <p style="text-align: center;">glucose → ethanol + carbon dioxide + energy</p> <p>Students should appreciate the commercial importance of this process including:</p> <ul style="list-style-type: none"> <li>• The formation of alcoholic drinks like beers and wines</li> <li>• The use of ethanol as a biofuel</li> <li>• The role of yeast in baking by providing carbon dioxide to make bread rise</li> </ul> <p>Yeast reproduces asexually by budding:</p> <ul style="list-style-type: none"> <li>• The yeast cell grows in size</li> <li>• The nucleus divides</li> <li>• A new yeast cell (bud) grows on the side of the parent cell</li> </ul> <p>Students could review the four unicellular organisms described in this section and comment on any similarities and differences that are apparent.</p> <p>Students should already be familiar with the cell as the basic building block from which organisms are formed.</p> <p>Students should appreciate that in a living organism, there are different types of cells, each having a particular function. Students should name some of the different types of cells found in plants and explain their function including:</p> <ul style="list-style-type: none"> <li>• Leaf epidermal cells; Leaf palisade cells; Root tip cells</li> </ul> <p>Students should also name some of the different types of cells found in the human body and explain their function including:</p> <ul style="list-style-type: none"> <li>• Skin cells, Blood cells, Muscle cells, Nerve cells, Sperm and ova</li> </ul> <p>Students should view prepared specimens of different types of cells using a microscope. They should note the similarities and the differences.</p> <p>Students should appreciate that cells are a particular type are usually grouped together to form a tissue. Tissue consists of cells of the same shape and size which carry out the same function.</p>
<ul style="list-style-type: none"> <li>• name some plant and animal tissues</li> <li>• state the functions of some plant and animal tissues</li> </ul>	<ul style="list-style-type: none"> <li>• Tissue</li> <li>- Plant (meristematic, conductive)</li> </ul>	<p>Students should identify some of the tissues present in plants and explain their function including:</p> <ul style="list-style-type: none"> <li>• Photosynthetic tissue, Epidermal tissue, Conducting tissue, Strengthening tissue</li> </ul> <p>Students should identify some of the tissues present in animals and explain their function including:</p> <ul style="list-style-type: none"> <li>• Epithelial tissue, Blood tissue, Nerve tissue, Muscle tissue, Skeletal tissue</li> </ul>



Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>• name some plant and animal organs</li> <li>• state the functions of some plant and animal organs</li>   <li>• name some plant and animal systems</li> <li>• state the functions of some plant and animal systems</li>   <li>• describe organism as the highest level of organization in multi-cellular organisms</li> </ul>	<ul style="list-style-type: none"> <li>- Animal (epithelial, blood, nerve)</li>   <li>• Organ                             <ul style="list-style-type: none"> <li>-Plant (leaf, stem flower root)</li> <li>-Animal (heart, lung, liver, stomach)</li> </ul> </li>   <li>• System                             <ul style="list-style-type: none"> <li>• Plant (root system, shoot system)</li> <li>• Animal (digestive system, circulatory system)</li> </ul> </li>   <li>• Organism                             <ul style="list-style-type: none"> <li>- Plants</li> <li>- Animals</li> </ul> </li> </ul>	<p>Students should appreciate that tissue may be grouped together to form a functional unit called an organ. An organ consists of a number of different tissues which combine to enable the organ to perform specific functions.</p> <p>Students should identify some organs present in plants and explain their functions including:</p> <ul style="list-style-type: none"> <li>• Leaf, Stem, Root, Flower</li> </ul> <p>Students could examine some plants and identify these organs.</p> <p>Students should identify some organs in animals and explain their functions including:</p> <ul style="list-style-type: none"> <li>• Heart, Lungs, Liver, Stomach</li> </ul> <p>Students should appreciate that organs may be grouped together to form a system. A system consists of several organs whose functions are coordinated.</p> <p>Students should identify some systems present in plants and explain their function including:</p> <ul style="list-style-type: none"> <li>• Root system; Shoot system</li> </ul> <p>Students should identify some systems present in animals and their functions including:</p> <ul style="list-style-type: none"> <li>• Digestive system; Circulatory system; Reproductive system</li> </ul> <p>Students should appreciate that systems combine together in an organism.</p> <p>Students should review the five levels of organisation in a multicellular organism:                      cells → tissues → organs → systems → organism</p> <p>Students could compare this organisation with that of a single-celled organism such as amoeba.</p>

**Assessment**

The teacher should assess each student’s work continuously over the whole unit and compare it with the following description, based on the competencies, to determine whether the student has achieved the minimum required level.

**Students at minimum requirement level**

A student working at the minimum requirement level will be able to: use hand lenses and microscopes to observe unicellular organisms and name some unicellular organisms; describe the structure, habitat, locomotion, nutrition, reproduction and importance of some unicellular organisms; name different types of cells, tissues, organs, and systems and state their functions; describe organism as the highest level of organization.

**Students above minimum requirement level**

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

**Students below minimum requirement level**

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

**Unit 3: Human biology and health (24 periods)**

**Unit Outcomes:** Students will be able to:

- state the primary and secondary sexual characteristics of males and females, label the reproductive structures and give their functions
- explain the menstrual cycle and the cares that girls should take before and during menstruation
- define fertilization and explain its process
- mention pills and condoms as birth control methods and explain how they are used
- trace some common reproductive health problems, describe how they affect humans and how they could be prevented
- show the local, national and global distribution of HIV and AIDS, explain its impacts in the society and express willingness to give care and support to PLWHA
- demonstrate assertiveness, decision making, and problem solving skills as life skills that help to prevent HIV.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• state the primary and secondary sexual characteristics of males and females</li> <li>• label the reproductive structures of males and females on a diagram</li> <li>• describe the functions of the reproductive structures of males and females</li> </ul>	<p><b>3. Human biology and health</b></p> <p><b>3.1 The reproductive system (14 periods)</b></p> <ul style="list-style-type: none"> <li>• Primary and secondary sexual Characteristics</li> <li>• The male and female reproductive organs</li> <li>• structure and function</li> </ul>	<p>Students should identify the reproductive system as one of the systems found in a animals. Students should discuss the primary and secondary sexual characteristics including:</p> <p>Male:</p> <ul style="list-style-type: none"> <li>• Male reproductive organ; Growth of facial hair; Deepening of the voice; Body becomes more muscular; Chest and shoulders broaden; Production of sperm begins</li> </ul> <p>Female</p> <ul style="list-style-type: none"> <li>• Female reproductive organ; Development and enlargement of breasts; Hips widen as the pelvic girdle enlarges; Body contours become more rounded; Ovulation accompanied by menstruation begins</li> </ul> <p>Students should appreciate that the secondary sexual characteristics only develop in the early teens during a period called puberty.</p> <p>Students should be able to name the parts of the male reproductive system and label a diagram showing them. These should include:</p> <ul style="list-style-type: none"> <li>• Penis, Testes, Scrotum, Sperm tube (vas deferens), Urethra, Prostate gland, Cowper’s gland</li> </ul> <p>Students should be able to explain the function of the various parts of the male reproductive system including:</p> <ul style="list-style-type: none"> <li>• Production of sperm in the testes</li> <li>• Passage of sperm along the sperm tube</li> <li>• Secretion of fluid by the prostate and Cowper’s glands</li> <li>• Passage of semen along the penis through the urethra</li> </ul> <p>Students should be able to name the parts of the female reproductive system and label a diagram showing them. These should include:</p> <ul style="list-style-type: none"> <li>• Ovaries, Oviducts (Fallopian tubes), Uterus, Cervix, Vagina, Vulva, Clitoris</li> </ul>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>• explain the menstrual cycle using a simplified diagram</li> <li>• explain the cares that girls should take before and during menstruation</li> <li>• define fertilization as the union of sperm and egg</li> <li>• explain the process of fertilization</li> </ul>	<ul style="list-style-type: none"> <li>• The menstrual cycle</li> <li>• Fertilization</li> </ul>	<p>Students should be able to explain the function of the various parts of the female reproductive system including:</p> <ul style="list-style-type: none"> <li>• Production of ova in the ovaries</li> <li>• Passage of an ovum along the oviduct</li> <li>• Development of a fertilised ovum in the uterus</li> <li>• Location of the male penis in the vagina during intercourse</li> <li>• Opening of the cervix during childbirth</li> </ul> <p>Students should appreciate that once a female has reached puberty she is able to reproduce. They should be aware of the following sequence of events which take place on a monthly basis in the female reproduction system:</p> <ul style="list-style-type: none"> <li>• The wall of the uterus begins to thicken.</li> <li>• An ovum is released from one of the ovaries.</li> <li>• The ovum passes down the oviduct. At this time it may be fertilised as a result of intercourse.</li> <li>• If the ovum has been fertilised it becomes embedded in the thickened uterus wall and develops into an embryo.</li> <li>• If the ovum has not been fertilised the thickened uterus wall breaks down with the loss of a small amount of blood, and passes out of the body through the vagina.</li> <li>• The loss of blood from the vagina over a few days is commonly called a period.</li> </ul> <p>Students should understand that this sequence of events is called the menstrual cycle. It occurs over a period of 28 – 35 days on a regular basis. Ovulation, the release of an ovum, occurs in the middle of the cycle.</p> <p>Students should be able to use a simple diagram to explain what is happening during this cycle.</p> <p>Students should appreciate that menstruation is a natural process that should be acknowledged and discussed freely. They should appreciate the need for additional personal hygiene during the period a woman passes blood and discuss the use of sanitary towels and other products.</p> <p>Students should understand that a woman is most fertile during the few days after the ovum is released and if intercourse takes during this time, there is a significant chance that fertilisation will occur. Students should know that:</p> <ul style="list-style-type: none"> <li>• Fertilisation is the union of a male sex cell or sperm, and a female sex cell or ovum.</li> <li>• Fertilisation normally takes place in the oviduct</li> <li>• A single sperm penetrates the wall of the ovum and the nucleus of the sperm combines with the nucleus of the ovum</li> <li>• The fertilised ovum is called a zygote</li> </ul>

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> <li>• mention pills and condoms as birth control methods</li> <li>• explain how pills and condoms are used for birth control</li> </ul>	<ul style="list-style-type: none"> <li>• Birth control methods (pills and condoms)</li> </ul>	<p>Students should understand that any method of birth control involves preventing fertilisation which, in turn, involves preventing the sperm and ovum from coming together. Students should discuss how this might be achieved. The most effective method would be to avoid sexual intercourse but, assuming this does take place, pose the question of how can the sperm be prevented from reaching the ovum?</p> <p>Students should know how each of the following is used and why it is effective:</p> <ul style="list-style-type: none"> <li>• Contraceptive pills – prevent ovulation so no ovum released</li> <li>• Condoms – a thin rubber barrier that prevents sperm entering the vagina</li> </ul> <p>Students should discuss these birth control methods, considering such factors as:</p> <ul style="list-style-type: none"> <li>• Cost</li> <li>• Availability</li> <li>• Effectiveness</li> <li>• Side effects of the contraceptive pill</li> </ul> <p>Students could research other methods of birth control including:</p> <ul style="list-style-type: none"> <li>• Coitus interruptus</li> <li>• Rhythm method</li> <li>• Spermicidal creams and foaming tablets</li> <li>• Intra-uterine device (IUD)</li> <li>• Diaphragm</li> <li>• Sterilisation</li> </ul> <p>Students should appreciate that birth control is the responsibility of both the man and the woman.</p> <p>Students could discuss the need for birth control and its role in family planning.</p> <p>Students could identify and discuss the problems arising from over-population both for the individual, the country and the world as a whole.</p>
<ul style="list-style-type: none"> <li>• describe how FGM, early marriage, STIs, rape and illegal abortion affect reproductive health</li> <li>• explain how FGM, early marriage, STIs, rape and illegal abortion could be prevented</li> </ul>	<ul style="list-style-type: none"> <li>• Reproductive health (Female genital mutilation, early marriage, STIs, rape, illegal abortion)</li> </ul>	<p>Students should discuss the effects of factors on the reproductive health of a woman including:</p> <ul style="list-style-type: none"> <li>• Female genital mutilation</li> <li>• Early marriage</li> <li>• Sexually transmitted infections</li> <li>• Rape</li> <li>• Illegal abortion</li> </ul> <p>Students should appreciate that none of these practices is acceptable and they should discuss how to educate people against them.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>• show the local, national and global distribution of HIV and AIDS using graphs and maps</li> <li>• explain the impacts of</li> <li>• HIV and AIDS in the society</li> <li>• express willingness to give care and support to PLWHA</li> <li>• demonstrate assertiveness, decision making, and problem solving skills as life skills that help to prevent HIV</li> </ul>	<p><b>3.2 HIV and AIDS</b> (10 periods)</p> <ul style="list-style-type: none"> <li>• HIV and AIDS                             <ul style="list-style-type: none"> <li>- Distribution of HIV and AIDS (local, national and global)</li> <li>- Impacts of HIV and AIDS on society</li> </ul> </li> <li>- Care and support to PLWHA</li> <li>- Life skills</li> </ul>	<p>Students should already be familiar with the causes of HIV and AIDS. They should be provided with current data on the prevalence of HIV and AIDS in their locality, in Ethiopia and in the world. Students should be posed questions on the data which will require them to interpret maps, graphs and data tables.</p> <p>Students should discuss the impact on HIV and AIDS on:</p> <ul style="list-style-type: none"> <li>• A person</li> <li>• A person’s family and friends</li> <li>• The country as a whole</li> </ul> <p>Let the students find out if there are governmental or non-governmental institutions in their locality that work on giving care and support to PLWHA. A visit could be arranged to such an institution. A guest speaker from the institutions could also be invited to the class to discuss with students. Students should be trained in safer ways of giving care and support to PLWHA.</p> <p>Students should discuss how each individual can keep him or herself safe from HIV. This should include the development of life skills, a willingness to be assertive and not give in to peer pressure and an assessment of the risks involved in any situation. Let them practice these skills through role plays.</p>

**Assessment**

The teacher should assess each student’s work continuously over the whole unit and compare it with the following description, based on the competencies, to determine whether the student has achieved the minimum required level.

**Students at minimum requirement level**

A student working at the minimum requirement level will be able to: state the primary and secondary sexual characteristics of males and females, label the reproductive structures and give their functions; explain the menstrual cycle and the cares that girls should take before and during menstruation; define fertilization and explain its process; mention pills and condoms as birth control methods and explain how they are used; trace some common reproductive health problems, describe how they affect humans and how they could be prevented; show the local, national and global distribution of

HIV and AIDS, explain its impacts in the society and express willingness to give care and support to PLWHA; demonstrate assertiveness, decision making, and problem solving skills as life skills that help to prevent HIV.

**Students above minimum requirement level**

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

**Students below minimum requirement level**

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

**Unit 4: Plants (17 periods)**

**Unit Outcomes:** Students will be able to:

- define photosynthesis, explain its light and dark phases and give a summary equation of photosynthesis
- conduct a simple experiment to confirm that plants produce food by photosynthesis
- demonstrate the steps followed in growing trees and in caring for them as they grow
- explain the advantages of indigenous trees over exotic trees and show willingness to participate in tree growing projects.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• define photosynthesis as the production of food by leaves using sunlight, water and chlorophyll</li> <li>• give a summary equation of photosynthesis</li> <li>• explain the major events in the process of photosynthesis</li> <li>• confirm that plants produce food by photosynthesis by conducting a simple experiment</li> </ul>	<p><b>4. Plants</b></p> <p><b>4.1 Food manufacture in green plants (7 periods)</b></p> <ul style="list-style-type: none"> <li>• What is photosynthesis?</li> <li>• Summary equation</li> <li>• Utilization of sunlight and production of glucose</li> <li>• Confirming occurrence of photosynthesis</li> </ul>	<p>Students should already know that green plants make their own food by the process of photosynthesis. In this process light energy is trapped by the green pigment, chlorophyll, in the leaves and used to combine carbon dioxide and water to form glucose. Students should be familiar with the equation:</p> $  \begin{array}{ccccccc}  6\text{H}_2\text{O} & + & 6\text{CO}_2 & \rightarrow & \text{C}_6\text{H}_{12}\text{O}_6 & + & 6\text{O}_2 \\  \text{Water} & & \text{carbon dioxide} & & \text{glucose} & & \text{oxygen}  \end{array}  $ <p>Students should understand that the following occur during and after food manufacture in plants</p> <ul style="list-style-type: none"> <li>• Sunlight is absorbed</li> <li>• Carbon dioxide and water combine to form glucose</li> <li>• Glucose is converted to starch in the leaves</li> <li>• Starch in the leaves is converted to glucose</li> <li>• Glucose is transported to different part of the plant</li> <li>• Glucose is converted back to starch and stored in different parts of the plant</li> </ul> <p>Starch is an example of a stored carbohydrate. Students could find out why:</p> <ul style="list-style-type: none"> <li>• glucose in plants is stored as starch and doesn't just remain as glucose</li> <li>• in which form is glucose stored in the human body</li> </ul> <p>Students should appreciate that the temporary storage of starch in leaves provides a convenient way of demonstrating that photosynthesis is taking place. Students should carry out a starch test on a green leaf by:</p> <ol style="list-style-type: none"> <li>1. Placing the leaf in boiling water for a few minutes</li> <li>2. Transferring the leaf into ethanol and heating it on a water bath for a few minutes</li> <li>3. Washing the leaf in cold water</li> <li>4. Adding a few drops of iodine solution to the leaf</li> <li>5. A blue-black colour indicates the presence of starch</li> </ol> <p>Students could carried out the starch test on the leaves of a plant which has been kept in the dark for several days to demonstrate that light is needed for photosynthesis.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>• demonstrate the steps followed in growing trees</li> <li>• demonstrate the steps followed in caring for trees as they grow</li> <li>• show willingness to participate in tree growing projects</li> </ul>	<p><b>4.2 Growing trees</b> (10 periods)</p> <ul style="list-style-type: none"> <li>• Steps in growing trees</li> <li>• Caring for trees as they grow</li> <li>• A tree growing project</li> </ul>	<p>Students could carry out the starch test on the leaves of a plant which has variegated leaves to demonstrate that starch is only present in the green parts of the leaf therefore chlorophyll is necessary for photosynthesis.</p> <p>Students could carry out an experiment on the pond weed <i>elodea</i> by placing a large piece in water under an inverted funnel and an inverted test tube filled with water. The apparatus is left in the light for several days and the gas collected is tested with a glowing wooden spill. Oxygen will cause the wooden spill to relight.</p> <p>Students could be given data showing how the rate of photosynthesis changes with light intensity and asked to display the data in some way and explain the pattern seen.</p> <p>Students should be familiar with the stages of growing trees to eventually be planted on the land. They should be able to discuss different aspects of the different stages.</p> <p>Planting seeds :</p> <ul style="list-style-type: none"> <li>• Prepare seed bed or pot of soil</li> <li>• Provide conditions suitable for growth</li> <li>• Protect against pests such as caterpillars who will target the young soft growth</li> <li>• Provide water and nutrients</li> </ul> <p>Transplanting seedlings in final position:</p> <ul style="list-style-type: none"> <li>• Dig a hole big enough for the root ball</li> <li>• Transplant and firm into the ground</li> <li>• Tie the seedling to a stake until is well established to support itself</li> <li>• Protect the seedlings from grazing animals</li> <li>• Continue to water the seedling in dry spells until its root system is sufficiently well established.</li> </ul> <p>Students could research those areas of Ethiopia that were forested in 1900 and those which are forested now. Students could find out the names of indigenous trees and what is being done across the country to re-establish forests of them.</p> <p>Students should, as a group, organise a tree-growing project in their area. This could involve such things as:</p> <ul style="list-style-type: none"> <li>• Raising funds to buy seedlings or acquiring them from suitable organisations</li> <li>• Caring for the seedlings until they can be planted in their final positions</li> <li>• Planning where the trees are to be planted</li> <li>• Planting the trees and providing immediate care such as sticks for support and protection from animals</li> <li>• Providing long-term support such as providing water in dry conditions until the tree roots are sufficiently developed to obtain all the water needed from the ground</li> </ul>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>explain the advantages of indigenous trees over exotic trees</li> </ul>	<ul style="list-style-type: none"> <li>Advantages of growing indigenous trees</li> </ul>	<ul style="list-style-type: none"> <li>Educating local people of the need to support their work by not allowing animals to damage the trees of chopping the trees for firewood</li> </ul> <p>Students should research which trees in their locality are indigenous and which have been imported from other regions or countries</p> <p>Students should discuss the advantages of growing indigenous trees. This could include:</p> <ul style="list-style-type: none"> <li>Maintaining the characteristic look of the area</li> <li>Providing flowers that can be pollinated by indigenous insects</li> <li>Providing food for indigenous animals such as birds</li> <li>Providing products such as herbal medicines which are obtained from indigenous trees</li> </ul> <p>Protecting existing trees from excess competition which may result from planting imported trees which are faster-growing</p>

**Assessment**

The teacher should assess each student’s work continuously over the whole unit and compare it with the following description, based on the Competencies, to determine whether the student has achieved the minimum required level.

**Students at minimum requirement level**

A student working at the minimum requirement level will be able to: give examples of flowering plants, state their general characteristics and explain the structures and functions of the root, stem and leaves; identify stomata using a microscope; classify flowering plants into monocotyledons and dicotyledons, distinguish between the two, and give examples for each; explain vegetative reproduction and give examples of flowering plants that reproduce by vegetative reproduction; draw and label the structures of a flower, state their functions and examine pollen grains and ovaries using a hand lens; tell the importance of pollination and the process of fertilization, state how fruits and seeds develop, state the functions of the structures of a seed and draw and label these structures; define photosynthesis, explain its

light and dark phases and give a summary equation of photosynthesis; conduct a simple experiment to confirm that plants produce food by photosynthesis; demonstrate the steps followed in growing trees and in caring for them as they grow; explain the advantages of indigenous trees over exotic trees and show willingness to participate in tree growing projects.

**Students above minimum requirement level**

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

**Students below minimum requirement level**

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.



**Unit 5: Animals (13 periods)**

**Unit Outcomes:** Students will be able to:

- explain the importance of caring for farm animals, list down their products, and state the methods of preparing and storing food and sheltering for farm animals
- compare the ruminant stomach with the human stomach and explain why farm animals regurgitate
- list the pregnancy periods of some farm animals and describe the special care given to their young
- explain the causes, symptoms, transmission and prevention of some common diseases of farm animals.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• explain the reasons for caring for farm animals</li> <li>• list down the products of farm animals</li>   <li>• compare the ruminant stomach with the human stomach</li> <li>• explain why farm animals regurgitate</li> </ul>	<p><b>5. Animals</b></p> <p><b>5.1 Keeping farm animals (13 periods)</b></p> <ul style="list-style-type: none"> <li>• Why we care for farm animals</li>   <li>• Products of farm animals</li>   <li>• Feeding and sheltering them (the ruminant stomach and regurgitation)</li> <li>• Preparing and storing food (silage hay, fodder)</li> </ul>	<p>Students should give examples of farm animals including poultry, cattle, sheep, goats, camels, horses and donkeys</p> <p>Students should discuss the reasons why farm animals are kept. This could include:</p> <ul style="list-style-type: none"> <li>• To provide food; To provide skins; To be sold for profit; To do work; To breed</li> </ul> <p>Students should describe the provided for different farm animals and how they are sheltered. For example, for free-range poultry:</p> <ul style="list-style-type: none"> <li>• Food - grain, green foliage, insects, poultry pellets</li> <li>• Shelter – coop</li> </ul> <p>Students should be aware that cattle are herbivores and therefore their diet is very different to the average person. Students should also recall from their knowledge of human digestion, that mammals cannot digest cellulose. From this they should deduce that a ruminant’s stomach must be significantly different to a human stomach.</p> <p>Students should know that:</p> <ul style="list-style-type: none"> <li>• The stomach of a ruminant like a cow has four chambers</li> <li>• The first chamber is called the rumen</li> <li>• Food enters the first chamber when it is swallowed and is fermented by anaerobic bacteria which break down the cellulose</li> <li>• The food then passes to the second chamber of the stomach, the reticulum where it becomes known as cud</li> <li>• The cud is regurgitated into the mouth where it is chewed again</li> <li>• The chewed cud passes to the third chamber of the stomach, the omasum where much of the water it contains is reabsorbed</li> <li>• The food then passes to the last chamber of the stomach, the abmasum, where normal gastric secretions digest the protein in the food</li> </ul> <p>Students should understand that forage crops are grown to feed livestock and that it is necessary to harvest and store the crop to feed animals when natural food is in short supply.</p>

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> <li>state the methods of preparing and storing food for farm animals</li> <li>state the methods of sheltering farm animals</li> <li>list the pregnancy periods of some farm animals</li> <li>describe the special care given to young farm animals</li> <li>state some of the symptoms seen on sick farm animals</li> </ul>	<ul style="list-style-type: none"> <li>Pregnancy periods (cattle, sheep, goats, camels, horse, donkey)</li> <li>Care for pregnant farm animals</li> <li>Care for young farm animals</li> </ul>	<p>Students should appreciate that hay is composed mainly of legumes and grasses, including cereal crops. Hay is best made in the dry season when there is sufficient sun to dry the cut material.</p> <p>Students should discuss the properties of well-prepared hay including:</p> <ul style="list-style-type: none"> <li>Slight green colour</li> <li>High leaf to stem ratio</li> <li>Low fibre so easily digestible</li> <li>Low moisture content (15-25%)</li> <li>No mould or dust</li> <li>Free from weeds and stones</li> <li>Able to be stored for long periods without deteriorating</li> </ul> <p>Students should appreciate that making silage involves the preservation of forage crop by acids produced by the fermentation of sugars present in the fodder.</p> <p>Students should understand the steps in the formation of silage including:</p> <ul style="list-style-type: none"> <li>Chopping and compacting the crop within a few days of cutting to exclude air</li> <li>Sealing the compacted material with soil and covering with a tarpaulin to exclude air and protect it from the sun and rain</li> <li>Leaving the silage to ferment</li> </ul> <p>Students should discuss the properties of a well-prepared silage including:</p> <ul style="list-style-type: none"> <li>Green colour</li> <li>Free from moulds and unpleasant odours</li> </ul> <p>Students should research the gestation periods of farm animals including cattle, sheep, goats, camels, horses and donkeys.</p> <p>Students should discuss different aspects of caring for pregnant farm animals and caring for the young after they are born</p> <p>Students should discuss how they might become aware that an animal is unwell. This could include:</p> <ul style="list-style-type: none"> <li>Loss of appetite</li> <li>Unusual behaviour</li> <li>Lack of strength or energy</li> </ul>

*Biology: Grade 8*

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> <li>• name some common diseases of farm animals</li> <li>• explain the causes, symptoms, transmission and prevention of some common diseases of farm animals</li> </ul>	<ul style="list-style-type: none"> <li>• Common diseases of farm animals (liver fluke, anthrax, trypanosomiasis) - causes, symptoms, transmission and prevention</li> </ul>	<p>Students should appreciate that, just as with people, farm animals are susceptible to disease. Students should be aware of the causes, symptoms, transmission and prevention of the following diseases or conditions.</p> <p>Arrange a field visit to a nearby animal farm of individual farmers or modern private or governmental husbandries. Let them observe how farm animals feed are prepared and stored and how the young and the pregnant are taken care of.</p> <p>Liver fluke:</p> <ul style="list-style-type: none"> <li>• Caused by a parasitic fluke <i>Fasciola hepatica</i> and affects cattle, but more serious in sheep</li> <li>• General weakness and debilitation</li> <li>• Transmitted by animals eating spores attached to grass. The parasite lodges in the body and eggs pass out in the animal dung. The eggs infect a snail, the secondary host, and more spores are laid</li> <li>• Remove infected animals and prevent animal dung coming into contact with water sources to break the cycle of re-infection.</li> </ul> <p>Anthrax:</p> <ul style="list-style-type: none"> <li>• Caused by a bacterium and affects all livestock</li> <li>• Symptoms include a high fever, swollen neck, lower abdomen and genitals, and in the latter stages, staggers</li> <li>• Transmitted through contaminated water but may also be licked up from the soil, particularly where the skin is broken due to injury</li> <li>• Isolating infected animals and vaccinating them. Burning the carcasses of dead animals and disinfecting all equipment and the area where the animal has been</li> </ul> <p>Trypanosomiasis:</p> <ul style="list-style-type: none"> <li>• Caused by a parasite called trypanosome which is carried by the tsetse fly</li> <li>• Symptoms fever followed by a coma which is often fatal</li> <li>• Transmitted by tsetse fly when the victim is bitten by a fly carrying the parasite</li> </ul> <p>Removing bushes and undergrowth along streams where the tsetse fly is found; spraying infected areas with insecticides; spraying with animas with insect repellents.</p>

### **Assessment**

The teacher should assess each student's work continuously over the whole unit and compare it with the following description, based on the competencies, to determine whether the student has achieved the minimum required level.

#### **Students at minimum requirement level**

A student working at the minimum requirement level will be able to: explain the importance of caring for farm animals, list down their products, and state the methods of preparing and storing food and sheltering for farm animals; compare the ruminant stomach with the human stomach and explain why farm animals regurgitate; list the pregnancy periods of some farm animals and describe the special care given to their young; explain the

causes, symptoms, transmission and prevention of some common diseases of farm animals.

#### **Students above minimum requirement level**

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

#### **Students below minimum requirement level**

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

**Unit 6: Environment (18 periods)**

**Unit Outcomes:** Students will be able to:

- define ecosystem, give examples of ecosystems, distinguish between them, and explain the adaptations of plants and animals to each ecosystem
- list some types of biological association, explain them and give examples of organisms for each type
- describe soil as a physical factor of the ecosystem, explain how it is formed, and explain its different types,
- describe the causes and methods of prevention of soil erosion
- Investigate the water humus and air contents of soil and particle size and water retention through simple experiments
- describe water as a physical factor of the ecosystem
- state the importance of water, explain the water cycle and describe the methods of conservation of water.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• define ecosystem as</li> <li>• distinguish between forest, grassland, desert, and aquatic ecosystems</li> <li>• explain the adaptations of plants and animals to each ecosystem</li> </ul> <ul style="list-style-type: none"> <li>• list some types of biological association</li> <li>• explain the types of biological association listed</li> <li>• give examples of organisms for each type of biological association</li> </ul>	<p><b>6. Environment</b></p> <p><b>6.1 Ecosystem (3 periods)</b></p> <ul style="list-style-type: none"> <li>• What is ecosystem</li> <li>• Examples of ecosystems and their climate, animals, plants, and their adaptations (forest, grassland, desert, aquatic)</li> </ul> <p><b>6.2 Biological associations (3 periods)</b></p> <ul style="list-style-type: none"> <li>• Parasitism, predation, mutualism, commensalisms</li> </ul>	<p>Students should be aware that an ecosystem is composed of all of the living and the non-living things in a habitat. There are two main types of ecosystem; the aquatic (water) ecosystem and the terrestrial (land) ecosystem.</p> <p>Students should discuss the characteristics of some different ecosystems including:</p> <ul style="list-style-type: none"> <li>• Forest; Grassland; Desert; Freshwater aquatic</li> </ul> <p>For each ecosystem students should consider such factors as:</p> <ul style="list-style-type: none"> <li>• The overall climate</li> <li>• The availability of food and water</li> <li>• The type of animals and plants that live in them</li> </ul> <p>Students should take examples of animals and plants from each ecosystem and discuss how each animal and each plant is adapted to survive within the habitat. For example in a desert ecosystem students may discuss the adaptation of the camel and of the cactus.</p> <p>Students could research the conditions in other ecosystems.</p> <p>Students could be given information on unknown animals and plants and asked to suggest what conditions the animal or plant is adapted to.</p> <p>Students should appreciate that some organisms form close relationships with other organisms. In some relationships one organism provides food and/or a habitat for another. This type of relationship is called symbiosis.</p> <p>Students should discuss some symbiotic relationships including:</p> <p>Mutualism: A symbiotic relationship between organisms of different species in which both organisms benefit. Examples include:</p> <ul style="list-style-type: none"> <li>• Micro-organisms which live in the alimentary canal of herbivorous mammals and break down cellulose.</li> <li>• Nitrogen-fixing bacteria which live in roots nodules of leguminous plants</li> <li>• Lichens which are an association between an alga and a fungus</li> </ul>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>• describe soil as a physical factor of the ecosystem</li> <li>• explain how soil is formed</li> <li>• explain the different types of soil</li> <li>• describe the causes of soil erosion</li> <li>• describe the methods of prevention of soil erosion</li> <li>• Investigate different characteristics of soil using simple experiments</li> </ul>	<p><b>6.3 physical factors of the ecosystem (12 periods)</b></p> <ul style="list-style-type: none"> <li>• Soil (formation, types, erosion, conservation)</li> </ul>	<p>Commensalism: A symbiotic relationship between organisms of different species in which one organism benefits but the other neither benefits nor is harmed. Examples include:</p> <ul style="list-style-type: none"> <li>• The remora fish which attaches itself to the underside of a shark and travels with it</li> </ul> <p>Parasitism: A symbiotic relationship between organisms of different species in which one organism benefits while the other is harmed. Examples include:</p> <ul style="list-style-type: none"> <li>• Ticks that attach themselves to animals and feed on their blood</li> <li>• Parasitic worms like tapeworm which live inside animals</li> </ul> <p>Students should discuss each of the examples, determining which organisms benefit from the relationship and which organs suffer as a result of it. As a result of their discussions, students should appreciate the differences between these forms of symbiosis.</p> <p>Students should appreciate that predation is the process by which one animal, the predator, kills and feeds on another animal, the prey.</p> <p>Students should name examples of animals in a predator-prey relationship.</p> <p>Students could discuss aspects of this relationship. These could include:</p> <ul style="list-style-type: none"> <li>• The predator relies on the prey for food</li> <li>• The predator tends to kill and eat the weakest animals so the population of prey is kept strong</li> <li>• A decrease in the size of the prey population will result in a decrease in the predator population</li> <li>• A decrease in the size of the predator population will result in an increase in the prey population</li> </ul> <p>Students should appreciate that soil is a growing medium in which plants grow. The soil provides a plant with stability as well as water and minerals essential for growth.</p> <p>Students should understand that soil consists of a matrix of tiny particles of rock which result from the erosion and weathering of rocks. Within this matrix there is air and water, and over time organic materials and mineral salts accumulate. These together provide a habitat for plants and small animals.</p> <p>Students should be aware of the three main types of soil: sandy, loam and clay, and their characteristics. They should discuss the advantages and disadvantages of each type.</p> <p>Students could investigate the components of soil by placing soil in a jar with water, shaking the mixture and leaving it to settle. They will see a gradation of particles starting with the largest at the bottom the finest at the top. Humus will float on the water.</p> <p>Students can investigate different characteristics of soil:</p> <ul style="list-style-type: none"> <li>• Water content – by drying a known mass in an oven at 100 °C</li> <li>• Humus content – by heating a known mass of dry soil on a tin lid with a Bunsen burner</li> <li>• Air content – by mixing 50 cm<sup>3</sup> of soil with 50 cm<sup>3</sup> of water and measuring the total volume</li> </ul>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>• describe water as a physical factor of the ecosystem</li> <li>• state the importance of water</li>   <li>• explain the water cycle with the help of a diagram</li> </ul>	<ul style="list-style-type: none"> <li>• Water (importance, water cycle, conservation)</li> </ul>	<ul style="list-style-type: none"> <li>• Particle size distribution – by passing a known volume of dry powdered soil through a series of sieves</li> <li>• Water retention – by timing how long it takes water to pass down a column of soil</li> </ul> <p>These experiments could be carried out on a single type of soil or on different soils and the results for each soil compared.</p> <p>The work on soil depletion can be linked into previous work on water retention and the importance of plants.</p> <p>Students should be able to explain how rain washes top soil away and how this can be avoided by contour ploughing and terracing.</p> <p>Students should also be able to describe how plant roots bind soil together and how the loss of ground cover, due to overgrazing, can result in soil erosion.</p> <p>Extend this work by discussing the problems of erosion by wind.</p> <p>Soil depletion can be linked into human activity. For example, the removal of trees for timber exposes plants that normally flourish in the shade, to the full strength of the sun. These plants eventually die and the soil is then exposed to erosion.</p> <p>Students could carry out research to find the extent of this problem in Ethiopia and in other countries.</p> <p>Students should appreciate from work earlier in this unit that water is an important abiotic (physical) factor in any ecosystem.</p> <p>Students should discuss why water is so important. This could include:</p> <ul style="list-style-type: none"> <li>• For drinking</li> <li>• To grow crops needed for food</li> <li>• To provide a variety of aquatic habitats for plants and animals</li> </ul> <p>Students could be able to draw and label the water cycle to identify the different processes and stages of recycling water. Students should be aware that:</p> <ul style="list-style-type: none"> <li>• In warm climates water evaporates from the surface of the oceans</li> <li>• The Sun provides the energy needed to convert liquid water to water vapour</li> <li>• Water vapour forms clouds</li> <li>• Clouds pass to colder parts of the world</li> <li>• At some point water vapour condenses and falls to the ground as rain, or sometimes as hail or snow</li> <li>• Water that lands on high ground has potential energy</li> <li>• This potential energy can be converted into electrical energy by a hydroelectric power plant</li> </ul> <p>Students should be aware that in some parts of the world it rains a lot and may result in flooding while in other parts of the world it rains very little and water is a scarce commodity.</p> <p>Students could identify parts of the world which frequently experience drought.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> <li>describe the methods of conservation of water</li> </ul>		<p>Students could obtain data on the average rainfall in different parts of Ethiopia and review the data. They could use the data to draw contour maps showing the rainfall in different areas.</p> <p>Students could build a rain gauge from an empty 2 litre water bottle and use it to measure the rainfall in their locality over a period of time.</p> <p>Students should appreciate how important it is, in areas where rainfall is scarce, to conserve water and not waste it unnecessarily. Students could discuss different methods of water conservation. These could include:</p> <ul style="list-style-type: none"> <li>During the rainy season collecting as much of the rain as possible in reservoirs and store ponds.</li> <li>Eliminating leakage from the pipes used to transport water from storage to the user.</li> <li>As individual, reducing ways in which water is wasted in the home such as leaking taps due to damaged washers, washing under running water rather than in a bowl of water, leaving taps on unnecessarily.</li> <li>In times of shortage eliminating unnecessary uses such as car washing and garden watering</li> </ul> <p>Students could draw up a plan of how they could reduce the use of water in their own homes should there suddenly be a period of drought.</p>

**Assessment**

The teacher should assess each student’s work continuously over the whole unit and compare it with the following description, based on the competencies, to determine whether the student has achieved the minimum required level.

**Students at minimum requirement level**

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and methods of prevention of soil erosion; describe water as a physical factor of the ecosystem; state the importance of water, explain the water cycle and describe the methods of conservation of water.

**Students above minimum requirement level**

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

**Students below minimum requirement level**

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.