

**Federal Democratic Republic of Ethiopia
Ministry of Education**

Biology Syllabus, Grades 11 and 12

2009

Table of Contents

Introduction	iii
Allotment of Periods	ix
Biology Grade 11	
General Objectives of Grade 11 Biology	2
Unit 1: The Science of Biology	3
Unit 2: Biochemical Molecules	6
Unit 3: Enzymes	8
Unit 4: Cell Biology	10
Unit 5: Energy Transformation	13
Biology Grade 12	
General Objectives of Grade 12 Biology	17
Unit 1: Micro-organisms	18
Unit 2: Ecology	22
Unit 3: Genetics	26
Unit 4: Evolution	30
Unit 5: Behaviour	33

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. Biology has special relevance to students as individuals, to the society and to the growth and development of Ethiopia at large. It is true that many of the contemporary issues and problems in the society are essentially biological in nature. Nutrition, health, drug abuse, agriculture, pollution, rapid population growth, environmental depletion and conservation are some examples. If these problems are to be dealt with realistically, an understanding of biological knowledge is required. The recent advances in biotechnology and genetic engineering that have significant influences on people's life also indicate the role of biology as everybody's science everyday.

The Biology syllabus for grades 11 and 12 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
Knowledge	<u>1. Constructing biological knowledge</u> The learner will know and be able to interpret and apply biological, technological and environmental knowledge.
Skills	<u>2. Biological investigation</u> 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.
Values & attitudes	<u>3. Biology, Society and Environment</u> 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 Based Education. This education strategy supports teaching and learning in different environments.

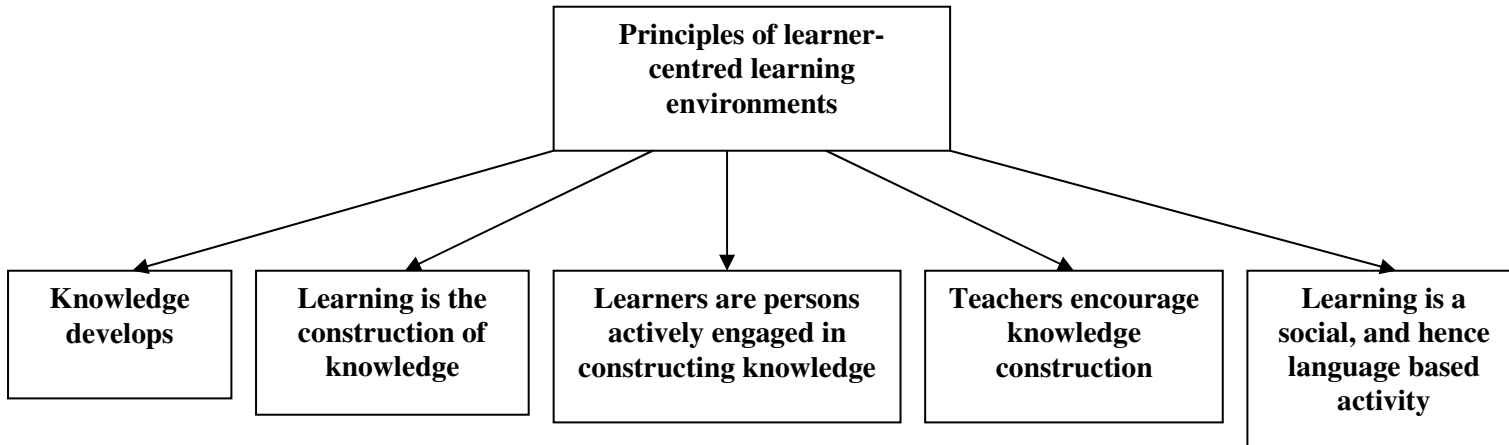
Constructivism emphasizes on two important dimensions:

- 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-centred process. The learner-centred 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-centred learning are summarized in the following diagram.



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 new curriculum framework for Ethiopian schools 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 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.

The curriculum framework has allotted four periods per week for grades 11 and 12 biology. Even though the academic calendar is made up of 40 weeks, the syllabus is prepared for 34 weeks (136 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.

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 flow chart 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 pre-planned, 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 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.

This document of grades 11 and 12 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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 - Terefe Leta (Oromia)
 - Teshome Habte (SNNPR)
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**Allotment of Periods
For Units and Sub-units of Biology
Grades 11 and 12**

<i>Grade</i>	<i>Unit</i>	<i>Sub-unit</i>	<i>Number of Periods</i>	
			<i>Sub-unit</i>	<i>Total</i>
11	Unit 1: The Science of Biology	1.1 Methods of science	10	29
		1.2 Basic tools of a biologist	7	
		1.3 Relevance and promises of biology	5	
		1.4 Biology and HIV/AIDS	7	
	Unit 2: Biochemical Molecules	2.1 Inorganic molecules 2.2 Organic molecules	8 16	24
Unit 3: Enzymes	3.1 Nature of enzymes	7	27	
	3.2 Functions of enzymes	9		
	3.3 Factors affecting the functions of enzymes	11		
Unit 4: Cell Biology	4.1 Cell theory	8	29	
	4.2 Types of cells	4		
	4.3 Parts of the cell and their functions	17		
Unit 5: Energy Transformation	5.1 Cellular respiration	14	27	
	5.2 Photosynthesis	13		
12	Unit 1: Micro-organisms	1.1 Bacteria	5	30
		1.2 Ecology and uses of bacteria	10	
		1.3 Viruses	15	
	Unit 2: Ecology	2.1 Cycling of matter through ecosystems	8	30
		2.2 Ecological succession	3	
		2.3 Biomes	5	
		2.4 Biodiversity	7	
		2.5 Population structure and dynamics	7	
	Unit 3: Genetics	3.1 Crossing principles	10	26
3.2 Molecular genetics		6		

Biology: Grades 11 and 12

<i>Grade</i>	<i>Unit</i>	<i>Sub-unit</i>	<i>Number of Periods</i>	
			<i>Sub-unit</i>	<i>Total</i>
		3.3 Protein synthesis	5	
		3.4 Mutations	5	
	Unit 4: Evolution	4.1 The origin of life	5	25
		4.2 Theories of evolution	5	
		4.3 Evidences of evolution	5	
		4.4 The process of evolution	5	
		4.5 The evolution of humans	5	
	Unit 5: Behaviour	5.1 Introduction	3	25
		5.2 Innate behaviour	5	
		5.3 Learned behaviour	10	
		5.4 Patterns of behaviour	7	