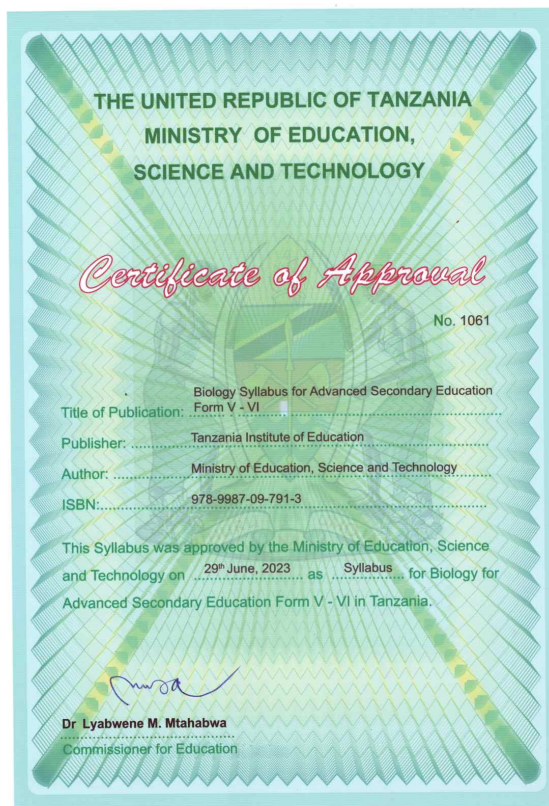


**THE UNITED REPUBLIC OF TANZANIA  
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY**



**BIOLOGY SYLLABUS FOR ADVANCED SECONDARY EDUCATION  
FORM V-VI  
2023**

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## Abbreviations and Acronyms

ATP	Adenosine Triphosphate
DNA	Deoxyribose Nucleic Acids
ICT	Information and Communication Technology
TIE	Tanzania Institute of Education



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Finally, TIE thanks the Ministry of Education, Science and Technology in a special way for facilitating the preparation and distribution of this syllabus.



Dr Aneth A. Komba

Director General

**Tanzania Institute of Education**

## 1.0 Introduction

Biology for Advanced Secondary Education is a compulsory subject for students who choose to join the Natural Science stream taking Biology among the subjects in their combination. The purpose of studying Biology is to enable students to expand understanding on life of living organisms, promoting environmental awareness and developing scientific literacy. It also allows students to acquire a suitable knowledge that will enable them to solve health and agriculture related issues. The subject serves as a bridge to enable students appreciate the values of resources present in Tanzania and develop ability to create works for self-employment.

The Biology syllabus is designed to guide the teaching and learning of Biology at Advanced Secondary Education, Form V-VI in the United Republic of Tanzania. The syllabus interprets the competences indicated in the 2023 Advanced Secondary Education Curriculum. It provides information that will enable teachers to plan their teaching and learning processes effectively. It also provides teaching and learning opportunities that help teachers to apply different methods and strategies to promote students' biological skills and develop 21<sup>st</sup> century skills, which include critical thinking, creativity, collaboration, communication and problem solving.

## 2.0 Main Objectives of Education in Tanzania

The main objectives of education in Tanzania are to enable every Tanzanian to:

- (a) Develop and improve his or her personality so that he or she values himself or herself and develops self-confidence;
- (b) Respect the culture, traditions and customs of Tanzania; cultural differences; dignity; human rights; attitudes and inclusive actions;
- (c) Advance knowledge and apply science and technology, creativity, critical thinking, innovation, cooperation, communication and positive attitudes for his or her own development and the sustainable development of the nation and the world at large;
- (d) Understand and protect national values, including dignity, patriotism, integrity, unity, transparency, honesty, accountability and the national language;
- (e) Develop life and work-related skills to increase efficiency in everyday life;

- (f) Develop a habit of loving and valuing work to increase productivity and efficiency in production and service provision;
- (g) Identify and consider cross-cutting issues, including the health and well-being of the society, gender equality, as well as the management and sustainable conservation of the environment; and
- (h) Develop national and international cooperation, peace and justice per the Constitution of the United Republic of Tanzania and international conventions.

### **3.0 Objectives of Advanced Secondary Education**

The objectives of Advanced Secondary Education are to:

- (a) Strengthen, expand and develop a deeper understanding of the knowledge, skills and attitudes developed at the Ordinary Secondary Education;
- (b) Protect the traditions and customs, national unity, national values and democracy, respect of human right and civil rights duties, and the responsibilities related to such rights;
- (c) Develop self-confidence and the ability to learn in various fields, including science and technology, and to gain theoretical and technical knowledge;
- (d) Strengthen the use of language in academic communication;
- (e) Strengthen accountability in cross-cutting social issues, including health, security, gender equality and sustainable environmental conservation;
- (f) Build competence and various skills which will enable the student to employ himself or herself, to be employed and to live comfortably by exploiting well his or her environment; and
- (g) Prepare the student for post-secondary education.



#### 4.0 General Competences for Advanced Secondary Education

The general competences for Advanced Secondary Education are to:

- (a) Apply the knowledge and skills acquired in Ordinary Secondary Education to Strengthen and broaden their academic understanding;
- (b) Demonstrate an appreciation of citizenship, national virtues, human rights and civil rights;
- (c) Demonstrate confidence in learning various fields, including Science and Technology, theoretical knowledge and vocational education;
- (d) Use language skills in academic communication;
- (e) Apply knowledge of cross-cutting issues to master the surrounding environment;
- (f) Use knowledge and skills to enable a student to employ oneself, be employed as well as manage life and his/her environment; and
- (g) Demonstrate readiness to proceed to the next level of education.

#### 5.0 Main and Specific Competences

The main and specific competences to be developed are presented in Table 1.

**Table 1:** *Main and Specific Competences for Form V-VI*

Main competences	Specific competences
1.0 Demonstrate mastery of advanced concepts, theories and principles in Biology	1.1 Demonstrate an advanced understanding of concepts, theories and principles in Biology

Main competences	Specific competences
2.0 Demonstrate mastery of biological terminologies	2.1 Demonstrate an understanding of the principles of biological nomenclature and classification
3.0 Conduct biological investigations	3.1 Demonstrate mastery of advanced skills for conducting biological investigations 3.2 Perform investigations on the anatomy and physiology of living organisms
4.0 Conduct a project in Biology	4.1 Conduct a project in Biology

## 6.0 Roles of Teachers, Students and Parents in Teaching and Learning of Biology

A good relationship between a teacher, student and parent/guardian is fundamental in ensuring successful learning. This section outlines the roles of each participant in facilitating effective teaching and learning Biology.

### 6.1 The teacher

The teacher is expected to:

- (a) Help the student to learn and acquire the intended competences in Biology;
- (b) Use teaching and learning approaches that will allow students with different needs and abilities to:
  - (i) Develop the competences needed in the 21st century;
  - (ii) Actively participate in the teaching and learning process.
- (c) Use student centred instructional strategies that make the student a centre of learning which allow them to think, reflect and search for information from various sources;

- (d) Create a friendly teaching and learning environment;
- (e) Prepare and improvise teaching and learning resources;
- (f) Conduct formative assessment regularly by using tools and methods which assess theory and practice;
- (g) Treat all the students equally irrespective of their differences;
- (h) Protect the student while at school;
- (i) Keep track of the student's daily progress;
- (j) Identify individual student's needs and provide the right intervention;
- (k) Involve parents/guardians and the society at large in the student's learning process; and
- (l) Integrate cross-cutting issues and ICT in the teaching and learning process.

## **6.2 The student**

The student is expected to:

- (a) Develop the intended competences by participating actively in various learning activities inside and outside the classroom; and
- (b) Participate in the search for knowledge from various sources, including textbooks, reference books and other publications in online libraries.

## **6.3 The parent**

The parent/guardian is expected to:

- (a) Monitor the child's academic progress;

- (b) Where possible, provide the child with the needed academic support;
- (c) Provide the child with a safe and friendly home environment which is conducive for learning;
- (d) Keep track of the child's progress in behaviour;
- (e) Provide the child with any necessary materials required in the learning process; and
- (f) Instil in the child a sense of commitment and positive value towards education and works.

## **7.0 Teaching and Learning Methods**

The teaching and learning methods are instrumental in developing student's competences. This syllabus suggests teaching and learning methods for each activity which includes but not limited to discussions, presentations, field visits, practical work, research, scientific experiments, and project works. However, a teacher is advised to plan and use other appropriate methods based on the environment or context. All the teaching and learning methods should be integrated with the everyday lives of students.

## **8.0 Teaching and Learning Resources**

The process of teaching and learning required different resources. In that regard, both the teacher and student should work together to collect or improvise alternative resources available in the school and home environment when needed. The teacher and student are expected to constantly seek for information from various sources to effectively facilitate teaching and learning process. The list of approved textbooks and reference books shall be provided by TIE.

## **9.0 Assessment**

Assessment is important in teaching and learning of Biology subject. It is divided into formative and summative assessments. Formative assessment informs both the teacher and students on the progress of teaching and learning, and in making decisions on improving the teaching and learning process. Teachers are, therefore, expected to apply a wide range of formative assessment methods which include but not limited to discussions, presentations, oral questions, brainstorming, experiments, observations, practical and projects.

Summative assessment, on the other hand, will focus on determining student's achievement of learning. Teachers are expected to use a variety of summative assessments including mid-term tests, terminal, mock examinations and projects. The scores obtained from these assessments will be used as Continuous Assessment (CA). Therefore, the continuous assessments shall contribute 30% and the National Form VI Examination shall be 70% of the student's final achievement, as indicated in Table 2.

**Table 2:** *Contribution of Continuous Assessment and Final Examination in the final score*

Type of Assessment	Form V	Form VI
First Term Examination	5%	6%
Second Term Examination	5%	-
Project	-	7%
Mock Examination	-	7%
National Examination	-	70%
<b>Total</b>	<b>100%</b>	

## 10.0 Number of Periods

The Biology Syllabus for Advanced Secondary Education provides estimates of the time that will be spent in learning and teaching, in consideration of the complexity of the specific competences and the learning activities. Ten periods of 40 minutes each have been allocated for this subject per week.

## 11.0 Teaching and Learning Contents

The contents of this syllabus are presented in matrix form with seven columns which include main competence, specific competence, learning activities, suggested methods, assessment criteria, suggested resources and number of periods as presented in the Table 3 and Table 4.

## Form V

**Table 3: Detailed Contents for Form V**

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Demonstrate mastery of advanced concepts, theories and principles in Biology	1.1 Demonstrate an advanced understanding of concepts, theories and principles in Biology	(a) Describe the concept of the cell ( <i>cell theory, organelles and biological molecules</i> )	<p><b>Brainstorming:</b> Guide students to brainstorm on the concept of the cell theory</p> <p><b>Group discussions:</b> Guide the students to discuss structures of typical cells and biological molecules of cell</p> <p><b>ICT-based learning:</b> Guide students to explore structure and functions of cells through animations</p>	The concept of the cell is correctly described	Stains, scalpel/ razor blade/ knife, stirrer, beakers, heat source, droppers, thermometer, measuring cylinder, microscope and its accessories, and water bath	185

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<b>Laboratory Practical:</b> Guide students to use prepared microscope slides to explore typical cells and their structures  <b>Laboratory Practical:</b> organise and guide students to conduct biochemical tests on the organic components of the cell			
		(b) Explain the physiology of photosynthesis ( <i>mechanism of light reaction and dark reaction in <math>C_3</math> and <math>C_4</math> plants</i> )	<b>Group discussion:</b> Organise and guide students in manageable groups to discuss the physiology of photosynthesis  <b>ICT-based learning:</b> Guide students to explore mechanisms	Physiology of photosynthesis is clearly explained	Potted plants, charts, diagrams and illustrations showing physiology of photosynthesis	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<p>of light reaction in C<sub>3</sub> and C<sub>4</sub> plants through animations</p> <p><b>Laboratory Practical:</b> Organise and guide students to conduct experiments that demonstrate the effects of light intensity and CO<sub>2</sub> concentration on the rate of photosynthesis</p>			
		(c) Describe the structure of epithelial tissues in relation to its digestive role	<p><b>Brainstorming:</b> Guide students to brainstorm on the concept of epithelia tissue in relation to its digestive role</p> <p><b>Exploration:</b> Guide students to explore structures of epithelia</p>	Structure of epithelia tissue in relation to its digestive role are clearly described	Microscope, microscope, microscope slides, diagrams and charts showing structure of	



Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			tissue in relation to its digestive role using digital simulations <b>Guest Speaker:</b> Invite a medical professional or a nutritionist to explain disorders of digestive system		epithelia tissue in relation to its digestive role	
		(d) Describe the physiology of gaseous exchange and respiration in mammals ( <i>transportation of gases, aerobic and anaerobic respiration mechanisms</i> )	<b>Group discussion:</b> Guide students to discuss physiology of gaseous exchange and respiration in mammals <b>ICT-based learning:</b> Guide students to explore mechanisms of gaseous exchange and respiration in mammals using animations or video	Physiology of gaseous exchange and respiration in mammals is correctly described	Charts, pictures, diagrams, models and videos showing physiology of gaseous exchange and respiration in mammals	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<b>Group Project:</b> Organise and guide students to conduct a simple research on the effects of smoking and air pollution on the respiratory system, and present their findings			
		(e) Explain the concept of gaseous exchange in plants ( <i>mechanism and theories of stomata opening and closing</i> )	<b>Brainstorming:</b> Guide students to brainstorm the concept of gaseous exchange in plants through think-ink-share to brainstorm <b>Group discussion:</b> In manageable groups, guide students to discuss the mechanism and theories governing opening and closing of stomata	Concept of gaseous exchange in plants is clearly explained	<i>Commelina</i> sp, hand lens, microscope, microscope slides, slide cover, knife/ razor blade, charts, diagrams and videos on plant adaptations	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<p><b>ICT-based learning:</b> Guide students to explore the mechanism of gaseous exchange in plants using animations or video</p> <p><b>Laboratory practical:</b> Guide students to observe and measure different factors affecting opening and closing of stomata</p> <p><b>Case Study:</b> Guide students to analyse the adaptation plants in a drought-stricken area that allow the plant to conserve water while still allowing gaseous exchange</p>			

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(f) Describe the physiology of coordination ( <i>mechanism of transmission of nerve impulse, seeing, hearing and body balance</i> )	<p><b>Brainstorming:</b> Guide students through think-ink-share to brainstorm the concept of coordination</p> <p><b>Group discussion:</b> In manageable groups, guide students to discuss physiology of coordination</p> <p><b>ICT-based learning:</b> Guide students to explore the mechanism of nerve impulse transmission, seeing, hearing and body balance using animations or video</p>	Physiology of coordination is clearly described	Charts, pictures, diagrams and models showing physiology of coordination	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(g) Describe the application or role of synthetic phytohormones	<b>Field trip:</b> Organise and guide students to visit nearby facilities where application of synthetic phytohormones is done such as botanical gardens and health facilities	Application or role of synthetic phytohormones are clearly described		
		(h) Explain the concept of regulation in mammals ( <i>feedback mechanisms, urine formation and osmoregulation</i> )	<b>Brainstorming:</b> Guide students through think-ink-share to brainstorm on the concept of regulation in mammals <b>Exploration:</b> Guide students to explore mechanism of urine formation, osmoregulation and feedback mechanism using digital simulations	Concept of regulation in mammals is correctly explained	Models, diagrams and charts showing the mechanisms of regulation in mammals	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<p><b>Group discussion:</b> Guide students in manageable groups to discuss the mechanisms of urine formation, osmoregulation and feedback mechanism</p> <p><b>Laboratory practicals:</b> Guide students to investigate the effect of different factors on urine formation and osmoregulation</p> <p><b>Guest speaker:</b> Invite a health practitioner; to guide students in analysing different cases of patients with kidney disorders and develop a treatment plan</p>			

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
2.0 Demonstrate mastery of taxonomic terminologies	2.1 Demonstrate an understanding of the principles of binomial nomenclature and classification	(a) Explain classification systems and taxonomic rank	<b>Brainstorming:</b> Guide students to brainstorm the concept of classification systems and taxonomic rank  <b>Group discussion:</b> Guide the students to discuss types of classification system	The concept of classification systems and taxonomic rank are clearly explained	Specimens of living organisms (preserved or fresh), simple constructed keys and prepared identification keys of plants and animals, pictures, photographs showing principles of binomial nomenclature	60

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b)Describe principles of binomial nomenclature ( <i>rules of scientific naming, taxonomic and taxonomic hierarchy</i> )	<p><b>Brainstorming:</b> Guide students to brainstorm on the concept of scientific names of living</p> <p><b>Group discussion:</b> Guide the students to discuss principles that govern the writing of scientific names of living organisms</p> <p><b>Project activity:</b> Organise and guide students to observe various organisms around the school compound and construct the bracketed taxonomic keys</p>	Principles of binomial nomenclature are clearly describe		



Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(c) Apply knowledge on binomial nomenclature in different fields ( <i>forestry, medicine and agriculture</i> )	<p><b>Field trip:</b> Organise and guide students to visit nearby places or facilities such as botanical gardens, and national parks and assign scientific names to organisms</p> <p><b>Project activity:</b> Organise and guide students to assign scientific names to trees present around the school compound</p>	Binomial nomenclature in Biology and related field is clearly used	Specimens of living organisms (preserved or fresh), constructed keys, prepared identification keys of plants and animals, charts, photographs, pictures and diagrams showing uses of binomial nomenclature	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(d) Describe the distinctive characteristics of kingdoms, phyla/ divisions and class ( <i>Monera</i> , <i>Protoctista</i> , <i>Fungi</i> , <i>Plantae</i> , and <i>Animalia</i> )	<p><b>Jigsaw:</b> Guide students through jigsaw to explore features of each comparative group of classification</p> <p><b>Laboratory practicals:</b> Guide students to carry out dissection of the selected animal to explore different systems</p> <p><b>Snow-balling:</b> summarise the economic importance of living organisms through snow-balling</p> <p><b>Project activity:</b> Guide students to perform activities such as growing different products, such as mushrooms, fruit trees</p>	Distinctive characteristics of kingdoms, phyla/ divisions and class are correctly described	Varieties of living organisms (preserved or fresh) examples: yeast, bread mould, mushroom, Tilapia fish, crabs, moss plant, fern plant, conifers, mouse/rat, frog/toad, flowering plants, hand lens, dissecting kit, dissecting dish, pins,	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			and vegetables, and grafting of different plants by the use of biological knowledge <b>Exploration:</b> Guide students to explore features of the dissected mammals using digital simulations.		chloroform, diagrams, charts videos and models showing dissected animals	
3.0 Conduct biological investigations	3.1 Demonstrate mastery of advanced skills for conducting biological investigations	(a) Apply skills used in biological investigation ( <i>observation, measurement, data collection, and report writing skills</i> )	<b>Group discussion:</b> Guide the students in manageable groups to discuss the basic procedure of conducting biological investigation	Skills used in biological investigation are correctly described	Illustrations, diagrams, charts, and photographs showing skills used in biological investigations	30

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Plan and execute in an independent biological investigation	<b>Inquiry-based learning:</b> Guide students to plan/ design experiments and analyze data to develop their investigative skills <b>Project work:</b> Organise and guide students to conduct biological investigations and present their findings	A biological investigations are clearly planned and carried out	Specimens of organisms, microscope, microscope slides, laboratory reagents and chemicals and laboratory apparatus	
	3.2 Perform investigations on the anatomy and physiology of living organisms	(a) Design and carry out anatomical and physiological investigations related to digestive and excretory systems, photosynthesis,	<b>Exploration:</b> Guide the students through animations or videos to explore steps for carrying out anatomical and physiological investigations related to digestive and excretory systems, photosynthesis, and gaseous exchange in living organisms	Anatomical and physiological investigations are correctly designed and carried out	Varieties of organisms, microscope, microscope slides, laboratory reagents and chemicals, laboratory apparatus and simulations	45

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		and gas exchange in living organisms	<b>Laboratory practicals:</b> Organise and guide students to carry out anatomical and physiological investigations related to digestive and excretory systems, photosynthesis, and gaseous exchange in living organisms			
4.0 Conduct a project in Biology	4.1 Conduct a project in Biology	(a) Design and carry out a project in Biology	<b>Project:</b> Guide students to design a project from any Biology themes <b>Field trip:</b> Task students to investigate the selected Biology theme and carry out the project	The project is well designed and carried out	Factories for production of different products, project guidelines, sample of project reports, laboratory facilities, and materials	30

## Form VI

**Table 4:** Detailed Contents for Form VI

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Demonstrate mastery of advanced concepts, theories and principles in Biology	1.1 Demonstrate an advanced understanding of concepts, theories and principles in Biology	(a) Explain the physiology and theories underlying transportation of materials in plants	<p><b>Group discussion:</b> In manageable groups, guide students to discuss physiology and theories underlying transportation of materials in plants</p> <p><b>ICT-based learning:</b> Guide students to explore physiology and theories underlying transportation of materials in plants using animations or video</p>	Physiology and theories underlying transportation of materials in plants are clearly explained	Microscopes slides, microscope, charts, diagrams showing vascular tissues, transparent plastic tube, seedlings, simulations, leaf such as <i>Commelina</i> sp., slide cover, charts showing opening and closing of stomata	240

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b)Describe the mechanism of blood circulation in vertebrates ( <i>single, double and maternal-foetal circulation</i> )	<b>Group discussion:</b> In manageable groups, guide students to discuss the mechanism of blood circulation in vertebrates <b>ICT-based learning:</b> Guide students to explore the mechanism of blood circulation in vertebrates using animations or video	Mechanisms of blood circulation in vertebrates are correctly described	Charts, picture, diagram of cardiac muscle, microscope slides, microscope, simulations and models showing circulatory systems	
		(c)Explain growth process in plants ( <i>cell cycle, growth patterns, seed dormancy and viability, and primary and secondary growth</i> )	<b>Brainstorming:</b> Guide students through think-ink-share to brainstorm on the concept of growth in plants <b>Group discussion:</b> In manageable groups, guide students to discuss the process of growth in plants	Growth process in plants is clearly explained	Charts, diagram, simulations, models, microscope slides, charts/ Diagrams showing various patterns of growth in plants, microscope,	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<p><b>ICT-based learning:</b> Guide students to use animations/video to explore the process of growth in plants</p> <p><b>Laboratory practical:</b> Organise and guide students to carry out biological investigations to analyse factors affecting growth of plants</p> <p><b>Field trip:</b> Organise and guide students to visit a nearby place where large scale cultivation is done to observe different stages of plant growth</p>		specimens of meristematic tissues, real plants, charts showing meristematic tissues and variety of seeds	



Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(d) Explain growth process in animals ( <i>growth patterns and metamorphosis</i> )	<p><b>Brainstorming:</b> Guide students through think-ink-share to brainstorm on the concept of growth in animals</p> <p><b>Group discussion:</b> In manageable groups, guide students to discuss the process of growth in animals</p> <p><b>ICT-based learning:</b> Guide students to explore the process of growth in plants using digital simulations</p> <p><b>Laboratory practicals:</b> Organise and guide students to carry out biological investigations to analyse factors</p>	Growth process in animals is clearly explained	Microscope, microscope slide, charts, diagrams, models and simulations, showing various patterns of growth in animals	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			affecting growth of animals <b>Field trip:</b> Organise and guide students to visit a nearby place where large scale animal keeping is done to observe different stages of animals growth			
		(e)Describe the mechanism of reproduction in plants ( <i>gametogenesis, fertilisation, and life cycles of selected plants</i> )	<b>Group discussion:</b> Guide students in a manageable group to discuss the mechanism of reproduction in plants <b>ICT-based learning:</b> Guide students to explore the mechanism of reproduction in plants using animations or video	Mechanisms of reproduction in plants is correctly described	Microscope slides, microscope, diagrams of endospermic and non-endospermic seeds and charts showing diagrams of life cycles of different plants	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<b>Project activity:</b> Organise and guide students to produce varieties of plants (fruits trees, vegetables, flowers)			
		(f) Describe the mechanism of reproduction in animals ( <i>gametogenesis, fertilisation and hormonal control of menstrual cycle, oestrus cycle and pregnancy</i> )	<b>Group discussion:</b> Guide students in a manageable group to discuss the mechanism of reproduction in animals  <b>ICT-based learning:</b> Guide students to use animations or video to explore the mechanism of reproduction in animals	Mechanism of reproduction in animals is correctly described	Microscope, microscope slides, preserved specimens of selected animals, Charts, and videos showing mechanisms of reproduction in animals	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<b>Project activity:</b> Organise and guide students to carry out projects of producing varieties of animals			
		(g)Describe principles of inheritance in living organisms ( <i>hereditary materials, DNA replication, protein synthesis and dihybrid inheritance</i> ).	<b>Brainstorming:</b> Guide students through think-in-share to brainstorm on the concept of inheritance in living organisms <b>Group discussion:</b> Guide students in a manageable group to discuss principles of inheritance in living organisms <b>ICT-based learning:</b> Guide students to explore the mechanism	Principles of inheritance in living organisms are clearly described	Charts, models, microscope, microscope slides, photographs, pictures, video and diagrams showing principle of inheritance in living organisms	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			of DNA replication, protein synthesis and dihybrid inheritance using animations or video <b>Project activity:</b> Organise and guide students to carry out a project of producing varieties of yield through the use of principle of inheritance			
		(h)Describe theories and mechanism underlying evolution <i>(theories of origin of life, organic evolution)</i>	<b>Brainstorming:</b> Guide students through think-ink-share to brainstorm on the concept of evolution <b>Exploration:</b> Guide students to use ICT to explore the theories	Theories and mechanism underlying evolution are clearly explained	Models, diagrams and chart showing mechanisms underlying evolution	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		<i>theory, evidence of evolution, and speciation)</i>	<p>of origin of life and organic evolution</p> <p><b>Group discussion:</b> Guide students to discuss theories of origin of life and organic evolution</p> <p><b>Field trip or ICT based learning:</b> Organise and guide student to visit nearby museums and observe remains of man or use digital simulation to observe remain fossil records</p>			

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(i) Explain the concept of ecology ( <i>methods of studying, biodiversity, ecological succession, and conservation methods</i> )	<p><b>Brainstorming:</b> Guide students through think-ink-share to brainstorm on the concept of ecology</p> <p><b>Exploration:</b> Guide students to explore mechanisms biodiversity, ecological succession and conservation using ICT</p> <p><b>Group discussion:</b> Guide students to explore methods of studying, biodiversity, ecological succession and conservation</p> <p><b>Field trip:</b> Organise and guide student to visit nearby national parks and zoo to</p>	Concept of ecology is correctly explained	Sampling equipment; tape measures, quadrants and notebooks, and pencil Charts or video showing mechanisms of biodiversity	

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			observe living organisms, biodiversity, ecological succession, threats and conservation methods			
2.0 Conduct biological investigations	2.1 Demonstrate mastery of advanced skills for conducting biological investigations	(a) Prepare and present a report based on the findings	<b>Laboratory activity:</b> Guide students to write biological report based on their anatomical and physiological investigations conducted using required procedures <b>Presentation:</b> Guide the students to present the biological investigation report	Biological investigations reports are clearly prepared following scientific procedure	Note book, pencil, and relevant text on scientific report writing procedure	20



Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	2.2 Perform investigations on the anatomy and physiology of living organisms	(a) Design and carry out anatomical and physiological investigations related to transportation in plants and animals, growth in plants and reproductive system	<p><b>Exploration:</b> Guide the students to explore steps for carrying out anatomical and physiological investigations related to transportation in plants and animals, growth in plants and reproductive system</p> <p><b>Laboratory practicals:</b> Organise and guide students to carry out anatomical and physiological investigations related to transportation in plants and animals, growth in plants and reproductive system</p>	Anatomical and physiological investigations related to transportation in plants and animals, growth in plants and reproductive system are correctly designed and carried out	Varieties of organisms, microscope, microscope slides, laboratory reagents and chemicals laboratory apparatti	40

Main Competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
2.0 Conduct a project in Biology	2.1 Conduct a project in Biology	(a) Complete and submit for assessment a scientific report of the project started in Form Five	<p><b>Practical:</b> Guide students to perform experiments of the selected Biology themes started in Form Five</p> <p><b>Project:</b> Guide students to analyse the experimental data by using ICT facilities and submit the synthesised product(s) and scientific report for assessment</p>	Scientific report of the project is clearly written and quality project product(s) are obtained	Samples, project guidelines, sample of project reports and biology based software	50

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