

**THE UNITED REPUBLIC OF TANZANIA**

**MINISTRY OF EDUCATION AND VOCATIONAL TRAINING**



**BIOLOGY ACADEMIC SYLLABUS FOR DIPLOMA IN SECONDARY  
EDUCATION**

**2009**

© Ministry of Education and Vocational Training, 2009

All rights reserved. No part of this publication may be reproduced, reported, stored in any retrieval system or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise without the permission of the copyright owner.

Designed and prepared by:

Tanzania Institute of Education

P.O. Box 35094

Dar es Salaam

Tanzania

Tel: +255 222 773006, 2774420

Fax: +255 222 774420

E-mail: [director.tie@tie.go.tz](mailto:director.tie@tie.go.tz)

## DECLARATION

Secondary Education Diploma course is a two year course which has been designed to prepare professional teachers who will teach at Ordinary Level secondary schools. A student teacher shall be recognized as a teacher when he/she successfully completes a secondary education diploma course for two years within which he/she successfully performed teaching practice.

This document is hereby declared as the **Biology Academic Syllabus of Curriculum and teaching for Secondary Education Diploma** course of 2009.

Approved by ..... *CHARLES PHILEMON* .....  
Signature..... *CW Philemon* .....  
Date:..... *14<sup>th</sup> September,* ..... 2009

/ Commissioner for Education  
Ministry of Education and Vocational Training  
P.O. Box 9121  
**Dar es Salaam**

Tel : +255 222 110150, 110179, 11046  
Fax : +255 222 113271  
Website : [www.moe.go.tz](http://www.moe.go.tz)

## TABLE OF CONTENTS

Introduction.....	i
Rationale for reviewing the course .....	i
Goals of the course.....	ii
Competences to be developed.....	ii
Course Objectives .....	ii
Description and Organization of the Course Syllabus.....	iii
Assessment of the Course .....	iv
1.0 BIOCHEMISTRY.....	1
1.1 Carbohydrates .....	1
1.2 Lipids .....	2
1.3 Proteins .....	2
1.4 Enzymes.....	3
2.0 CLASSIFICATION OF LIVING THINGS.....	5
2.1 Principles of Classification .....	5
2.2 Major Groups of Living Things.....	6
3.0 RESPIRATION.....	8
3.1 Aerobic and Anaerobic Respiration.....	8
3.2 Respiratory Pathways.....	9
4.0 BODY HEALTH AND IMMUNITY.....	11
4.1 Body Health .....	11
4.2 Body Immunity .....	13
5.0 GENETICS .....	16
5.1 Genetic Materials .....	16
5.2 Mendelian Principles of Inheritance .....	16
5.3 Genetic Disorders.....	17
5.4 Mutations .....	18
5.5 Application of Genetics .....	18
6.0 ECOLOGY .....	20
6.1 Energy Flow and Nutrient Cycle .....	20
6.2 Population Growth.....	20
6.3 Pollution and Its Impact on Living Things .....	21
Reading List.....	23

## **Introduction**

This revised Biology academic syllabus for Diploma in Secondary Education, has been prepared to introduce the academic component in the Biology diploma course which was lacking in the 2007 syllabus. The 2007 syllabus mainly emphasized the acquisition of appropriate teaching and learning strategies resources and assessment procedures for teaching the subject in secondary schools. The academic content in this syllabus has been selected on the basis of the learner's needs, society demands and the current global challenges. Because such factors change in the course of time the Biology tutor should strive to update his/her academic capacity through continuous search of knowledge.

The Biology tutor is urged to put more emphasis on the application of learner centred approaches and techniques and collaborate with other internal and external colleagues to improve the teaching and learning of Biology subject. This syllabus suggests a number of teaching and learning strategies, resources and assessment procedures for each topic. However, the tutor and student teachers are free to use any other teaching and learning strategies, resources and assessment procedures depending on the nature of the topics and existing teaching and learning situation.

## **Rationale for reviewing the course**

The Academic Biology syllabus for diploma in secondary education has been revised in order to address the current challenges and demands for the Tanzanian society. These challenges and demands include the following:

- a) The current revised secondary education curriculum which is competence based
- b) The new innovations in teaching including constructivism approaches
- c) Contemporary/cross cutting issues
- d) Advancement in science and technology
- e) Appropriate linkages of the diploma in education with lower and higher level courses.

Therefore the course intends to provide student teachers with basic knowledge, skills, competences and understanding in teaching and learning Biology. Basing on the above, the secondary school Diploma teachers need to be developed into professional teachers as well as being given opportunity for further studies.

## **Goals of the course**

The goals of the course are:

- a) To develop Biology student teachers who are qualified in teaching of Biology and carrying out other related duties
- b) To develop student teachers competence in the using of science and technology in teaching and learning Biology
- c) To prepare student teachers to deal with various challenges e.g. cross-cutting issues
- d) To develop student teachers supportive skills in teaching Biology to learners with special educational needs
- e) To prepare student teachers for further studies and life long learning.

## **Competences to be developed**

After the two-year Biology course, the student teacher should have the ability to:

- a) Solve daily problems using Biology knowledge and skills
- b) Apply biological knowledge and skills to deal positively and effectively with cross-cutting issues
- c) Guide learners to create and construct biological knowledge through effective communication skills and a variety of interactive teaching and learning methods
- d) Translate Biology curriculum into classroom practice for learners including those with special learning needs
- e) Use appropriate media and instructional technologies to teach Biology subject
- f) Apply action research findings for improving classroom practices and promoting learners' personal development
- g) Conduct assessment, measurement and evaluation in Biology subject.

## **Course Objectives**

By the end of the two-year Biology course the student teacher should be able to:

- a) Use appropriate Biological knowledge and skills in everyday life
- b) Apply skills for teaching and learning Biology through the use of various basic experiments and other hands-on activities
- c) Demonstrate attitude, knowledge and skills in dealing effectively and efficiently with crosscutting issues
- d) Analyse academic and pedagogical content of Biology subject
- e) Conduct action research in the teaching and learning of Biology

- f) Apply appropriate pedagogical skills to learner including those with special education needs
- g) Use basic skills in measurement, assessment and evaluation
- h) Upgrade academic knowledge in Biology subject.

### **Description and Organization of the Course Syllabus**

The course syllabus emphasizes the acquisition of competences such as the ability to conduct biological experiments use ICT in academic empowerment, plan and conduct learning experiences for learners with varied educational needs and ability to communicate effectively. Six topics have been selected, which are Biochemistry, Classification, Respiration, Health and Immunity, Genetics and Ecology. The specific objectives provided establish the boundary of flexibility to the teaching and learning process. The Diploma Academic Biology course shall be covered in 128 hours within two years of course duration.

The suggested teaching and learning strategies and resources are intended to help the tutor and student teacher, plan lessons such that the learner becomes responsible for one's learning while the tutor assumes the facilitation role. A number of assessment procedures have been suggested; the tutor should decide on the appropriate procedures for assessing the desired competences.

The academic syllabus consists of two main parts: firstly preliminary pages covering introduction, course description, course rationale, goals of the course, competences to be developed, course objectives, organization of the syllabus and assessment of the course. Secondly the subject content pages covering topics, sub topics, specific objectives, teaching and learning strategies, resources and assessment procedures.

In terms of organization the syllabus components are arranged in a linear form (rather than in the traditional matrix format) so as to make it user-friendly and give the tutor enough freedom to be flexible in planning and executing classroom learning experiences. The specific objectives, teaching and learning strategies, resources and assessment procedures have been aligned with the corresponding sub-topics.

### **Assessment of the Course**

There will be continuous assessment throughout the course. At the end of this course the student teacher shall sit for a final National Examination conducted by the National Examination Council of Tanzania (NECTA). Continuous assessment shall carry 50% and the final National Examination will constitute the remaining 50%. It should be noted that Biology course is divided into two main parts: the academic part and the pedagogy part. Each part shall contribute 50% (25% from continuous assessment and 25% from final examination) of the total assessment of the course.

The analysis of assessment procedures and the weighting for the pedagogy part is shown below.

<b>Sr/No</b>	<b>Assessment type</b>	<b>Frequency</b>	<b>Weight</b>
1.	Test	4	05%
2.	Projects/practicals	3	05%
3.	Portfolio	2	05%
4.	Terminal examinations	3	10%
5.	Final examination	1	25%
<b>Total</b>			<b>50%</b>



## **1.0 BIOCHEMISTRY**

### **1.1 Carbohydrates**

**Estimated Time: 8 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Carry out biochemical tests to identify reducing sugars, non-reducing sugars and starch
- b) Describe the structure of monosaccharide, disaccharides and polysaccharides
- c) Explain properties of monosaccharide, disaccharides and polysaccharides
- d) Explain the significance of different types of carbohydrates in living things.

#### **Teaching and Learning Strategies**

- a) Experimentation (biochemical tests on carbohydrates)
- b) Brainstorming
- c) Group discussion and presentation in a plenary session.

#### **Teaching and Learning Resources**

- a) Different types of food substances containing monosaccharide, disaccharides and polysaccharides drawn from the environment
- b) Relevant chemicals/reagents; iodine solution, Benedict's solution, dilute Hydrochloric acid, Sodium hydroxide
- c) Relevant apparatus and equipment such as test tubes, beakers, source of heat, test tube holders, filter papers, mortar and pestle/blender, spotted tiles, litmus papers, test tube racks.

#### **Assessment Procedures**

- a) Quizzes, essays and tests.
- b) Observation schedule/form for recording experimental results and inferences
- c) Written practical reports.

## **1.2 Lipids**

**Estimated Time: 4 hours**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Carry out biochemical tests to identify fats and oils
- b) Describe the structure of fats and oils
- c) Explain properties of fats and oils
- d) Explain the significance of fats and oils in living things.

### **Teaching and Learning Strategies**

- a) Experimentation (biochemical tests on fats and oils)
- b) Brainstorming
- c) Group discussion and presentation in a plenary session.

### **Teaching and Learning Resources**

- a) Different types of food substances containing fats and oils drawn from the environment
- b) Sudan III solution
- c) Relevant apparatus and equipment such as mortar and pestle, beaker, test tubes, filter paper, test tube rack, source of heat.

### **Assessment Procedures**

- a) Quizzes, essays and tests on structure, properties and importance of fats and oils.
- b) Observation schedule/form for recording experimental results and inferences
- c) Written practical reports on the experiment on fats and oils.

## **1.3 Proteins**

**Estimated Time: 5 hours**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Carry out biochemical tests to identify proteins
- b) Describe the structure of proteins
- c) Explain properties of proteins

- d) Explain the significance of proteins in living things.

### **Teaching and Learning Strategies**

- a) Experimentation (biochemical tests on proteins).
- b) Brainstorming.
- c) Group discussion and presentation in a plenary session.

### **Teaching and Learning Resources**

- a) Different types of food substances containing proteins drawn from the environment
- b) Relevant chemicals e.g. Copper (II) Sulphate solution and Sodium hydroxide solution.
- c) Relevant apparatus and equipment such as mortar and pestle, beaker, test tubes, filter paper, test tube rack, source of heat.

### **Assessment Procedures**

- a) Quizzes, essays and tests.
- b) Observation schedule/form for recording experimental results and inferences
- c) Written practical reports.

## **1.4 Enzymes**

**Estimated Time: 5 hours**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Investigate the effect of temperature, pH and inhibitors on enzyme reaction
- b) Explain the properties of enzymes
- c) Classify enzymes
- d) Describe modes/mechanisms of enzymes action.

### **Teaching and Learning Strategies**

- a) Experimentation (biochemical tests on factors affecting enzyme reaction)
- b) Brainstorming
- c) Group discussion and presentation in a plenary session

### **Teaching and Learning Resources**

- a) Food substrate containing starch and protein.
- b) Enzyme sources e.g. saliva, germinating millet extract, green peas and green pawpaw
- c) Relevant equipment and apparatus e.g. oven, source of heat, refrigerator, ice cubes, beakers, test-tubes, scalpel, mortar and pestle and thermometers.
- d) Relevant chemicals/reagents such as dilute acids, bases and hydrogen peroxide.
- e) Charts showing enzyme classification.

### **Assessment Procedures**

- a) Quizzes, essays and tests.
- b) Observation schedule/form for recording experimental results and inferences.
- c) Written practical reports.

## **2.0 CLASSIFICATION OF LIVING THINGS**

### **2.1 Principles of Classification**

**Estimated Time: 8 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Construct simple taxonomic keys
- b) Use simple taxonomic keys to identify organisms
- c) Explain the basis of classifying organisms under the artificial and natural systems of classification
- d) State rules of the binominal nomenclature
- e) Explain the significance of scientific naming of organisms.

#### **Teaching and Learning Strategies**

- a) Brainstorming
- b) Practical exercises
- c) Discussion and plenary presentations
- d) Internet search.

#### **Teaching and Learning Resources**

- a) Variety of living organisms (live and or preserved)
- b) Photographs and Charts
- c) Hand lenses.
- d) Tools for capturing organisms
- e) Computers and Internet source

#### **Assessment Procedures**

- a) Quizzes, essays, tests and practical tests.
- b) Project.
- c) Portfolio.

## **2.2 Major Groups of Living Things**

### **2.2.1 Viruses**

**Estimated Time: 2 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Explain the problems associated with classifying viruses
- b) Describe the general features of viruses
- c) Explain the economic importance of viruses

#### **Teaching and Learning Strategies**

- a) Brainstorming
- b) Library/internet search
- c) Group discussion and presentation in a plenary session

#### **Teaching and Learning Resources**

- a) Charts/pictures of different types of viruses
- b) Samples of plants and animals showing signs of viral infection

#### **Assessment Procedures**

Quizzes, essays and tests

## **2.2.2 Kingdoms of Living Things**

**Estimated Time: 15 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Explain the problems associated with the classification of living things into major groups (Kingdoms)
- b) Describe the general and distinctive features of kingdoms and their phyla
- c) Classify representative organisms to their appropriate phyla/division
- d) Classify arthropods, chordates and angiosperms to class/sub class level
- e) Describe the adaptive features of arthropods, mammals and terrestrial plants
- f) Explain the economic importance of selected phyla/division in each kingdom

### **Teaching and Learning Strategies**

- a) Brainstorming/think- pair- share
- b) Group discussion and presentation in a plenary session
- c) Practical observation and classification of some representatives of major groups of living organisms.

### **Teaching and Learning Resources**

- a) Various living organisms, live or preserved representing each kingdom
- b) Charts/pictures of various organisms
- c) Hand lenses, microscopes, microscope slides and slide covers

### **Assessment Procedures**

- a) Quizzes, essays and tests
- b) Project on collecting, classifying and preserving a selected group of organisms

### **3.0 RESPIRATION**

#### **3.1 Aerobic and Anaerobic Respiration**

##### **3.1.1 Aerobic Respiration**

**Estimated Time: 4 hours**

##### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Carry out experiments to investigate the product of aerobic respiration
- b) Explain the mechanism of aerobic respiration
- c) Explain the concept of Oxygen Debt
- d) Explain the economic importance of aerobic respiration.

##### **Teaching and Learning Strategies**

- a) Experiment to investigate the products of aerobic respiration
- b) Group discussion and plenary presentation
- c) Library research.

##### **Teaching and Learning Resources**

- a) Relevant equipment/apparatus: Conical flasks, rubber bands, delivery tubes, fractionating column, string, test tubes, thermometers and a mirror
- b) Relevant chemicals: paraffin, pyrogallol, and lime water
- c) Chart showing chemical equation of aerobic respiration.

##### **Assessment Procedures**

- a) Quizzes, essays, test and assignments
- b) Observing and grading student teacher carrying out experiment on products of aerobic and respiration.

##### **3.1.2 Anaerobic Respiration**

**Estimated Time: 5 hours**

##### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Carry out experiments to investigate the product of anaerobic respiration
- b) Explain the mechanism of anaerobic respiration
- c) Explain the economic importance of anaerobic respiration



- c) Differentiate aerobic from anaerobic respiration.

### **Teaching and Learning Strategies**

- a) Experimentation
- b) Group discussion and plenary presentation
- c) Library research

### **Teaching and Learning Resources**

- a) Relevant equipment/apparatus: Conical flasks, rubber bands, delivery tubes, fractionating column, string, test tubes, and thermometers
- b) Relevant chemical: Lime water
- c) Specimen: banana, yeast and glucose
- d) Chart showing chemical equation of anaerobic respiration.

### **Assessment Procedures**

- a) Quizzes, essays, test and assignments
- b) Observation checklist
- c) Individual assignment/project

## **3.2 Respiratory Pathways**

**Estimated Time: 6 hours**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Describe the respiratory pathways using carbohydrate, lipid and protein substrate
- b) Explain the fate of pyruvic acid
- c) Compute total – ATP yield when a carbohydrate substrate is oxidized aerobically and anaerobically
- d) Explain the concept of metabolic rate and its derivative form basal metabolic rate (BMR)

### **Teaching and Learning Strategies**

- a) Library survey
- b) Group discussion and plenary presentation.

## **Teaching and Learning Resources**

Charts/models on the respiratory pathways and Krebs's cycle.

## **Assessment Procedures**

- a) Tests
- b) Individual

## **4.0 BODY HEALTH AND IMMUNITY**

### **4.1 Body Health**

#### **4.1.1 Concept of Health**

**Estimated Time: 2 Hour**

##### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) State the meaning of health
- b) Explain factors contributing to healthy and unhealthy body condition
- c) Explain the importance of good health

##### **Teaching and Learning Strategies**

- a) Brainstorming
- b) Group discussion and presentation

##### **Teaching and Learning Resources**

Charts/Pictures/Photographs showing people with good health and bad health.

##### **Assessment Procedures**

Quizzes, essays and tests on body health

#### **4.1.2 Reproductive Health**

**Estimated Time: 8 hours**

##### **Specific Objectives**

By the end of this sub-topic the student-teacher should be able to:

- a) Draw and label the human reproductive systems
- b) Describe the different parts of the human reproductive system and their functions.
- c) Explain the mechanism of menstrual cycle.
- d) Explain complications and disorders of reproductive systems.
- e) Explain types, advantages and side effects of modern and natural methods of family planning methods.

### **Teaching and Learning Strategies**

- a) Gallery walk
- b) Group discussions and plenary presentation,
- c) Guest speaker's

### **Teaching and Learning Resources**

- a) Dissected preserved specimen/models/charts showing human reproductive systems
- b) Samples of different types of family planning gadgets
- c) Chart showing types of modern family planning methods

### **Assessment Procedures**

- a) Quizzes, essays and tests on reproductive health.
- b) Project on traditional family planning methods in surrounding community.

## **4.1.3 Drugs, Drug Abuse and Responsible Behavior**

**Estimated Time: 5 hours**

### **Specific Objectives**

By the end of this sub-topic the student-teacher should be able to:

- a) Explain the proper ways of handling and using drugs
- b) Describe the causes and effect of drug addiction and drug abuse
- c) Suggest preventative and control measures on drug abuse and drug addiction
- d) Differentiate responsible from irresponsible behavior.

### **Teaching and Learning Strategies**

- a) Invitation of a health officer (guest speaker) to make a presentation on drugs and drug abuse.
- b) Discussion and plenary discussion
- c) Role play
- d) Questions and answers

### **Teaching and Learning Resources**

- a) Charts/Pictures/photographs
- b) Radio/Video/television.

- c) Audio/video cassettes
- d) Pictures showing samples of drugs.

### **Assessment Procedures**

- a) Quizzes, essays and tests
- b) Projects.

## **4.2 Body Immunity**

### **4.2.1 Concept of immunity**

**Estimated Time: 4 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Explain the concept of the immune system
- b) Explain the types of immunity in a human body
- c) Identify the components of the immune system
- d) Explain the importance of body immunity
- e) Explain the problems arising from the immune system

#### **Teaching and Learning Strategies**

- a) Library/internet search
- b) Group discussions and plenary presentations on the immunity
- c) Questions and answers

#### **Teaching and Learning Resources**

- a) Charts/Pictures/Photographs
- b) Internet search facilities

#### **Assessment Procedures**

Quizzes, tests and essays on body immunity.

#### **4.2.2 Sexually Transmitted Diseases (STDs) and Sexually Transmitted Infections (STIs)**

**Estimated Time: 6 hours**

##### **Specific Objectives**

By the end of this sub-topic the student-teacher should be able to:

- a) Distinguish between STDs and STIs
- b) Explain causes, ways of transmission, symptoms and effects of STIs and STDs
- c) Explain ways of managing STIs and STDs
- d) Describe the impact and control/preventive measures of STIs and STDs in the neighbouring community.

##### **Teaching and Learning Strategies**

- a) Brainstorming concept of STDs and STIs.
- b) Guest speaker to give a talk on various aspects of STDs and STIs
- c) Questions and answers
- d) Follow up plenary discussion on guest speaker's presentation

##### **Teaching and Learning Resources**

- a) Pictures/Charts/Models showing effects of STDs and STIs
- b) Radio/Television
- c) Radio/Video cassettes of documentaries on STDs and STIs

##### **Assessment Procedures**

- a) Quizzes, essays and tests.
- b) Written reports
- c) Project

#### **4.2.3 Human-Immuno Deficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS)**

**Estimated Time: 6 hours**

##### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Explain the cause, ways of transmission, symptoms, effects and preventive measures of HIV/AIDS
- b) describe ways of managing HIV/AIDS
- c) Explain the impact and control/preventive measures of HIV/AIDS in the neighbouring community and the country.

### **Teaching and Learning Strategies**

- a) Brainstorming, discussion and presentations
- b) Guest speaker /health expert
- c) Study visit
- d) Questions and answers

### **Teaching and Learning Resources**

- a) Pictures/Charts/Models
- b) Radio/Television
- c) Radio/Video cassettes

### **Assessment Procedures**

- a) Quizzes, essays and tests
- b) Written reports
- c) Project.

## **5.0 GENETICS**

### **5.1 Genetic Materials**

**Estimated Time: 4 hours**

#### **Specific objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Describe the chemical composition and properties of genetic materials
- b) Explain the mechanisms of DNA replication and its significance
- c) Describe nature and of the genetics code
- d) Relate the genetics code the process of protein synthesis.

#### **Teaching and Learning Strategies**

- a) Brainstorming, question and answers
- b) Internet research
- c) Discussion and plenary presentation

#### **Teaching and Learning Resources**

- a) Charts/Models of DNA and RNA molecular structures.
- b) Charts showing DNA replication and protein synthesis
- c) Internet resources

#### **Assessment Procedures**

Quizzes, essays and tests

### **5.2 Mendelian Principles of Inheritance**

**Estimated Time: 8 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Carry out experiments on Mendelian first and second principles of inheritance
- b) Interpret Mendelian monohybrid and dihybrid crosses and ratios
- c) Distinguish between Mendelian and non-Mendelian inheritance
- d) Apply Mendelian and non-Mendelian inheritance principles to solve genetic problems.



### **Teaching and Learning Strategies**

- a) Designing and conducting breeding experiments in drosophila and peas
- b) Demonstrating the mixing of genes using e.g. seeds and beads of different colours
- c) Question and answer
- d) Group discussions and presentations
- e) Library/internet search

### **Teaching and Learning Resources**

- a) Drosophila, peas, banana juice, seeds and beads
- b) Charts showing flow diagrams of progenies
- c) Photographs/pictures showing different plants and animals phenotypes inherited in a Mendelian and non-mendelian fashion.

### **Assessment Procedures**

- a) Quizzes, essays and tests
- b) Portfolio/Individual reports on experimental results and inferences

## **5.3 Genetic Disorders**

**Estimated Time: 3 hour**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Explain the concept of genetic disorders
- b) Explain causes and effects of genetic disorders
- c) Outline ways of controlling and managing genetic disorders.

### **Teaching and Learning Strategies**

- a) Questions and answers
- b) Discussion and plenary presentation
- c) Problems solving on crosses of genetic disorders.

### **Teaching and Learning Resources**

- a) Real organisms exhibiting genetic disorders
- b) Photograph/pictures of organisms showing genetic disorders

### **Assessment Procedures**

Quizzes, essays and tests

## **5.4 Mutations**

**Estimated Time: 4 hours**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Explain the concept of mutation
- b) Describe the causes of mutations
- c) Explain the effects of mutations

### **Teaching and Learning Strategies**

- a) Brainstorming
- b) Field trip to nearby hospital to see X-ray machine
- c) Discussion and presentation

### **Teaching and Learning Resources**

- a) Photographs /charts
- b) Samples of objects containing mutagenic agents e.g. tobacco, coffee, X-ray

### **Assessment Procedures**

- a) Quizzes, essays and tests
- b) Individual reports on field trip

## **5.5 Application of Genetics**

**Estimated Time: 3 hours**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Explain the concepts of genetic engineering and biotechnology
- b) Explain application of genetics in various fields
- c) Outline the advantages and disadvantages of genetic engineering and biotechnology

**Teaching and Learning Strategies**

- a) Gallery walk
- b) Discussion and presentation
- c) Study visit to a breeding station

**Teaching and Learning Resource**

- a) Plants and animals produced through genetic engineering/hybridization
- b) Photographs
- c) Television/Radio
- d) Audio/video cassette

**Assessment Procedures**

- a) Quizzes, essays and tests
- b) Written reports on study visit to breeding station

## **6.0 ECOLOGY**

### **6.1 Energy Flow and Nutrient Cycle**

**Estimated Time: 4 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Differentiate between energy flow and nutrient cycle
- b) Describe energy flow from the producers to the consumers
- c) Explain the flow of energy in a selected aquatic and terrestrial habitat
- d) Explain the concept of food chain and food web
- e) Describe common nutrient cycles e.g. nitrogen and carbon cycles.

#### **Teaching and Learning Strategies**

- a) Observation of organisms in their natural habitats to establish food chain and food webs
- b) Discussions and presentation
- c) Question and answer

#### **Teaching and Learning Resources**

- a) Live organisms
- b) Natural habitat
- c) Charts showing ecological pyramids and energy flow diagrams

#### **Assessment Procedures**

- a) Quizzes, essays and tests
- b) Portfolio
- c) Reports based on field work

### **6.2 Population Growth**

**Estimated: 4 hours**

#### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Differentiate between the term population and community
- b) Interpret population growth trends and associated growth curves
- c) Explain factors influencing human population growth and distribution

- d) Explain the effects of rapid human population growth on the environment

### **Teaching and Learning Strategies**

- a) Questions and answers
- b) Internet search
- c) Group discussions and plenary presentation
- d) Role play

### **Teaching and Learning Resources**

- a) Photographs/pictures showing population growth curves
- b) Internet facilities

### **Assessment Procedures**

- a) Quizzes, essays and tests
- b) Written reports on Internet search

## **6.3 Pollution and Its Impact on Living Things**

**Estimated: 5 hours**

### **Specific Objectives**

By the end of this sub-topic, the student-teacher should be able to:

- a) Identify types of pollutants
- b) Explain effects of pollution on living things and the environment
- c) Explain the sources of pollution in the neighbouring community
- d) Describe various control measure against pollution

### **Teaching and Learning Strategies**

- a) Brainstorming
- b) Group discussion and plenary presentation
- c) Questions and answers
- d) Study visits to sites exhibiting different types of pollution

### **Teaching and Learning Resources**

- a) Photographs/pictures showing polluted areas
- b) Photographs of various organisms affected by pollution

- c) Real polluted sites

**Assessment Procedures**

- a) Quizzes, essays and tests on pollution
- b) Written reports on study visits to polluted sites

## Reading List

Berrie, G. K., Berie, A. and Eze, J. M. (1990). *Tropical Plant Science*. Longman, Singapore.

Blomond, B. (1992). *AIDS: A Moral Issue*. Macmillan press Ltd.

Brown, G.D. and Creedy, J. (1970). *Experimental Biology Manual*. Heinemann Educat. London Wx 8AH.

Eames, J.A. and MacDaniels L.H. (1972). *An Introduction to Plant Anatomy*. Tata MC Graw-Hill.

Institute of Education (TIE) (1999). *Biology for Secondary Schools Book – IV*. Institute of Curriculum Development, Dar es Salaam

Johnson, R. and Godman, A. (1987). *Junior Tropical Biology*. Longman Singapore.

Legg, C. J. and Mackean D.G. (2000). *Advanced Biology Principles and Application* 2<sup>nd</sup> Edition . Wix 4BD, London.

Mackean, D.G. (2000). *GSCS Biology*. NW1 3BH 3<sup>rd</sup> Edition. London

Mckusick, V. A. (2005). *Human Genetics* Prentice Hall.

Rami Reeta, (1991). *Dictionary of Biology*. ANMOL, New Delhi. India.

Raven, P. H. and Johnson, G. B. (1986). *Biology. MOSBY College*. Toronto, Canada.

Roberts, (1986): *Biology Structure and Function*. London.

Taylor D. J., Green, N. P. O., and Stout, G. W. (1977). *Biological Science*. Cambridge University Press, London, U.K

Vines, A. E. and Rees. (1972). *Plant and Animal Biology*. 4<sup>th</sup> Edition Vol I and Vol II Longman Group Ltd, London, U.K.

Young, B. and Durston, S. (1991). *Primary Health Education*. Longman Group. Essex U.K.