



L-Università  
ta' Malta

MATSEC  
Examinations Board



# SEC 35 Syllabus

## Agribusiness

**2023**

Updated on 19<sup>th</sup> September, 2022

**SEC35 Agribusiness**

**Syllabus Addendum**

*Mitigating factors for 2023 MATSEC Examinations Session*

Changes in Subject Content	<p>Content of Unit 1 <b>K9, K10, C5</b> and <b>A2</b> may not be covered.</p> <p>Content of Unit 3 <b>K4, K9, C1</b> and <b>C2</b> may not be covered.</p>
Changes in Coursework	<p>Unit 1 <b>A2</b> will not be assessed in the coursework but still included on the front sheet and awarded full marks.</p> <p>Unit 3: No changes.</p>
Changes in Exam Paper(s)	<p>The Unit 1 Controlled assessment will not include <b>K9, K10</b> and <b>C5</b>. Marks for these criteria, which shall not be assessed, will be prorated at the end of the unit based on the combined performance in Knowledge and Comprehension criteria within the same unit.</p> <p>The Unit 3 Controlled assessment will not include <b>K4, K9, C1</b> and <b>C2</b>. Marks for these criteria, which shall not be assessed, will be prorated at the end of the unit based on the combined performance in Knowledge and Comprehension criteria within the same unit.</p>

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## Introduction

The aim of this learning and assessment programme is to assist secondary schools to manage vocational programmes, specifically in the planning and implementation of the programme delivery.

This learning and assessment programme is structured in two parts, namely:

Part A: General Policies

Part B: Unit Specifications

In Part A, the Learning Outcomes of the programme are explained. Important terms used in the Learning and Assessment Programme (LAP) are defined.

In Part B, the content to be covered in each unit is provided. The learning outcomes together with a brief description are also specified. The assessment criteria together with the scheme of assessment are presented in this part of the document.

In order to ensure effective implementation of the programme, adequate standards, quality assurance processes and procedures have to be adopted. Additionally, policies, guidelines and strategies related to assessment practices are documented in the SEC Vocational Subjects Policy Document. Standard templates will also be provided and will be structured as follows:

<b>List of Templates</b>
Teacher's Timeframe
Assignment Brief Front Sheet
Record of Internal Verification – Assignment Brief
Record of Internal Verification – Assessment Decision
External Verification Report Template
Unit Tracking Sheet Template

## Part A: General Policies

### Introduction

The aim of the vocational programme in Agribusiness is to provide candidates with the underpinning knowledge related to Agribusiness. By the end of the programme, candidates are expected to have gained sufficient skills and knowledge and be able to apply them.

### Programme Learning Outcomes

#### At the end of the programme, I can:

- Become familiar with the most common horticultural plants grown on the Maltese Islands.
- Become familiar with the appropriate methods of soil sampling and analysis.
- Develop the required skills and techniques in land cultivation, plant care and plant propagation.
- Be familiar with the Health and Safety regulations when using standard tools and equipment related to the horticultural and animal husbandry sectors.
- Promote best practices related to animal care whilst safeguarding both the animal and the carer.
- Provide candidates with the basics of animal care and breeding.
- Enable candidates to develop an appreciation of the business aspect of agricultural enterprises.
- Show the importance of animal breeding for the society and the economy.

### Unit Learning Outcomes

#### Unit 1: Plant and Soil Science

##### At the end of the unit, I can:

- LO 1.** Demonstrate an understanding of the life cycle and morphologies of different organs of crop/ornamental plants' roots and shoot systems.
- LO 2.** Demonstrate an understanding of Health and Safety in agribusiness.
- LO 3.** Undertake a season's growth of different groups of vegetables.
- LO 4.** Apply a suitable fertiliser using the appropriate technique.
- LO 5.** Demonstrate an understanding of the purpose and methods used for soil analysis.
- LO 6.** Demonstrate an understanding of the soil factors which contribute to healthy plant growth.

## **Unit 2: Aquatic and Land Based Production**

### **At the end of the unit, I can:**

- LO 1.** Demonstrate an understanding of the morphology and nutritional requirements of different fish species.
- LO 2.** Undertake proper fish husbandry tasks to prevent and cure diseases and correct disorders.
- LO 3.** Describe the main processes of plant physiology.
- LO 4.** Conduct post-harvesting processes according to marketing standards.
- LO 5.** Explain the propagation requirements and growth media for different plants.

## **Unit 3: Rabbit Care and Genetics**

### **At the end of the unit, I can:**

- LO 1.** Demonstrate an understanding of the biology and genetic principles of rabbit production.
- LO 2.** Maintain the right environment for rabbit husbandry.
- LO 3.** Use adequate preventive and curative measures for healthy rabbit growth.
- LO 4.** Explain the reproductive phases and breeding of rabbits.
- LO 5.** Demonstrate an understanding of the ways rabbits can be processed to enhance revenues of a rabbit farm.

## Programme Descriptors

Programme descriptors are understood as outcome statements of what a candidate is expected to have achieved by the end of the programme. These are an adaptation of MQF level descriptors for the specific programme.

## Overview

MQF Level 1	MQF Level 2	MQF Level 3
<p>Basic general <b>knowledge</b>.</p> <ol style="list-style-type: none"> <li>1. Acquires basic general knowledge related to management of crops, fish and animals and expresses the application of a variety of simple tools and context as an entry point to lifelong learning;</li> <li>2. Knows and understands the steps needed to complete simple tasks and activities in situations related to agribusiness environments;</li> <li>3. Is aware and understands basic tasks and instructions related to activities in agribusiness;</li> <li>4. Understands basic textbooks, manuals and other information related to crop, fish and animal husbandry and health.</li> </ol>	<p>Basic factual <b>knowledge</b> of a field of agribusiness.</p> <ol style="list-style-type: none"> <li>1. Possess good knowledge of the three fields of agribusiness – crops, fish and animals;</li> <li>2. Is aware and interprets type of information and ideas within agronomic, aquaculture and animal management systems;</li> <li>3. Understands facts and procedures in the application of basic tasks and instructions related to a situation of an agribusiness nature;</li> <li>4. Selects and uses relevant knowledge to accomplish specific actions for self and others, in terms of safety and proper handling of a task.</li> </ol>	<p><b>Knowledge</b> of facts, principles, processes and general concepts in a field of agribusiness.</p> <ol style="list-style-type: none"> <li>1. Understands the relevancy of theoretical knowledge and information related to crop, fish and animal management;</li> <li>2. Assesses, evaluates and interprets facts, establishing basic principles and concepts in tasks related to agribusiness;</li> <li>3. Understands facts and procedures in the application of more complex tasks and instructions related to a situation of an agribusiness nature;</li> <li>4. Selects and uses relevant knowledge acquired on one’s own initiative to accomplish specific actions for self and others, in terms of safety and proper handling of a task in normal practice and in case of an unexpected situation.</li> </ol>

MQF Level 1	MQF Level 2	MQF Level 3
<p>Basic <b>skills</b> required to carry out simple tasks.</p> <ol style="list-style-type: none"> <li>1. Has the ability to apply basic knowledge and carry out a limited range of simple tasks related to the management of crops, fish and animals;</li> <li>2. Has basic repetitive communication skills to complete well defined routine tasks and identifies whether actions have been accomplished;</li> <li>3. Follows instructions and be aware of consequences of basic actions for self and others, in terms of safety and proper handling of a task in normal agribusiness practice.</li> </ol>	<p>Basic cognitive and practical <b>skills</b> required to use relevant information in order to carry out agribusiness tasks and to solve routine problems using simple rules and tools.</p> <ol style="list-style-type: none"> <li>1. Has the ability to demonstrate a range of skills by carrying out a number of complex tasks within the three main fields of agribusiness – crops, fish and animals;</li> <li>2. Communicates basic information related to the management of crops, fish and animals;</li> <li>3. Ensures agribusiness tasks are carried out effectively taking into account acquired knowledge and safety guidelines.</li> </ol>	<p>A range of cognitive and practical <b>skills</b> required to accomplish agribusiness tasks and solve problems by selecting and applying basic methods, tools, materials, and information.</p> <ol style="list-style-type: none"> <li>1. Demonstrates a range of developed skills to carry out more than one complex task effectively and in unfamiliar and unpredictable contexts taking into account safety rules and procedures;</li> <li>2. Communicates more complex information related to the management of crops, fish and animals;</li> <li>3. Solves basic agribusiness problems by applying basic methods, tools, materials and information given in a restricted learning environment.</li> </ol>
<p>Work out or study under direct supervision in a structured context.</p> <ol style="list-style-type: none"> <li>1. Applies basic knowledge and skills to do simple, repetitive and familiar tasks related to crop, fish and animal management;</li> <li>2. Participates in and takes basic responsibility for the action of simple agribusiness tasks;</li> <li>3. Activities are carried out under guidance and within simple defined timeframes;</li> <li>4. Acquires and applies basic key agribusiness competences at this level.</li> </ol>	<p>Work or study under supervision with some autonomy.</p> <ol style="list-style-type: none"> <li>1. Applies factual knowledge and practical skills to do some structured tasks related to crop, fish and animal management;</li> <li>2. Ensures one acts pro-actively in the management of agribusiness systems;</li> <li>3. Carries out activities under limited supervision and with limited responsibility in a quality controlled context;</li> <li>4. Acquires and applies basic key agribusiness competences at this level.</li> </ol>	<p>Take responsibility for completion of tasks in agribusiness and adapt own behaviour to circumstances in solving problems.</p> <ol style="list-style-type: none"> <li>1. Applies knowledge and skills to do some tasks systematically;</li> <li>2. Adapts own behaviour to circumstances in solving problems by participating pro-actively in structured learning environments in the management of agribusiness systems;</li> <li>3. Uses own initiative with established responsibility and autonomy, but is supervised in quality controlled learning environments, normally in a trade environment;</li> <li>4. Acquires key agribusiness competences at this level as a basis for lifelong learning.</li> </ol>



## Definitions/Terminology

Term	Definition
Assessment Criteria	A description of what a candidate is expected to do in order to demonstrate that a learning outcome has been achieved.
Assessor	The person responsible to grade the candidate's work, issue a mark and determine the candidate's final grade.
Competences	Each competence is defined as a combination of knowledge and skills and is associated with the level of autonomy and responsibility that the person is expected to have at that level.
Controlled Assessment	An assessment set by MATSEC which may include written and/or practical tasks as specified in the syllabus. This may be a take-home assessment or carried out under controlled conditions.
Coursework	A number of assignments set by teachers and given to the candidate during the course as specified in the syllabus.
Knowledge	Knowledge refers to the understanding of basic, factual and theoretical information, which is traditionally associated with formal learning but can also be acquired from informal and non-formal learning.
Learning Outcome	Learning Outcomes are statements which describe what a qualification represents in terms of knowledge, skills and competences. The Malta Qualifications Framework (MQF) defines a learning outcome as what the candidate understands and is capable of doing at the end of the learning process.
Malta Qualification Framework	The Malta Qualifications Framework (MQF) provides an indication of the level of difficulty as a benchmark for a qualification, which needs to be assigned a level and mapped to the framework. The MQF has level descriptors from Level 1 to 8. The level descriptors are useful for education and training providers as they describe the Knowledge, Skills and Competences and a set of Learning Outcomes, which indicate to the candidate the end of a learning process.
Quality Assurance	A continuous process to assure the standards and quality of the learning assessment programme.
Sample of Work	A sample of work is a percentage of the candidate's work gathered as a representative sample for the internal or external verifier.
Skills	Skills imply the application of acquired knowledge and understanding in different contexts. A skill may be the result of formal learning or of repetitive work in an informal setting.
Synoptic Assessment	An assessment in the form of a written examination and conducted under controlled conditions covering all learning outcomes and the majority of Knowledge and Comprehension assessment criteria in a given unit.
Unit Content	The unit content is the content required to be communicated and given to the candidate per learning outcome. Each learning outcome must have content related to it, which content must be delivered to provide the candidate with the tools necessary to achieve that outcome.

## Assessment Scope

Assessment is an important element in any learning process. This should inform candidates about their achievements and at the same time it should meet important conditions of reliability, validity and fairness. Thus, important rules and procedures must be adhered-to. In particular, the assessment regulations and procedures that are explained in this section will ensure that assessments are:

- Of the required standard, quality and level;
- Fair for all candidates;
- Valid and reliable.

Each unit will be assessed by means of three assignments, one of which must be an assessment conducted within a controlled school environment. The assessment mode/type, criteria to be assessed and the distribution of marks are explained in Part B of the programme as part of the unit specifications.

## Quality Assurance

An important aspect of this programme is the quality assurance process that must be conducted throughout the implementation of the programme. Three main processes are to be conducted as stipulated in the table below.

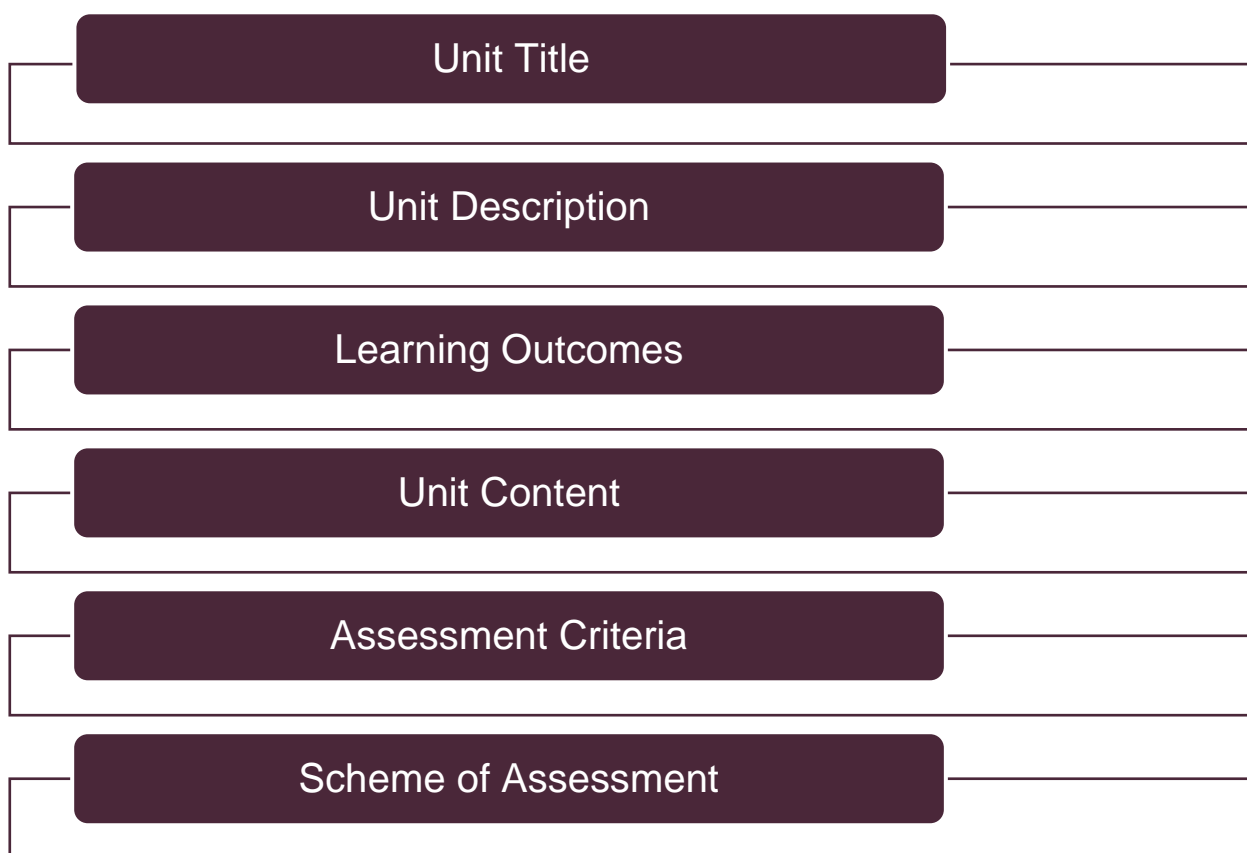
Internal Verification of Assessment Briefs	All assessment briefs are to be internally verified before being issued to the candidates. Within this process, important checks relating to learning outcomes, criteria to be assessed, validity and reliability are to be performed.
Internal Verification of Assessment Decisions	Once candidates complete their work, and their assessments have been corrected, a representative sample of candidates' work is to be internally verified.
External Verification	The process of external verification will ensure that programme quality and standards are met.

## Part B: Unit Specifications

### Introduction

This part of the programme guide provides detailed specification for each of the 3 units that are to be implemented for the successful completion of the programme. The curriculum design adopted for the development of the units of study is based on the learning outcomes approach. The latter can be defined as “written statements of what a candidate should be able to do/know/apply by the end of the learning process.”<sup>1</sup>

The structure of the unit specifications is presented below:



### Interpreting the Unit Specifications

The syllabus is written in a way whereby the knowledge criteria at MQF level 3 build upon the knowledge criteria at MQF level 2 and in the same manner the knowledge criteria at MQF level 2 build upon the knowledge criteria at MQF level 1. The same applies for the comprehension and application criteria. The comprehension criteria also build upon the knowledge criteria and the application criteria build upon the knowledge and the comprehension criteria.

<sup>1</sup> [http://www.cedefop.europa.eu/files/4156\\_en.pdf](http://www.cedefop.europa.eu/files/4156_en.pdf)

The document is an assessment syllabus; therefore any other examples or information apart from those written in the unit content should be taught so that candidates will enjoy the learning process and get a general overview of the subject. Under each grading criterion, only the **minimum** content that has to be covered is listed. The material covered in class must at least reflect **both** the unit content and grading criteria.

Examples (e.g.), commas, semi-colons, bullets, or, and N.B. are used in the Learning and Assessment Programme. When semi-colons are used the candidates should be assessed on all the content prescribed. However, when the list is headed with example (e.g.), all the content is to be covered but candidates are to be assessed on more than 50% of the content prescribed for that grading criterion. Where bullets are present, marks allocated for the criterion should be equally distributed. Where 'or' is present, only one of the listed items should be assessed. Where an 'N.B.' is present, important information regarding the assessment is given.

Where the plural is used in grading criteria (e.g. types, aspects, etc.), at least two answers are expected. Unless indicated otherwise in the unit content, when assignments are written, the criteria assessed should build on each other.

In each grading criterion there is a command verb which determines the type of answers expected by the student, such as list, identify, outline, describe, explain, etc... These verbs are defined in the glossary of verbs available on the MATSEC website. It is of vital importance that the command verbs specified in the grading criteria remain unchanged in the assignment brief.

## Unit 1: Plant and Soil Science

Unit 1	Plant and Soil Science
<p><b>Unit Description</b></p>	<p>Horticulture consists of the science, technology and business involved in the cultivation of fruit, vegetables, grapevines, olives, and other similar crops.</p> <p>Candidates will be introduced to plant morphology and life cycles. In this unit candidates will also understand the basics of horticultural production and trends.</p> <p>In addition, candidates will become familiar with plant nutrient requirements and fertilisation together with the common soil types, the basics of soil sampling and simple soil analysis techniques.</p>

### Learning Outcomes

#### At the end of the unit, I can:

- LO 1.** Demonstrate an understanding of the life cycle and morphologies of different organs of crop/ornamental plants' roots and shoot systems.
- LO 2.** Demonstrate an understanding of Health and Safety in agribusiness.
- LO 3.** Undertake a season's growth of different groups of vegetables.
- LO 4.** Apply a suitable fertiliser using the appropriate technique.
- LO 5.** Demonstrate an understanding of the purpose and methods used for soil analysis.
- LO 6.** Demonstrate an understanding of the soil factors which contribute to healthy plant growth.

## Unit Content

Subject Focus	The plant body
LO 1.	Demonstrate an understanding of the life cycle and morphologies of different organs of crop/ornamental plants' roots and shoot systems.
K-1.	Main organs of a typical flowering plant: e.g. stem, root, leaf, fruit, flower, seed.
	Organs of crop/ornamental plants' roots and shoot systems: e.g. stem, root, leaf, fruit, flower, seed, flower bud, apical bud.
	Specialised versions of crop/ornamental plants' organs: e.g. rhizomes (underground stems), stem tubers, root tubers, apical/apex bud, lateral/axillary buds, lateral roots, tap root.
K-2.	Plant cell components: e.g. cell wall, cell membrane, nucleus, cytoplasm, vacuole, mitochondria, chloroplasts.
	Transport systems in monocots and dicots: xylem; phloem.
K-3.	Stages of a crop lifecycle: germination; flowering; pollination; fruiting; seed dispersal.
C-1.	<b>N.B.</b> For assessment purposes, <b>TWO</b> leaves of each type should be classified.
	Microscopy: monocot leaf cross-section <b>and/or</b> monocot stem cross-section <b>and/or</b> monocot root cross-section <b>and/or</b> dicot leaf cross-section <b>and/or</b> dicot stem cross-section <b>and/or</b> dicot root cross-section. <b>N.B.</b> For assessment purposes, <b>TWO</b> plants based on microscopy results should be explained.
	Morphology: external structure of a leaf; external structure of rooting system; internal seed structure; flower structure.

Subject Focus	Health and Safety
LO 2.	Demonstrate an understanding of Health and Safety in agribusiness.
K-4.	Hazards and risks in a crop production enterprise: <ul style="list-style-type: none"> <li>• Hazards: e.g. sharp objects and biohazards, tools and machinery, fuel, electricity, direct sunlight, not wearing the appropriate PPEs, pesticides and fertilisers, lifting heavy objects, dust;</li> <li>• Risks: e.g. cuts, burns, infections, poisoning, electric shock, heat stroke, back injury, eye irritation, respiratory problems.</li> </ul>
	Information needed when calling for help in an emergency: emergency number; location of accident; number of people involved; description of the accident/injuries involved.
	Reasons for maintaining Health and Safety measures: ensure safe working conditions; legal obligations.

<b>C-2.</b>	Preventive measures for maintaining a safe work environment: availability of personal protective equipment; training in Health and Safety on the workplace; perform a risk assessment; minimise hazards to the minimum.
	First Aid box items: sterile adhesive dressings; triangular bandages; safety pins; sterile un-medicated dressings; sterile eye wash; surgical gloves; roller bandages; personal protection shield for artificial breathing; gauze pads; scissors.
	Dealing with injuries: e.g. <ul style="list-style-type: none"> <li>• Burn: cool burn; apply sterile dressing,</li> <li>• Cut: apply pressure on the area; apply sterile dressing,</li> <li>• Poisoning: notice symptoms; notice consciousness,</li> <li>• Electric shock: do not touch person; if possible turn off source of electricity,</li> <li>• Heat stroke: take reading of body temperature; apply cool water,</li> <li>• Eye irritation: avoid rubbing eyes; flush with cool water.</li> </ul>

<b>Subject Focus</b>	<b>Growing vegetables</b>
<b>LO 3.</b>	Undertake a season’s growth of different groups of vegetables.
<b>K-5.</b>	Crop types: leafy crops; fruiting crops; tuberous crops; grains.
	Crop production types: outdoor soil-based (geoponic) crop production; greenhouse soil-based (geoponic) production; hydroponic crop production; aquaponic crop production; organic crop production.
<b>K-5.</b>	Production requirements: soil/media requirements; planting method and spacing; irrigation system and intensity; general crop care from planting to harvesting.  <b>N.B.</b> For assessment purposes, <b>ONE</b> of the following crops should be considered: lettuce <b>or</b> cabbage <b>or</b> spinach <b>or</b> tomatoes <b>or</b> zucchini <b>or</b> broad beans <b>or</b> citrus <b>or</b> potatoes <b>or</b> onions <b>or</b> garlic <b>or</b> wheat.
<b>K-6.</b>	Market actors: agribusiness entrepreneur; producer; processors/manufacturers; wholesaler/agent/distributor; consumer.
<b>C-3.</b>	Justifying the harvest date deviation of a crop: lettuce <b>or</b> cabbage <b>or</b> spinach <b>or</b> tomatoes <b>or</b> zucchini <b>or</b> broad beans <b>or</b> wheat <b>or</b> potatoes <b>or</b> onions <b>or</b> garlic.  <b>N.B.</b> For assessment purposes, <b>THREE</b> options of harvest date deviations should be provided by the assessor, out of which the candidate should choose and justify <b>ONE</b> for a given crop in a given scenario.
	Sales agreements: online <b>and/or</b> contractual <b>and/or</b> by order <b>and/or</b> retail.  <b>N.B.</b> For assessment purposes, <b>TWO</b> of the following customer scenarios should be provided by the assessor: end consumer <b>and/or</b> processor <b>and/or</b> wholesaler <b>and/or</b> hospitality industry.
	Crop production strategy: diversity of crops <b>and/or</b> variety of crops <b>and/or</b> quantity of crops <b>and/or</b> production method <b>and/or</b> price.  <b>N.B.</b> For assessment purposes, <b>TWO</b> of the above aspects, or other valid ones, should be considered by the candidate as a basis for justifying the crop production strategy.

A-1.	Drip irrigation system for a specific land area: attaching drip tape in the correct orientation; laying of drip tape; sealing off the drip tape.
	Calculating the number of seeds/plants: calculating area of plot; establishing spacing; calculating the number of seeds/plants needed according to respective spacing.
	Sowing seeds or transplanting seedlings: depth; spacing; sealing off; irrigation. <b>N.B.</b> For assessment purposes, a minimum area of 25 m <sup>2</sup> should be utilised for this criterion at all MQF levels.
A-2.	Tools and Health and Safety equipment to produce a plant: <ul style="list-style-type: none"> <li>• Tools: e.g. trowel, pocket knife, dibber, pruning shears;</li> <li>• Personal protective equipment: safety shoes/wellingtons; garden gloves; overalls.</li> </ul>
	Routine work for the production of a plant: e.g. de-weeding, regular irrigation, addition of fertiliser.
	Plant nursery activities: preparation and sowing of a full seed tray seeded with one plant species; tray tag marking and watering; repotting from a seed tray/smaller pot to a larger pot; maintain the plant to maturity. <b>N.B.</b> For assessment purposes at MQF 3, only ornamentals plants are to be considered.

Subject Focus	Soil fertility
LO 4.	Apply a suitable fertiliser using the appropriate technique.
K-7.	Crop requirements: leaf growth; fruit turgidity; healthy flowering and fruiting; healthy rooting. <b>N.B.</b> For assessment purposes, the following macronutrients should be considered: Nitrogen; Phosphorus; Potassium; Calcium; Magnesium; Sulfur.
	Deficiency symptoms: e.g. total leaf chlorosis of older leaves (N), leaf purpling (P), leaf margin necrosis (K), deformed/stunted new leaves (Ca), interveinal chlorosis of older leaves (Mg), interveinal chlorosis on new leaves (Fe), necrotic spots on new leaves (Zn), total leaf chlorosis on new leaves (S), necrosis of shoot tips (B).
K-8.	Manure types commonly used in the Maltese islands: cattle manure; goat and sheep manure; rabbit manure; poultry manure.
	Advantages and disadvantages of using manure in vegetable production: <ul style="list-style-type: none"> <li>• Advantages: e.g. nutrients, humus, improving soil texture;</li> <li>• Disadvantages: e.g. pathogens and weeds, nutrient leaching, storage difficulties.</li> </ul>
	Storage and application requirements of manure according to the Nitrates Action Program: covered manure clamp; connected to cesspit; application prohibited between 15th October to 15th March; maximum amount 170kg N/ha.
A-3.	Choosing the correct fertiliser: type of fertiliser; nutrient content; frequency of application.
	Preparation of fertiliser: correct dosage; application media.
	Applying the proper fertiliser: identification of deficiency; correct use of PPE; application; record keeping of fertiliser application.



Subject Focus	Soil analysis
LO 5.	Demonstrate an understanding of the purpose and methods used for soil analysis.
K-9.	Tools for taking soil samples: e.g. auger/hand drill, spade, bucket/labelled bag.
	Commonly measured parameters in soil and water analysis: e.g. pH, sodium, chloride, nitrates, phosphorus, potassium, electrical conductivity.
	Importance of analysing soil and water parameters: suitability of irrigation water; selection of crop; appropriate fertilisation; meeting crop requirements.
C-4.	Sampling soil: zig-zag pattern; depth of sample.
	Parameters: <ul style="list-style-type: none"> <li>• Water/Soil pH;</li> <li>• Water/Soil Conductivity;</li> <li>• Nitrogen;</li> <li>• Phosphorus;</li> <li>• Potassium.</li> </ul>

Subject Focus	Soil properties
LO 6.	Demonstrate an understanding of the soil factors which contribute to healthy plant growth.
K-10.	Maltese soil types: calcisols; leptosols; luvisols; arenosols.
	Soil texture: sandy; clayey; silty; loam.
C-5.	Activities: e.g. mulching, tilling, fertilisation, addition of manure, crop rotation, soil solarisation.
	Biotic and abiotic soil factors: <ul style="list-style-type: none"> <li>• Biotic: e.g. earthworms, pathogenic and saprotrophic microorganisms, pests;</li> <li>• Abiotic: e.g. pH, soil water, soil texture, soil structure, soil temperature, organic matter, porosity, drainage.</li> </ul>

**N.B.** No marks should be awarded in any application criteria unless candidates are wearing all appropriate clothing and PPE (including gloves when using hand tools) during practical work, and Health and Safety practices are strictly abided-to!

## Learning Outcomes and Assessment Criteria

<b>Subject Focus:</b>	<b>The plant body</b>
<b>Learning Outcome 1:</b>	Demonstrate an understanding of the life cycle and morphologies of different organs of crop/ornamental plants' roots and shoot systems.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-1. Identify main organs of a typical flowering plant.	K-1. Label different organs of crop/ornamental plants' roots and shoot systems.	K-1. Label different specialised versions of different crop/ornamental plants' organs.						
<b>K-2. Label the different plant cell components.</b>	<b>K-2. Identify the different transport systems in monocots and dicots.</b>	<b>K-2. Describe the functions of the transport system and plant cell components.</b>	<b>C-1. Classify leaves into monocotyledons and dicotyledons.</b>	<b>C-1. Explain whether plants are monocotyledon or dicotyledon based on the results of microscopy.</b>	<b>C-1. Differentiate between the morphologies of monocotyledon and dicotyledon crops/ ornamental plants.</b>			
<b>K-3. Name the stages of the life cycle of a named crop species.</b>	<b>K-3. Organise the stages of the life cycle of a named crop species.</b>	<b>K-3. Outline the stages of the life cycle of a named crop species.</b>						

<b>Subject Focus:</b>	<b>Health and Safety</b>
<b>Learning Outcome 2:</b>	Demonstrate an understanding of Health and Safety in agribusiness.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b><i>K-4. Match different types of risks with hazards in a crop production enterprise.</i></b>	<b><i>K-4. List the information needed when calling for help in an emergency.</i></b>	<b><i>K-4. State reasons for maintaining Health and Safety measures in crop production enterprise.</i></b>	C-2. Outline preventive measures required for maintaining a safe work environment in a crop production enterprise.	C-2. Describe the use of different items that should be present in a First Aid box according to legislation.	C-2. Explain ways of dealing with particular injuries.			

<b>Subject Focus:</b>	<b>Growing vegetables</b>
<b>Learning Outcome 3:</b>	Undertake a season’s growth of different groups of vegetables.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-5. Identify different crop types.	K-5. Outline different crop production types.	K-5. Describe the production requirements of one named crop.	C-3. Justify a harvest date deviation of a given crop.	C-3. Justify the appropriate sales agreement/s to be established with given customers.	C-3. Justify a crop production strategy for a given scenario.	A-1. Follow instructions to set up a drip irrigation system for a specific land area.	A-1. Calculate the number of seeds/plants of a single crop needed for a specific land area.	A-1. Sow/transplant the number of a plant/seeds needed for a specific land area according to your calculations.
<b><i>K-6. Define the term market in relation to agribusiness.</i></b>	<b><i>K-6. Define the terms demand and supply in relation to agribusiness.</i></b>	<b><i>K-6. Describe the role of different market actors.</i></b>				A-2. Use the required agricultural tools and personal protective equipment to produce a plant.	A-2. Practice routine work that is required for the production of a plant.	A-2. Practice routine plant nursery activities.

<b>Subject Focus:</b>	<b>Soil fertility</b>
<b>Learning Outcome 4:</b>	Apply a suitable fertiliser using the appropriate technique.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-7. Define plant macronutrients and micronutrients.</b>	<b>K-7. Select the appropriate macronutrient/s for specific crop requirements.</b>	<b>K-7. Relate different deficiency symptoms to the missing nutrient/s causing them.</b>						
K-8. List the different types of manure commonly used in the Maltese islands.	K-8. Outline the advantages and disadvantages of manure use in vegetable production.	K-8. Describe the storage and application requirements of manure according to the Nitrates Action Program.				A-3. Choose the correct fertiliser for a specific objective.	A-3. Prepare the correct fertiliser for a specific crop.	A-3. Apply the proper fertiliser using appropriate Health and Safety equipment.

<b>Subject Focus:</b>	<b>Soil analysis</b>
<b>Learning Outcome 5:</b>	Demonstrate an understanding of the purpose and methods used for soil analysis.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-9. List the tools required to take soil samples.</b>	<b>K-9. List the most commonly measured parameters in soil and water analysis.</b>	<b>K-9. Outline the importance of measuring soil and water parameters.</b>	C-4. Explain how a soil sample is taken.	C-4. Analyse the results of soil and water samples for electrical conductivity and pH using simple lab procedures.	C-4. Justify the selection of plants that are the most suitable for specific soil and water parameters according to the results of a soil/water sample.			

<b>Subject Focus:</b>	<b>Soil properties</b>
<b>Learning Outcome 6:</b>	Demonstrate an understanding of the soil factors which contribute to healthy plant growth.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-10. Define soil fertility.</b>	<b>K-10. Outline different Maltese soil types.</b>	<b>K-10. Relate soil texture to water and nutrient availability.</b>	<b>C-5. Distinguish between biotic and abiotic soil factors.</b>	<b>C-5. Explain activities which can improve soil fertility.</b>	<b>C-5. Describe how biotic and abiotic soil factors can affect plant growth.</b>			

## Assessment Criteria

Assessment criteria provide guidance on how the candidates will be assessed in order to ensure that the learning outcomes have been achieved.

To achieve each outcome a candidate must satisfy the assessment criteria listed in the previous table. The assessment criteria which will be assessed in the controlled assessment have been highlighted.

## Scheme of Assessment

Assignment Number	Assignment Type	Percentage distribution
1	Coursework	26 - 34%
2	Coursework	26 - 34%
3	Controlled	38 - 42%

## Distribution of Marks

Criteria	MQF Level 1 Marks	MQF Level 2 Marks	MQF Level 3 Marks	Totals
Knowledge	1	1	2	4
Comprehension	2	2	2	6
Application	3	3	4	10

## Unit 2: Aquatic and Land Based Production

Unit 2	Aquatic and Land Based Production
<p><b>Unit Description</b></p>	<p>The objective of this unit is to build upon the land-based production knowledge, skills and competences covered in Unit 1 and introduce new concepts on aquatic production.</p> <p>Through this unit candidates will be introduced to basic fish care techniques. They will be given an overview of the morphology and nutritional requirements of different fish species together with fish diseases and disorders, their prevention, and cure.</p> <p>Furthermore, in this unit candidates will become familiar with the major physiological processes of plants such as germination, photosynthesis and transpiration. The major tasks required for vegetable cultivation and propagation will also be tackled.</p>

### Learning Outcomes

**At the end of the unit, I can:**

- LO 1.** Demonstrate an understanding of the morphology and nutritional requirements of different fish species.
- LO 2.** Undertake proper fish husbandry tasks to prevent and cure diseases and correct disorders.
- LO 3.** Describe the main processes of plant physiology.
- LO 4.** Conduct post-harvesting processes according to marketing standards.
- LO 5.** Explain the propagation requirements and growth media for different plants.



## Unit Content

Subject Focus	Different fish and fish diets
LO 1.	Demonstrate an understanding of the morphology and nutritional requirements of different fish species.
K-1.	Fish species: e.g. goldfish <b>or</b> koi, cardinal tetra <b>or</b> angel fish, tilapia <b>or</b> a dwarf African cichlid, molly <b>or</b> guppy, sea bream <b>or</b> tuna, clown fish <b>or</b> damsel fish.
	Fish morphology: <ul style="list-style-type: none"> <li>• Internal: e.g. skeleton, swim bladder, heart, gills, brain, intestines, reproductive organs, stomach, urinary bladder;</li> <li>• External: e.g. head, dorsal fin, caudal fin, pelvic fin, pectoral fin, anal fin, scales, lateral line, anus.</li> </ul>
	Fish habitats: e.g. cold fresh water, tropical planted fresh water, tropical stone-scape fresh water, brackish, marine Mediterranean, marine tropical.
K-2.	Nutrients required for fish growth: e.g. proteins, carbohydrates, fat, fibre, vitamins, minerals.
	Feeds used in fish husbandry: live feed; dry feed; fresh feed; frozen feed.
C-1.	Importance of live feed in fry/larva: size of fish mouth; instinct.
	Life stages and nutritional requirements: <ul style="list-style-type: none"> <li>• Life stages: e.g. larva/fry, juvenile, adult;</li> <li>• Nutritional requirements: e.g. proteins, carbohydrates, fats.</li> </ul>
	Feeds for healthy fish growth: daphnia <b>and/or</b> artemia <b>and/or</b> rotifers <b>and/or</b> flakes <b>and/or</b> pellets <b>and/or</b> granules <b>and/or</b> molluscs <b>and/or</b> fish by-products. <b>N.B.</b> For assessment purposes, <b>ONE</b> of the following fish species should be considered: sea bream <b>or</b> tuna <b>or</b> African dwarf cichlids <b>or</b> angel fish.

Subject Focus	Maintaining fish
LO 2.	Undertake proper fish husbandry tasks to prevent and cure diseases and correct disorders.
K-3.	<p>Fish health problems: e.g. fin rot, fish pop eye, lateral line disease, noda virus, fungus, swim bladder disease, ich, intestinal worms/nematodes, genetic disorders.</p> <p><b>N.B.</b> For assessment purposes at MQF 3, the question should be limited to <b>TWO</b> fish health problems only.</p>
K-4.	<p>Basic accessories in setting up a typical aquarium or tank: heater/chiller; water pump; air pump; filter.</p> <p>Décor and lighting components: e.g. substrate, rocks, live plants, artificial plants, basic decorative lighting, specialized lighting.</p> <p>Tank and cage requirements:</p> <ul style="list-style-type: none"> <li>• Tank requirements for ornamentals: e.g. size, temperature, salinity, type of filtration, light, décor;</li> <li>• Cage requirements for edibles: size; location.</li> </ul> <p><b>N.B.</b> For assessment purposes, the following fish should be used at MQF 3: neon tetras <b>or</b> gold fish <b>or</b> corydoras <b>or</b> dwarf African cichlids <b>or</b> molly <b>or</b> guppy <b>or</b> clown fish <b>or</b> damsel fish <b>AND</b> sea bream <b>or</b> blue fin tuna.</p>
C-2.	<p>Justification of aquarium size in terms of: fish size; aggression.</p> <p><b>N.B.</b> For assessment purposes, the following fish species should be considered: koi/goldfish <b>or</b> dwarf African cichlids <b>or</b> tilapia <b>or</b> angel fish <b>or</b> mollies/guppies <b>or</b> tetras <b>or</b> clown fish.</p> <p>Benefits of a water change: reduction of nitrogenous pollutants; replenish trace minerals; control water clarity; removal of decomposing organic material.</p> <p>Aquarium décor in relation to fish health: e.g. substrate, rocks, plants.</p>
A-1.	<p>Setting-up suitable life supporting equipment for selected fish requirements: filtration and aeration; temperature control; décor and lighting.</p> <p>Preparation of aquarium: set water conditions for selected fish; set-up nitrogen cycle; test chemical levels.</p> <p>Routine tasks in maintaining and up-keeping a fish tank: switch off electrical supply to tank; wear non-slip shoes; wash hands; handle chemicals with care; feeding; water changes; water testing; cleaning of glass; monitoring and recording fish health; monitoring and recording the overall set-up.</p>

<b>Subject Focus</b>	<b>Plant control and protection</b>
<b>LO 3.</b>	Describe the main processes of plant physiology.
<b>K-5.</b>	Processes by which water travels through soil: infiltration; capillary action.
	Plant structures: rooting system; xylem.
	Transpiration process: osmosis; water uptake by roots; water travels up through xylem; water reaches leaves; water evaporates and transpires into the atmosphere through stomata.
<b>K-6.</b>	Factors affecting the rate of photosynthesis: light intensity; carbon dioxide concentration; temperature; water availability.
	External stimuli: light direction; gravity.
<b>K-7.</b>	Plant health problems: e.g. aphids, thrips, leaf miners, nematodes, cutworms, caterpillars, fruit fly, white fly, snails/slugs, scale insects, early blight, late blight, rust, downey mildew, powdery mildew, mosaic virus, blossom end rot, red spider mite.
<b>C-3.</b>	Modifications to the environment in a protected cultivation: e.g. light, heat, humidity.
	Irrigation systems characteristics: e.g. drip, sprinkler, mister/fogger.
	Using light or temperature to control the following plant processes: e.g. germination, growth rate, flowering.
<b>C-4.</b>	Plant protection products: synthetic chemicals; chemicals derived from natural products; biological; cultural.
	Good practice in applying plant protection measures: e.g. use of PPE, keeping records, application during favourable weather, observe recommendations on label, respect pre-harvest time window, check for compatibility issues.
	General principles of Integrated Pest Management (IPM): pest monitoring; deciding pest threshold; planning of control tactics; plant protection methods.

Subject Focus	Post-harvest practices
LO 4.	Conduct post-harvesting processes according to marketing standards.
K-8.	Factors that contribute towards spoilage and decay: heat; humidity; poor hygiene; unsuitable storage/transportation media.
	Practices that slow down spoilage and decay: reduction in time from harvest to storage/packaging; rapid reduction in temperature; suitable storage; good hygiene.
	Suitable packaging for different products: e.g. lettuce, carrots, potatoes, herbs, soft fruits, garlic.
C-5.	Post-harvesting processes: grading; cleaning/processing; packaging; labelling.
	Evaluation of product presentation: grading; cleaning/processing; packaging; labelling. <b>N.B.</b> For assessment purposes, marks for evaluation should be awarded only if conclusions are supported by valid arguments.
A-2.	Grading a clean product: colour; deformations; damages; size; firmness.
	Packaging and storage conditions: size of packaging; material of packaging; storage temperature.
	Presentation of a packaged product: cleanliness (subjective to product type); labelling; branding; creativity (packaging).

Subject Focus	Producing new plants
LO 5.	Explain the propagation requirements and growth media for different plants.
K-9.	Types of germination: epigeal; hypogeal.
	Ideal conditions for propagation: sheltering; water availability; temperature/humidity; free from pathogens/pests, suitable growing medium.
	Propagation techniques: e.g. seeding, stem cutting, stem tuber cutting, rhizome cutting, grafting, layering, runners, bulb, leaf.
K-10.	Growing media used for plant propagation and growth: e.g. peat, compost, coconut coir, soil, expanded clay, rockwool®, vermiculite, perlite, horticultural sand.
	Applications of growing media in horticulture: open field production; production of seedlings; hydroponics; ornamental planting in pots.
	Characteristics of growing medium: water drainage; pathogen/pest free; nutrient-holding capacity; aeration.

**A-3.**

Procedure to propagate a plant by cuttings: selection of healthy mother plant; suitable season for plant of choice; sterilisation/cleaning of tools; selection of branches for good cuttings; selection of suitable point on the branch for viable cutting; clean cutting at correct angle.

Procedure to graft a plant: suitable season for plant of choice; suitable grafting technique for plant of choice; selection of suitable rootstock and scion; cutting of root stock stem; preparation of scion according to grafting method; grafting and sealing of root stock with scion.

Maintenance to produce a viable propagated plant:

- Cuttings: suitable growing medium; use of rooting powder; regular watering; inspection for signs of pathogens/pests;
- Graft: monitor graft wound; removal of shoots emerging from rootstock; inspection for signs of pathogens/pests; removal of any materials used to protect graft on success.

***N.B.*** No marks should be awarded in any application criteria unless candidates are wearing all appropriate clothing and PPE (including gloves) during practical work, and Health and Safety practices are strictly abided-to!

## Learning Outcomes and Assessment Criteria

<b>Subject Focus:</b>	<b>Different fish and fish diets</b>
<b>Learning Outcome 1:</b>	Demonstrate an understanding of the morphology and nutritional requirements of different fish species.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-1. Match fish species to their respective habitat.</b>	<b>K-1. Label the general morphology of a typical fish.</b>	<b>K-1. Outline various fish habitats in terms of salinity and temperature.</b>	C-1. Describe the importance of using live feed in fry/larva.	C-1. Explain why fish have different nutritional requirements at specific life stages.	C-1. Select feeds for healthy fish growth at different life stages of a given species.			
K-2. List the nutrients required for fish to grow.	K-2. Describe the different feeds used in fish husbandry.	K-2. Outline the roles of various nutrients for healthy fish growth.						

<b>Subject Focus:</b>	<b>Maintaining fish</b>
<b>Learning Outcome 2:</b>	Undertake proper fish husbandry tasks to prevent and cure diseases and correct disorders.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-3. List the most common fish health problems.	K-3. Outline the symptoms of the most common fish health problems.	K-3. Identify a correct treatment procedure to control fish health problems.	C-2. Justify aquarium size to a given fish species.	C-2. Explain the benefits of water change of a fish tank.	C-2. Discuss the importance of the right aquarium décor in relation to fish health.	A-1. Set-up an aquarium with the necessary life supporting equipment according to the selected fish requirements.	A-1. Prepare the aquarium to make it suitable to host fish.	A -1. Perform routine tasks in the maintenance and upkeep of a fish tank taking into consideration Health and Safety aspects.
K-4. Outline the use of basic accessories required in setting up a typical aquarium or tank.	K-4. Outline the need for décor and lighting components in the setting up of an aquarium.	K-4. Describe the tank and cage requirements of an ornamental and an edible fish species.						

<b>Subject Focus:</b>	<b>Plant control and protection</b>
<b>Learning Outcome 3:</b>	Describe the main processes of plant physiology.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-5. List the processes by which water travels through soil.</b>	<b>K-5. Describe the plant structures that are involved in the intake and internal transport of water and soil nutrients.</b>	<b>K-5. Outline the process by which water travels from soil to the atmosphere via transpiration.</b>	<b>C-3. Explain how the environment can be modified in a protected cultivation.</b>	<b>C-3. Compare the characteristics of various irrigation systems.</b>	<b>C-3. Discuss how light or temperature can be used to control plant processes in horticulture.</b>			
<b>K-6. Define photosynthesis.</b>	<b>K-6. Describe the factors affecting the rate of photosynthesis.</b>	<b>K-6. Describe how a plant reacts to external stimuli to maximise photosynthesis.</b>						
<b>K-7. List the most common plant health problems.</b>	<b>K-7. Identify a plant health problem for a given specific symptom/s.</b>	<b>K-7. Describe a suitable treatment required to cure a plant health problem.</b>	<b>C-4. Distinguish between different types of plant protection products.</b>	<b>C-4. Discuss good practice when applying plant protection measures.</b>	<b>C-4. Explain the general principles of Integrated Pest Management (IPM).</b>			



<b>Subject Focus:</b>	<b>Post-harvest practices</b>
<b>Learning Outcome 4:</b>	Conduct post-harvesting processes according to marketing standards.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-8. List the factors that contribute towards natural product spoilage and decay.</b>	<b>K-8. Outline practices that slow down the process of natural product spoilage and decay.</b>	<b>K-8. Describe suitable packaging for different products.</b>	C-5. Outline the importance of keeping suitable levels of hygiene in post-harvesting processes.	C-5. Explain post-harvest processes required to present the product on the market.	C-5. Evaluate the presentation of a purchased fresh product.	A-2. Grade a clean product according to market needs.	A-2. Place the product in the appropriate packaging and storage conditions for retail.	A-2. Present a packaged product which is attractive to the consumer.

<b>Subject Focus:</b>	<b>Producing new plants</b>
<b>Learning Outcome 5:</b>	Explain the propagation requirements and growth media for different plants.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-9. Mention the different types of germination.</b>	<b>K-9. Outline different conditions required for optimum propagation of plants.</b>	<b>K-9. Describe different propagation techniques used for different plants.</b>				A-3. Use the correct procedure to propagate a plant by cuttings.	A-3. Use the correct procedure to graft a plant.	A-3. Maintain a number of cuttings and grafts to produce a viable propagated plant.
K-10. List different growing media used for plant propagation and growth.	K-10. State suitable growing media for different applications in horticulture.	K-10. Outline characteristics of a selected growing medium used in horticulture.						

## Assessment Criteria

Assessment criteria provide guidance on how the candidates will be assessed in order to ensure that the learning outcomes have been achieved.

To achieve each outcome a candidate must satisfy the assessment criteria listed in the previous table. The assessment criteria which will be assessed in the controlled assessment have been highlighted.

## Scheme of Assessment

Assignment Number	Assignment Type	Percentage distribution
1	Coursework	26 - 34%
2	Coursework	26 - 34%
3	Controlled	38 - 42%

## Distribution of Marks

Criteria	MQF Level 1 Marks	MQF Level 2 Marks	MQF Level 3 Marks	Totals
Knowledge	1	1	2	4
Comprehension	2	2	2	6
Application	3	3	4	10

## Unit 3: Rabbit Care and Genetics

Unit 3	Rabbit Care and Genetics
<p><b>Unit Description</b></p>	<p>The breeding of rabbits is considered as a key agribusiness sector in Malta. Rabbit is an important ingredient in Maltese cuisine and also a very popular pet.</p> <p>This unit will assist candidates to become familiar with the care required in the breeding of rabbits. An insight of the origin, history and process of domestication of rabbits shall be provided.</p> <p>Candidates will explore the requirements for breeding rabbits in terms of feed, water and micro-climatic conditions. They shall be exposed to specific housing requirements and equipment, and will also be guided in considering the economic significance and production features of different breeds and hybrids of rabbits.</p> <p>Through this unit, candidates shall be exposed to rabbit morphology, reproduction, physiology, genetics, specific diseases, disorders and their treatment.</p>

### Learning Outcomes

#### At the end of the unit, I can:

- LO 1.** Demonstrate an understanding of the biology and genetic principles of rabbit production.
- LO 2.** Maintain the right environment for rabbit husbandry.
- LO 3.** Use adequate preventive and curative measures for healthy rabbit growth.
- LO 4.** Explain the reproductive phases and breeding of rabbits.
- LO 5.** Demonstrate an understanding of the ways rabbits can be processed to enhance revenues of a rabbit farm.

## Unit Content

Subject Focus	Rabbit biology
LO 1.	Demonstrate an understanding of the biology and genetic principles of rabbit production.
	Levels of organisation in a living organism: cells; tissues; organs; systems.
K-1.	Rabbit's key organs: e.g. heart (circulation), lungs (gaseous exchange), kidneys (excretion), liver (metabolism), stomach (digestion), caecum (fermentation), intestines (digestion and absorption), brain (coordination), blood (blood circulation & immunity).
K-2.	Rabbit's main body systems: e.g. circulatory system, respiratory system, excretory system, digestive system, nervous system, immune system.
	Accessory structures: e.g. veins, arteries, capillaries, trachea, bronchi, alveoli, ureter, urinary bladder, urethra, mouth, oesophagus, pancreas, gall bladder, rectum, anus, spinal cord, nerves, lymphatics.
K-3.	<p>Common rabbit breeds:</p> <ul style="list-style-type: none"> <li>• Meat Market: New Zealand White; Californian;</li> <li>• Pet/Fur: Netherland dwarf; Lionhead; Flemish giant; Rex; Angora.</li> </ul> <p>Features related to breeding purpose:</p> <ul style="list-style-type: none"> <li>• Meat Market: rapid growth and maturation; high muscle to bone ratio;</li> <li>• Pet/Fur: long life span; dense and homogenous coat.</li> </ul>
K-4.	Features of sexual reproduction: male and female parents; formation of gametes; fertilisation; genetically unique off-spring.
C-1.	<p>Blood components: red blood cells; white blood cells; plasma; platelets.</p> <p>Interaction of the circulatory system with another system: the respiratory system <b>or</b> the excretory system <b>or</b> the digestive system <b>or</b> the nervous system <b>or</b> the immune system.</p>
C-2.	<p>Types of genotypes: homozygous dominant; homozygous recessive; heterozygous; co-dominance.</p> <p>Distribution of traits in F1 and F2 using genetic diagrams: genetic cross diagram <b>or</b> punnet square diagram.</p>

Subject Focus	Rabbit husbandry
LO 2.	Maintain the right environment for rabbit husbandry.
K-5.	Stages of commercial rabbit husbandry: kit; weaning; fattening; adult/parent stock.
	Equipment necessary to maintain adequate microclimatic conditions: extractors; fans; heaters/chillers; lighting system.
	Favourable microclimatic conditions for growing rabbits: quality of air/ventilation; temperature; lighting; humidity.
K-6.	Feeds: e.g. weaning feed, fattening feed, medicated feed, doe feed, maintenance feed, pet rabbit feed.
	Given nutrients: proteins; carbohydrates; fibre; fat.
C-3.	Housing/cage requirements of meat and pet/show rabbits: size; flooring; presence/absence of nest box; presence/absence of bedding.
	Equipment used for commercial and domestic rabbit keeping: <ul style="list-style-type: none"> <li>• Drinking/feeding: e.g. nipple drinkers, bowls, hoppers;</li> <li>• Cleaning: manure conveyor; power wash; simple hand tools; disinfecting (e.g. steam cleaner, flame).</li> </ul>
C-4.	Nutritional requirements of commercial and domestic rabbits: protein; carbohydrates; fibre; calcium requirements.
	Life stages of rabbits: weaning; fattening; lactating doe; resting does/bucks.
A-1.	Biosecurity measures: quarantine new life stock; administer and record vaccinations regularly; make use of disinfecting floor mats; do not share tools and equipment with other farms; be on the lookout and record signs of illness; keep tools and equipment clean. <b>N.B.</b> <i>The school should have a basic biosecurity protocol in place according to the exigencies of the farm. This protocol should be communicated to candidates and adhered to when undertaking rabbitry tasks.</i>
	Maintaining a clean and hygienic environment: cleaning of cages; removal of excrement and cleaning of floors; disinfection of drinker/feeder system.
	Routine tasks in a working rabbitry: feed rabbits; monitor livestock health; prepare and/or clean and inspect nesting boxes; record inspection of rabbitry equipment for wear and tear.

Subject Focus	Rabbit pests, diseases and disorders
LO 3.	Use adequate preventive and curative measures for healthy rabbit growth.
K-7.	Rabbit diseases and parasites: viral; bacterial; fungal; parasites (endo-parasites and ecto-parasites).
	Rabbit health conditions: e.g. coccidiosis, snuffles, myxomatosis, viral haemorrhagic disease, ear canker, buck teeth, sore hocks, malocclusion.
	Rabbit medicinal routes: oral-dissolving in water; medical feeds; injectable; topical; subcutaneous injectable.
C-5.	Unfavourable environmental conditions influencing rabbit health: quality of air/ventilation; temperature; lighting; humidity; noise.
	Treatment procedures to control most common diseases and disorders: <ul style="list-style-type: none"> <li>• Coccidiosis/snuffles: drugs and/or antibiotics;</li> <li>• Myxomatosis/viral haemorrhagic disease: culling;</li> <li>• Malocclusion/buckteeth: cutting the teeth with sharp pliers to the gums;</li> <li>• Sorehocks: applying disinfectants;</li> <li>• Mites and fleas: insecticidal spray/injection.</li> </ul>
	Preventive and biosecurity measures: e.g. cleaning, vaccinations, regular inspection, proper microclimatic and housing conditions, good record keeping, adequate feeding, clean and disinfect water system, good feed storage, farm disinfection.
A-2.	Rabbit health checklist: eyes; ears; teeth; nose; genitals; rear; tail; coat; paws; body temperature.
	Handling a rabbit: approaching; neck grab; weight support.
	Monitoring a rabbit's health condition: <ul style="list-style-type: none"> <li>• Free from disease, disorders and pests by checking: eyes; ears; teeth; nose; genitals; rear; tail; coat; paws; body temperature.</li> <li>• Normal appetite;</li> <li>• Vaccinations;</li> <li>• PPE: gloves and overall to protect against zoonoses and allergies.</li> </ul>

Subject Focus	Rabbit reproduction
LO 4.	Explain the reproductive phases and breeding of rabbits.
K-8.	Steps involved in a commercial rabbit breeding system: select parent stock; place doe in buck's cage for mating; place nest in doe's cage on the 24th day from mating; clean nest trays regularly; wean depending on breeding intensity.
	Behaviour and anatomical features of rabbits in relation to reproduction: <ul style="list-style-type: none"> <li>• Behaviour: <ul style="list-style-type: none"> <li>○ Males: spraying of urine;</li> <li>○ Females: assume lordosis;</li> </ul> </li> <li>• Anatomical features: <ul style="list-style-type: none"> <li>○ Males: well developed genitals;</li> <li>○ Females: vulva becomes red.</li> </ul> </li> </ul>
	Function of a rabbit's reproductive organs: <ul style="list-style-type: none"> <li>• Males: penis; testes; prostate; seminal vesicle; urethra;</li> <li>• Females: ovaries; vulva; uterus; cervix; vagina.</li> </ul>
A-3.	Examination of a rabbit: handling rabbit; positioning rabbit; identifying genitals.
	Features for the selection of commercial rabbits for breeding: <ul style="list-style-type: none"> <li>• General characteristics: animals having desirable traits; free from disease; good blood lines; does not have records showing defects/problems;</li> <li>• Males: at least six months old; in possession of robust and good muscular structure with well visible testes;</li> <li>• Females: between 4 kg and 4.5 kg; mother weans a good number of kits per litter.</li> </ul>
	Reproductive scheme for commercial rabbits: selection of parent stock; selection of breeding intensity; copulation; planning of kindling; preparation of nest; cleaning of nest upon kindling; counting of kits; weaning.

Subject Focus	The rabbit business
LO 5.	Demonstrate an understanding of the ways rabbits can be processed to enhance revenues of a rabbit farm.
K-9.	Different methods of rabbit slaughtering: stunning; dislocation; halal; striking.
	Presentation methods of rabbit meat: butchering; deboning; grounding; product creation (e.g. sausages, burgers, etc.).
K-10.	Factors to consider for establishing a market price: capital costs; running costs; competitors' price; consumers' willingness to pay; profit margin.

**N.B.** No marks should be awarded in any application criteria unless candidates are wearing all appropriate clothing and PPE (including gloves) during practical work, and Health and Safety practices are strictly abided-to!

## Learning Outcomes and Assessment Criteria

<b>Subject Focus:</b>	<b>Rabbit biology</b>
<b>Learning Outcome 1:</b>	Demonstrate an understanding of the biology and genetic principles of rabbit production.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-1. List the different levels of organisation in a living organism.</b>	<b>K-1. Label the rabbit's key organs.</b>	<b>K-1. Describe a main function of the rabbit's key organs.</b>	<b>C-1. Outline the major blood components.</b>	<b>C-1. Describe main functions of the blood components.</b>	<b>C-1. Discuss how the circulatory system interacts with another system.</b>			
K-2. List the rabbit's main body systems.	K-2. Match organ/s with the respective rabbit's body systems.	K-2. Associate named accessory structures with the rabbit's body systems.						
K-3. Identify the most common rabbit breeds.	K-3. Match rabbit breeds with their breeding purpose.	K-3. Describe features in relation to breeding purpose.						
<b>K-4. State the difference between sexual and asexual reproduction.</b>	<b>K-4. Define the terms DNA, gamete, gene, allele and chromosome.</b>	<b>K-4. Outline the main features of sexual reproduction.</b>						
			<b>C-2. Define F1 and F2 generations.</b>	<b>C-2. Distinguish between different types of genotypes.</b>	<b>C-2. Calculate the probability of different phenotypes in the F1 and F2 generations.</b>			



<b>Subject Focus:</b>	<b>Rabbit husbandry</b>
<b>Learning Outcome 2:</b>	Maintain the right environment for rabbit husbandry.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-5. Outline the stages of commercial rabbit husbandry.	K-5. List the equipment necessary to maintain adequate microclimatic conditions in a rabbitry.	K-5. Describe favourable microclimatic conditions for growing rabbits.	C-3. Describe housing/cage requirements of meat and pet/show rabbits in different stages of their lives.	C-3. Select the equipment that is used for commercial and domestic rabbit keeping.	C-3. Suggest changes that should be implemented in a given site to make it suitable for commercial rabbit production.			
<b>K-6. Define animal feed concentrate.</b>	<b>K-6. List the different feeds used in rabbit husbandry.</b>	<b>K-6. Outline the function of given nutrients for healthy rabbit growth.</b>	<b>C-4. Compare and contrast the nutritional requirements of commercial and domestic rabbits.</b>	<b>C-4. Describe the nutritional requirements of rabbits at different life stages.</b>	<b>C-4. Select particular feeds for healthy rabbit growth at different stages in commercial rabbit husbandry.</b>	A-1. Use the correct biosecurity protocol to undertake tasks in a rabbitry.	A-1. Maintain a clean and hygienic environment in a rabbit production unit.	A-1. Undertake routine tasks in a working rabbitry.

<b>Subject Focus:</b>	<b>Rabbit pests, diseases and disorders</b>
<b>Learning Outcome 3:</b>	Use adequate preventive and curative measures for healthy rabbit growth.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-7. Classify the different common rabbit diseases and parasites.</b>	<b>K-7. Relate rabbit health conditions to their cause.</b>	<b>K-7. Categorise different rabbit medicinal routes used for preventive and curative treatments.</b>	C-5. Outline how unfavourable environmental conditions influence overall rabbit health.	C-5. Identify the correct treatment procedure to control the most common rabbit diseases and disorders.	C-5. Discuss the proper preventive and biosecurity measures for different diseases, disorders and pests.	A-2. Prepare a checklist to be used during a rabbit health check.	A-2. Use the correct procedure in handling a rabbit.	A-2. Monitor a rabbit's health condition to assess current status using the appropriate PPEs.

<b>Subject Focus:</b>	<b>Rabbit reproduction</b>
<b>Learning Outcome 4:</b>	Explain the reproductive phases and breeding of rabbits.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b>K-8. List the steps involved in a commercial rabbit breeding system.</b>	<b>K-8. Outline a rabbits' behaviour and anatomical features in relation to reproduction.</b>	<b>K-8. Describe the function of a rabbit's reproductive organs.</b>				A-3. Examine a rabbit to determine its sex.	A-3. Select rabbits with the required features for commercial breeding.	A-3. Conduct a basic reproductive scheme for commercial rabbits.

<b>Subject Focus:</b>	<b>The rabbit business</b>
<b>Learning Outcome 5:</b>	Demonstrate an understanding of the ways rabbits can be processed to enhance revenues of a rabbit farm.

Knowledge Criteria			Comprehension Criteria			Application Criteria		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
<b><i>K-9. Identify the different methods of rabbit slaughtering.</i></b>	<b><i>K-9. Outline the process of skinning and eviscerating a slaughtered rabbit.</i></b>	<b><i>K-9. Describe the various methods of presenting rabbit meat to the consumer.</i></b>						
K-10. Define profit and loss.	K-10. List the factors that must be taken into consideration before establishing a market price.	K-10. Outline the factors that must be taken into consideration before establishing a market price.						

## Assessment Criteria

Assessment criteria provide guidance on how the candidates will be assessed in order to ensure that the learning outcomes have been achieved.

To achieve each outcome a candidate must satisfy the assessment criteria listed in the previous table. The assessment criteria which will be assessed in the controlled assessment have been highlighted.

## Scheme of Assessment

Assignment Number	Assignment Type	Percentage distribution
1	Coursework	26 - 34%
2	Coursework	26 - 34%
3	Controlled	38 - 42%

## Distribution of Marks

Criteria	MQF Level 1 Marks	MQF Level 2 Marks	MQF Level 3 Marks	Totals
Knowledge	1	1	2	4
Comprehension	2	2	2	6
Application	3	3	4	10

## Appendix 1 – Minimum Required Resources

These resources should be available for at least 16 candidates.

### General Requirements

- Preferably, minimum 2 tumuli of arable land and suitable for cultivation
- Greenhouse/propagation house
- Manure clamp
- Cesspit
- Storage for agricultural machinery
- Storage for fertiliser and pesticides
- Storage for fodder and animal feed
- Class room with interactive monitor or LCD projector
- Dressing rooms with lockers
- Toilets with shower
- Running water
- Adequate supply of second class water for irrigation

### Rabbitry

- Flat deck breeder cages
- Extractor
- Fly zapper
- Rabbit scales up to 10 kg
- Hygrometer + Thermometer
- Drainage system to cesspit
- Buffer tank 50 litres
- Light fixtures with timer
- Sink - with hot and cold water
- Rabbit cages with nest boxes, feeder and automatic nipple drinkers

### Fish Room

- Aquariums with capacity of 45 – 50 lit (volume of water) complete with light, filters and heater
- Aquariums with capacity of 110 – 130 lit (volume of water) complete with light, filters and heater
- Nano-quarantine/hospital tanks (15 – 20 lit)
- Hydrometer/salinometer
- Large breeders
- Aquarium thermometers
- Aquarium immersion heaters
- Water testing set
- Water testing strips cans
- Aquarium magnetic glass cleaners
- Airstones
- Airline elbows
- Airline tees
- Airline pressure regulators
- Airline non-return valves
- Aquarium submersible pump for water changes
- Air pumps
- Fish nets

## Tools and Machinery

- String trimmer
- Chainsaw
- Petrol transport tank
- Diesel transport tanks
- Irrigation pipe punch
- Battery operated sprayer
- Industrial bins
- Manual sulphurator
- Pesticide face mask
- Grass cutting apron
- Ear muffs
- Grass cutting visor
- Wheel burrow
- Watering can
- Chainsaw
- String trimmer
- Diesel rotovator
- Inter row cultivator
- 10-20L rotary fertiliser/seed spreader
- Shovel head hoe (zappun)
- Hoe (mgħażqa)
- Fork hoe
- Dibbers
- Riddle
- Rake
- Pruning shears (secateurs)
- Lopper
- Spades
- Garden trowels
- Grafter knife
- Pruning saws
- Sickles
- Folding hand saws
- Pocket knife
- Hammer
- Sledge hammer
- Side cutter
- Heavy duty craft knife
- Wire brushes
- Large shifting spanner
- Hack saw
- Screw drivers set
- Pliers
- Spanner set
- Allen keys
- Socket ratchet
- Heavy duty shelving
- Sack trolley
- Long nose pliers
- Adjustable spanner
- Drill bits

- Measuring tape
- Cordless hammer drill
- PVC pipe cutter
- Gas flame torch burner
- Flint spark lighter
- Refillable LPG cylinder

### **Irrigation System**

- Agricultural sprinklers (friefet)
- Drip tape
- Irrigation pipes and several fittings
- Ball valves
- Submersible/centrifugal irrigation pump and several fittings
- Adjustable fertiliser dozers or water powered dosers
- Irrigation timer

### **Scientific Apparatus**

- Soil testing kit
- pH soil/temp probe
- One piece regular soil auger
- Microscope slides\*
- USB microscope pack
- Iodine solution for testing for starch (photosynthesis)
- Simple potometer
- Digital balance
- Glass beakers
- Hand magnifiers
- Retort stands and clamps
- Glass rods
- Polyethene Wash bottles
- Beakers
- Petri dishes
- Filter papers
- Safety glasses
- Stainless steel spatulas
- Plastic test tube racks
- Wooden test tube holder
- Soda glass boiling tubes with rim
- Economy test tubes (16 x 100 mm)
- Gratnell trays
- Student Dissection Kit
- Borosilicate glass measuring cylinders
- Disposable Pasteur pipettes
- Glass funnels
- Conical flasks
- Test tubes brushes
- Hotplate
- Wire gauze
- Tripod
- Heat mat
- First Aid box

- Eye washing station
- Dicot flower model
- Fish model
- Chicken model
- Plant posters
- Handheld EC/TDS meter
- Handheld pH meter

*\*Root apical meristem*

- Shoot apical meristem
- Monocot root cross section
- Dicot root cross section
- Monocot stem showing vascular bundle
- Dicot stem showing vascular bundle
- Annual rings woody stem
- Dicot leaf cross section
- Lower epidermis (leaf) showing stomata
- Typical plant cell
- Sieve tube element phloem longitudinal section
- Cell division - mitosis
- Cell division - meiosis
- Parenchyma cells
- Collenchyma cells
- Sclerenchyma cells
- Xylem cells longitudinal section
- Root tip with hair roots
- Case to hold the slides

**Other Requirements**

- Fire alarm system
- Fire-fighting equipment
- Intruder alarm system
- Telephone and data network (internet access)
- Access to computer laboratories
- Digital cameras (video and photo) with tripod
- External hard drive
- External pen drive storage
- External DVD/CD writer