RHS Qualifications

RHS Level 3 Diploma in the Principles and Practices of Horticulture

Qualification Specification For reference only

Contents

Optional Units

1. RHS Qualifications Contact Details

RHS Qualifications is the Awarding Organisation of the Royal Horticultural Society.

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UK

Tel: 01483 226500

Email: qualifications@rhs.org.uk

RHS Website: rhs.org.uk/qualifications

2. Equality and Diversity Policy Statement

RHS Qualifications is committed to policies that will promote equal opportunities in all its operations, regardless of age, disability, ethnic origin, gender, marital status, religion, sexual orientation or any other factor.

RHS Qualifications is committed to ensuring that there is no unfair discrimination in any of its operations and will take into account all current legislation in relation to the equality of opportunity.

RHS Qualifications will constantly monitor and review its policies and practices pertaining to equal opportunities, to ensure that they remain consistent with its equal opportunities objectives and continue to comply with all relevant legislation.

RHS Qualifications will strive to make awareness of and respect for equality and diversity, an integral part of the culture of the organisation.

A copy of the RHS Qualifications Equality and Diversity Policy is available on the RHS website.

3. RHS Level 3 Diploma in the Principles and Practices of Horticulture

3.1 Introduction

This qualification provides a route to employment in professional horticulture by assessing knowledge of the principles underpinning horticultural practices, and a range of essential practical skills in horticulture.

It supports career development for those already working in professional horticulture by assessing knowledge of the principles underpinning horticultural practices and a range of essential practical skills in horticulture.

It provides a foundation for further learning or training in the field of horticulture

Whilst there are no formal pre-requisites for entry to the qualification, it is strongly recommended that students who undertake this qualification have obtained the RHS Level 2 Certificate in the Principles of Horticulture and the RHS Level 2 Certificate in Practical Horticulture or equivalent before they commence on the course.

The qualification is on the Register of Regulated Qualifications.

Qualification Number: 601/7189/3

3.2 Guided Learning Hours (GLH) and Total Qualification Time (TQT)

The Guided Learning Hours (GLH) represent the time that the learner spends learning under the immediate guidance and supervision of a tutor and includes assessment by the tutor, as well as invigilated exams. Guided Learning Hours are always less than total qualification time, as learners are expected to complete a certain amount of study in their own time.

The Guided Learning Hours for this qualification are 324.

Total Qualification Time (TQT) includes the Guided Learning Hours and represents the notional time that an average learner could reasonably expect to take to complete the learning outcomes of the units to the standard determined by the assessment criteria, and gain the qualification. It includes all face-to-face contact with tutors as well as assessment time and unsupervised directed study, coursework and practice.

The Total Qualification Time for this qualification is 547.

3.3 Teaching Pattern

The qualification is designed to be studied on a part-time basis. No particular teaching pattern is specified, and centres offering courses leading to the qualification are free to define their own teaching structure and teaching hours.

3.4 Qualification Structure

The qualification will be awarded to those who successfully complete the twelve mandatory units and one of the optional units:

RHS Ref	Unit	Level
R3101	Plant taxonomy, structure, and function Unit reference number H/505/2966	3
R3102	The root environment, plant nutrition and growing systems Unit reference number M/505/2839	3
R3103	The management of plant health Unit reference number D/505/2934	3
R3104	Understanding applied plant propagation Unit reference number J/505/8534	3
R3111	Understanding garden survey techniques and design principles Unit reference number M/507/5862	3
R3112	Understanding the selection and use of landscaping elements in the garden Unit reference number A/507/5864	3
R3113	Understanding the setting out and construction of landscaping elements in the garden Unit reference number F/507/5865	3
R3114	Understanding a range of specialist elements in the establishment of garden and urban plantings Unit reference number J/507/5866	3
R3121	Collecting and testing of soil samples and specifying adjustments for horticulture Unit reference number A/601/7683	3

R3122	Collecting, preparing and propagating from seed Unit reference number F/601/7684	3
R3123	Establishing and maintaining a range of plant types and forms Unit reference number Y/601/7688	3
R3124	Identification of a range of common garden plants, weeds, pests, diseases and disorders Unit reference number R/601/7690	3
	Optional Units (credit value 3)	
R3125	Planning, collecting, preparing and establishing propagation material Unit reference number Y/601/7691	3
R3125	Management of green spaces, landscaped areas, and ornamental gardens Unit reference number K/601/7694	3

3.5 Assessment

Each theory unit will be assessed by a separate written examination covering all learning outcomes specified in the unit.

Examinations must be taken in a centre approved by RHS Qualifications, or under arrangements for exceptional supervision agreed by RHS Qualifications.

Examinations must be conducted in accordance with the RHS Regulations for the Conduct of Examinations.

Theory examinations will be offered twice a year in February and June.

Assessment of the practical units will be conducted by the centre using RHS criteria. Assessment information and guidance documents can be found in the Guidance for Centres Delivering Practical Assessment

For the theory examinations, past examination papers including the examiner's comments are published for the past four examination sessions. These are available for download under the appropriate qualification section of the RHS website.

3.6 Language

Examinations will be offered in English.

3.7 Learning Resources

There is a wide range of books and other learning resources published which support the studies of those learning horticulture. RHS Qualifications does not recommend or endorse any specific learning resources as meeting the needs of learners studying for RHS qualifications. Learners are encouraged to seek guidance from their tutors on which resources best support their studies, or to choose the most appropriate resources for their needs from the wealth of material available.

3.8 Grading

Where a candidate receives commendation in all eight theory mandatory units, and a pass in all the practical units the qualification will be awarded with commendation.

RHS Ref	Unit	Mark	Pass with Commendation	Pass
R3101	Plant taxonomy, structure, and function	100	70	50
R3102	The root environment, plant nutrition and growing systems	100	70	50
R3103	The management of plant health	60	42	30
R3104	Understanding applied plant propagation	40	28	20
R3111	Understanding garden survey techniques and design principles	80	56	40
R3112	Understanding the selection and use of landscaping elements in the garden	80	56	40
R3113	Understanding the setting out and construction of landscaping elements in the garden	80	56	40
R3114	Understanding a range of specialist elements in the establishment of garden and urban plantings	60	42	30

4. Approved Centres

Centres wishing to offer examinations leading to RHS qualifications must be approved by RHS Qualifications.

Applications for approval should be sent to the Quality Assurance and Relationships Officer at the contact details in section 1.

5. Candidate Registration

RHS Approved centres should register candidates for examinations in the units of the qualification through the RHS Qualifications web portal.

Approved Centres undertake to obtain on behalf of their learners a Unique Learner Number (ULN), unless the learner chooses not to have one.

If centres supply an email address for candidates at the time of registration, candidates will be invited to open an account on the RHS Qualifications web portal, and will be able to view their examination history, their current registrations, and their results when available.

6 Reasonable Adjustments and Special Consideration

RHS Qualifications is committed to ensuring fair assessment for all candidates, and will facilitate access to its qualifications through reasonable adjustments to assessment arrangements for candidates with an identified specific need. An example of a reasonable adjustment which could be made is the production of a modified examination paper for a candidate with a visual impairment.

Special consideration is given following the examination to candidates who are present for the examination but may have been disadvantaged by temporary illness, injury or adverse circumstances which arose at, or near, the time of examination**.**

Full guidance is provided in the document 'Guidance to Centres for Reasonable Adjustments and Special Consideration'. The document is available on the RHS website (rhs.org.uk/qualifications), the RHS Qualifications Approved Centre web portal, or can be obtained from RHS Qualifications.

Applications for reasonable adjustments or special consideration must be made by the Approved Centre on behalf of the candidate. Application must be made within specified timescales.

7. Enquiry about Results service

The following service is available to candidates who have a query regarding their examination result:

Applications must be submitted within 10 working days of the results release date. Applications received after this date will not be processed.

If the paper has already been re-marked during the results moderation process, then the candidate will not be eligible for a further re-mark. They will be eligible to apply for a written feedback report on the exam paper but the mark and hence the grade will not change. We will advise the candidate of their options once the application has been submitted. Candidates can then decide if they wish to continue with the application.

8. Examination Dates

For a full list of examination dates please see the RHS Qualifications Examination Dates**,** this document is available on the Qualifications page on the RHS website and on the RHS web portal.

9. Fees

For a full list of fees please see the RHS Qualifications Fees Notice, this document is available on the Qualifications page on the RHS website and on the RHS web portal. All fees are payable prior to confirmation of service or entry for the examination.

Late Entries

RHS Qualifications publishes annually, and distributes to Approved Centres, the closing dates of entry for each examination for the following year. Entries submitted after the published closing date will be subject to a late entry fee. The total fee charged for late entries is twice the standard examination fee for each unit

Replacement Certificate (if lost, damaged or destroyed)

The fee for a replacement certificate can be found on the RHS Qualifications Fees Notice. Please send your request to the Qualifications Department.

Re-mark & Feedback

The fee for a remark and feedback can be found on the RHS Qualifications Fees Notice. If a re-mark results in an upgrade of the result, the fee paid will be refunded.

10 Unit Equivalents

Below is a table listing unit equivalences that have been granted for this qualification. Candidates who have been awarded a unit credit certificate for the previous unit number will not receive a unit certificate for the equivalent unit number.

Current Equivalent Unit Number	Previous Unit Number
H/505/2966	F/601/0993
M/505/2839	M/601/1007
D/505/2934	M/601/1038
J/505/8534	A/601/1043

M/507/5862	T/601/3633
A/507/5864	A/601/3794
F/507/5865	D/601/3836
J/507/5866	T/601/3857

11. Appeals Procedure

An Appeals procedure exists to conduct appeals lodged by candidates against decisions made by RHS Qualifications, concerning their examination performance, the granting of an award and/or the closure of their entry to an award on academic grounds.

The procedure is also followed in cases where there is irregularity or malpractice in the conduct of examinations and where RHS Qualifications has imposed a penalty on a candidate, tutor or invigilator, and the Centre wishes to appeal against this decision after results are published.

A copy of the procedure is available on the RHS Qualifications web portal and on the RHS website.

12. Policy on Malpractice and Maladministration

Malpractice consists of those acts which undermine the integrity and validity of the assessment or examination, the certification of qualifications and/or damage the authority of those responsible for conducting the assessment, examination and certification.

RHS Qualifications does not tolerate actions or attempted actions of malpractice by learners or centres in connection with RHS qualifications. RHS Qualifications may impose penalties and/or sanctions on candidates or centres where incidents, or attempted incidents, of malpractice have been proven.

A copy of the full policy is available on the RHS Qualifications web portal and on the RHS website.

Plant taxonomy, structure, and function

RHS reference number: R3101
Unit reference number: H/505/2966
Unit equivalent to F/601/0993
Unit guided learning hours: 32
Unit Level: Level 3

Unit purpose and aim(s): This unit will enable the learner to understand the principles of plant classification and nomenclature and to identify the role and function of higher plants' anatomical and morphological features. The unit also examines photosynthesis, respiration and movement of water through the plant, together with the regulation of plant growth.

Learning Outcome	Assessment criteria	Indicative content
1. Understand the Plant Kingdom and the taxonomic hierarchy.	1.1 Describe the major groups of the Plant Kingdom.	List the main groups within bryophytes, pteridophytes, gymnosperms and angiosperms. Describe and compare the structural and reproductive characteristics of: mosses, ferns, conifers and flowering plants in relation to their adaptation to terrestrial life. **DETAILS OF ALTERNATION OF GENERATIONS AND HAPLOID/DIPLOID STRUCTURES ARE NOT REQUIRED.**
	1.2 Describe features of plant classification and nomenclature relevant to horticulture.	State the hierarchy of botanical units and explain how and when they are used. To include: family, genus, species, subspecies, varietas, forma. To include **ONE NAMED** plant example for **EACH** of the above terms showing how it is written. Explain the meaning and use of the terms: cultivar, Group, trade designation (selling name), Plant Breeders' Rights, interspecific, intergeneric and graft hybrids, naming authority. To include **ONE NAMED** plant example for **EACH** of the above terms, showing how it is written. State the significance of the ICN (The International Code of Nomenclature for algae, fungi and plants) formerly ICBN (International Code of Botanical Nomenclature) and the ICNCP (International Code for Nomenclature for Cultivated Plants) in the naming of plants. Explain the reasons for name changes: reclassification (scientific research, new discovery), changes in nomenclature (rule of priority), incorrect identification.

		Explain how plant names can indicate: plant origin, habitat, commemoration, colour, growth habit, leaf form. To include **TWO NAMED** plant examples for **EACH**.
2. Understand the structure and function of plant tissues and organs in the life of the plant.	2.1 Identify a range of plant tissues and describe their structure and function.	Identify and describe the structure and function of plant tissues, to include: Simple tissues: parenchyma, collenchyma, sclerenchyma (fibres and sclereids), epidermis, meristem (cambium). Complex tissues: xylem (vessels, tracheids, parenchyma, sclerenchyma fibres), phloem (sieve tube elements, companion cells, parenchyma, sclerenchyma fibres). Secondary tissues: periderm (outer bark), phellem (cork), phellogen (cork cambium), phelloderm (secondary cortex), secondary phloem (inner bark) vascular cambium, secondary xylem, radial parenchyma (ray), annual rings. Describe the process of secondary thickening in the stem of a woody perennial (e.g. *Tilia*), from primary tissues to two years old.
	2.2 Identify and describe types of inflorescence.	Identify and describe types of inflorescence, to include: raceme (*Digitalis*), spike (*Acanthus*), umbel (*Allium*), corymb (*Sambucus*), cyme (*Myosotis*), panicle (*Syringa*), capitulum (*Helianthus*) and verticillaster (*Phlomis*).
	2.3 Describe plant adaptation for pollination.	Describe how the flowers/inflorescences of named plants are adapted for pollination by different named agents (to include: wind, bee, moth, butterfly, fly, bird), in relation to flower structure/shape, position, colour, scent, provision of food, flowering time, mimicry. Draw and label diagrams to show the structure of grass and legume flowers and relate to mode of pollination. State the meaning of cross pollination and self pollination. Explain the benefits of **EACH** using plant examples. State the means by which cross pollination is favoured: self incompatibility, flowering time, heterostyly, protandry/protogyny, dioecious plants.

	2.4 Describe fertilisation and the structure of fruits.	Describe the process of fertilisation, to include: pollen grain, pollen tube, two male gametes, ovary, ovule, micropyle, ovum/egg cell/ female gamete, endosperm nucleus, zygote, double fertilisation. State the advantages and limitations of fertilisation resulting from cross pollination and self pollination. Describe the relevance of cross/self pollination to horticulture, to include: top fruit production (apple), vegetables (maize, cucumber), the use of cross/self pollination in the production of F1 hybrids. State the advantages of F1 hybrids. **NO DETAILS OF THE GENETIC BASIS OF F1 HYBRIDS REQUIRED**. Describe the development and structure of a true fruit: pericarp (exocarp/epicarp, mesocarp, endocarp). Recognise and describe the following fruit categories and their fruit examples: dry dehiscent (legume, capsule, follicle), dry indehiscent (nut, achene), succulent/fleshy (drupe, berry). Name **ONE** plant example for **EACH** fruit example. Describe what is meant by a false fruit. Draw and label a diagram of a pome from a named plant.
3. Understand photosynthesis, respiration, water/solute relations in the plant and their relevance to horticulture.	3.1 Describe the process of photo-synthesis.	Describe the structure of the chloroplast to include: stroma, thylakoids, grana. Describe the process of photosynthesis: The interception of light by chlorophyll (wavelengths absorbed, PAR). The light dependent reaction (splitting of water to release oxygen and electrons, production of ATP and NADPH). The light independent reaction/dark reaction (carbon dioxide fixation, use of ATP, NADPH and electrons from the light reaction to produce sugar (glucose)). Significance of enzymes in photosynthesis: catalysts, temperature dependency. Specify differences in photosynthetic efficiency in: C3, C4 and CAM plants in outline using **NAMED** plant examples. **NO DETAILS OF METABOLIC PATHWAYS REQUIRED**.

	3.2 Explain how the rate of photosynthesis can be manipulated.	Describe how the following factors influence the rate of photosynthesis and explain how they can be manipulated*:* Light: light intensity (light compensation point, light saturation point); supplementary and replacement lighting; choice of lamp in relation to wavelength. Carbon dioxide: levels; ventilation; CO_2 enrichment methods. Temperature: temperature range, heating, shading, ventilation, damping down. Water and mineral nutrients: the need for adequate levels of irrigation and essential elements for chlorophyll formation (nitrogen, magnesium and iron).
	3.3 Describe the processes of respiration.	Structure of the mitochondrion to include: matrix, cristae. Describe aerobic respiration: Glycolysis (sugar (glucose) split to form pyruvate, production of ATP in the cytoplasm). Uptake of pyruvate and oxygen by the mitochondrion to produce CO_2, H_2O and ATP/heat. Energy output up to 38 ATP for **EACH** glucose molecule. Describe anaerobic respiration: Glycolysis (sugar (glucose) split to form pyruvate, production of ATP); pyruvate converted to ethanol (toxic) and CO_2 in the cytoplasm. Energy output 2 ATP for **EACH** glucose molecule. Describe examples of horticultural situations leading to anaerobic respiration.
	3.4 Explain the movement of water and solutes through the plant.	Explain how water and solutes enter, move through, and leave the plant. To include: apoplast, symplast, endodermis, Casparian strip, transpirational pull, root pressure, capillary action, guttation. Describe the significance of the following terms in relation to water movement in the plant: diffusion, osmosis, mass flow, capillarity, adhesion and cohesion.

		Explain how environmental factors affect the rate of transpiration: temperature, water availability, relative humidity, wind speed. Describe the uptake and distribution of mineral nutrients in the plant: nutrients from soil solution/foliar feed, distribution in the xylem and phloem, active uptake against concentration gradient into cells by membrane carriers. Describe transport of sucrose in the phloem: mass flow hypothesis, phloem loading and unloading. Describe the concept of sources and sinks in relation to: plant organs; seasonal changes.
	3.5 Explain the inter-relationships between photosynthesis, respiration and transpiration and describe their control in horticultural situations.	Describe how photosynthesis, respiration and transpiration are inter-related when optimising plant yield and/or quality in the following horticultural situations: outdoor planting; intensive glasshouse production; post harvest storage (manipulation of temperature and water loss, controlled and modified atmospheres, climacteric/non climacteric behaviour).
	3.6 Explain how plants are adapted to different habitats.	Explain how plants are adapted for: low light levels (shade plants – to include differences in leaf surface area, chlorophyll density, palisade layer); anaerobic conditions (bog plants – to include aerenchyma, pneumatophores); reduced water supply (xerophytes - to include xeromorphic adaptations in *Pinus*). To include **ONE NAMED** plant example for **EACH** adaptation.
4. Understand the role of plant growth regulators in plant development and their relevance to horticulture.	4.1 Describe the properties and key effects of endogenous plant growth regulators (PGRs) and their interactions.	Describe the 5 major groups of endogenous PGRs to include the following properties and effects: Auxin e.g. IAA Properties: polar movement, root/shoot sensitivity, produced at shoot apex. Effects: cell elongation and enlargement, root development, apical dominance, fruit set and development. Gibberellin e.g. GA Properties: non-polar movement; produced in young expanding organs. Effects: promotes stem elongation; promotes seed germination and release from bud and seed dormancy;

		promotion of flowering and its link to vernalisation e.g. in biennials. Cytokinin e.g. zeatin Properties: non-polar movement, produced in meristems. Effects: promotion of cell division; shoot development; retardation of senescence. Abscisic acid Properties: non-polar movement; produced in leaves, stems, fruits and seeds; continuously broken down and remade. Effects: stomatal closure; promotion of dormancy in seeds. Ethene (ethylene) Properties: gas, produced in all cells; transported as a precursor ACC. Effects: senescence and ripening; abscission. Describe the interactions of PGRs in: cell division and differentiation (micropropagation); apical dominance; seed and bud dormancy.
	4.2 Describe the use of synthetic PGRs in horticultural situations.	Distinguish between synthetic and endogenous PGRs. State the advantages of synthetic PGRs. State what is meant by and give examples of: hormone mimics, growth retardants and growth inhibitors. Describe **TWO** synthetic PGRs used in different horticultural situations from the following list (purpose, application method, timing and amounts): IBA (4-indole –3-butyric acid) – adventitious rooting of ornamental cuttings; gibberellins – improved fruit set, quality and yield in top fruit, rhubarb and celery; Paclobutrazol – growth control in ornamental plant production; Trinexapac-ethyl – growth retardation in amenity grassland and managed turf; Ethene (ethylene) – sprout inhibition in potato storage. **CHECK PGR AVAILABILITY WITH HEALTH AND SAFETY EXECUTIVE** https://secure.pesticides.gov.uk/pestreg/prodsearch.asp **OR IN CURRENT UK PESTICIDE GUIDE. DETAILS OF PGRs USAGE CAN BE FOUND IN UK PESTICIDE GUIDE AND PRODUCT LEAFLETS**

	4.3 Describe tropic plant movements.	Describe and explain the mechanism of: Phototropism and gravitropism (geotropism) in the root and shoot; thigmotropism (seismotropism).
	4.4 Describe how flowering is controlled in plants.	State what is meant by the terms: photoperiodism, critical day length, day length categories (short day, long day, day neutral plants), 'florigen'. Name **ONE** plant example for **EACH** day length category. Describe the role of phytochrome in the photoperiodic response. State what is meant by the term vernalisation (cold treatment required for flowering) State the photoperiodic/vernalisation requirements (day length, temperature) for flowering in a **NAMED** horticultural crop: AYR *Chrysanthemum*, poinsettia (*Euphorbia pulcherrima*) **OR** strawberry (*Fragaria x annanassa*). **NO PRODUCTION DETAILS REQUIRED**

The root environment, plant nutrition and growing systems

RHS reference number: R3102
Unit reference number: M/505/2839
Unit equivalent to M/601/1007
Unit guided learning hours: 28
Unit Level: Level 3

Unit purpose and aim(s): This unit provides the underpinning knowledge required for the management of sc growing media and plant nutrition and an understanding of organic growing systems.

Learning Outcomes	Assessment Criteria	Indicative content
1. Understand formation and properties of soils and other growing media.	1.1 Explain the process of soil formation and development.	Explain the natural processes of soil formation: types of parent rock (igneous, sedimentary & metamorphic); weathering processes of parent rock (physical, chemical and biological), addition of organic matter; formation of soil types: alluvial, loess, sedentary; to include the influence of the underlying rock types (limestone/chalk, sandstone, granite); development and characteristics of main horizons: organic layer, A, E, B, C horizons, parent rock. Describe the following UK soil types and their effects on plant growth: iron pan podzol, brown earth, rendzina and gleys.
	1.2 Review the properties of soil organic matter, colloids and mineral components.	Define the terms anion, cation and buffering capacity, and explain the significance of cation exchange in soils and growing media. Organic matter: Describe the process of humification. Describe the properties of humus. Colloids: Particle size, origins of colloids, properties to include: cation exchange capacity and buffering capacity. Mineral components: Particle size (Soil survey of England & Wales classification).

		Describe the properties of sand, silt & clay, to include: surface charge, water holding ability, cation exchange capacity and buffering capacity. Describe how properties of these soil components influence soil temperature, nutrients, water holding ability and pH.
	1.3 Compare a range of soil structures and describe their effects on plant growth and soil management.	To include crumb, blocky, prismatic, platy, massive and structureless. Effects on plant growth: root penetration, plant stability, access to air, water and nutrients. State what is meant by the term cultivation window and explain how it relates to soil texture and structure.
	1.4 Compare the physical and chemical properties on a range of substrates and constituents used for growing media.	Substrates and constituents, to include peat, sand, loam, grit, perlite, vermiculite, polystyrene granules, peat alternatives (to include coir, composted green waste, composted bark), rockwool, leca. Properties to include: nutrient content, pH, water holding, cation exchange capacity, buffering capacity, stability, sterility.
2. Understand the relationship between plant growth, air and water in soils and other growing media.	2.1 Describe the relationship between air and water content in the pore space of soils and growing media and how this influences their management.	To include definitions of Air Filled Porosity, Saturation Point, Field Capacity, Temporary and Permanent Wilting Point, Soil Moisture Deficit and Available Water Content. Describe how soil texture, soil structure, organic matter content, irrigation and precipitation relate to the soil terms listed above. Compare irrigation techniques to maintain moisture in soils and growing media at appropriate levels, to include: ebb and flow, overhead sprinklers, porous pipe, drip irrigation and water balance sheet. Compare drainage techniques used to improve soil aeration to include: pipe drainage, mole drainage, swales and sand slitting.

3. Understand the role of living organisms in soil processes.	3.1 Summarise the biological activity that takes place in soils during the production of humus from organic matter.	Identify a range of organisms involved in humus production: macro-organisms: slugs, snails, earthworms, woodlice, spring tails, beetles, nematodes (eelworms). micro-organisms, bacteria, actinomycetes, saprophytic fungi. Identify the requirements for their activity: moisture, temperature, oxygen and pH.
	3.2 Describe the carbon and nitrogen cycles and summarise the role of nitrogen-fixing organisms.	**Carbon cycle**: Describe the carbon cycle. Significance of carbon dioxide storage and release during soil cultivation, minimum tillage. **Nitrogen cycle**: Describe the nitrogen cycle. Nitrogen fixation (rhizobia, azotobacter) Nitrifying (nitrosomonas, nitrobacter) and denitrifying bacteria. **Phosphorus cycle**: Describe the Phosphorus cycle. Explain why knowledge of the carbon:nitrogen ratio is important when adding organic matter to the soil.
	3.3 Compare the roles of the rhizosphere and mycorrhizae in aiding healthy plant growth and treatment of root zones with added mycorrhizae.	State what is meant by the terms rhizosphere and mycorrhiza. Describe how endo and ecto mycorrhiza aid plant growth to include: moisture uptake, nutrient uptake (phosphates). Describe how the rhizosphere influences plant growth in the context of: nutrient uptake, moisture retention, defence against pathogens, allelopathy.
4. Understand the role of nutrients in plant growth.	4.1 Explain how specific nutrients affect plant growth.	Describe **ONE** role of **EACH** of the elements in plant metabolism: NPK nitrogen, potassium, phosphorus, sulphur, calcium, magnesium, iron and boron – expected level of detail: phosphorus required in ATP for energy transfer. State how the mobility of nutrients in soils (nitrogen, phosphorus and potassium) and in the plant (nitrogen, phosphorus, potassium, magnesium, calcium and iron) influence plant deficiency symptoms.

		Nitrogen: describe symptoms of deficiency and excess, and explain the causes to include: protein and chlorophyll synthesis, the effects on water uptake/osmosis and vegetative growth. Phosphorus: describe symptoms of deficiency and explain the causes, to include the effect on seedling growth. Potassium: describe symptoms of deficiency and excess, and explain the causes, to include: the effects on water uptake/osmosis, vegetative growth and reproductive phase. Magnesium: describe symptoms of deficiency and excess, and explain the causes, to include: chlorophyll synthesis, the effect on potassium availability and vegetative growth. Calcium: describe symptoms of deficiency (bitter pit, blossom end rot), excess and explain the causes, to include: vegetative growth, watering and liming. Iron: describe symptoms of deficiency and explain the causes to include protein/chlorophyll synthesis. Copper: state the horticultural situations where possible toxicity may occur (hydroculture, pesticide residue).
	4.2 Explain how various factors affect the availability of plant nutrients in soils and growing media.	Describe how **EACH** of the following factors affect the availability of plant nutrients, to include pH, soil texture, soil organisms, water content and leaching. Identify and compare **TWO** liming materials (neutralising value, fineness). Describe the use of fertilisers in various horticultural situations: open ground cultivation (mixed border, calcifuge), compost in seed trays and short term containers, long term container/nursery stock, lawns, hydroculture,. Fertilisers: types (soluble, slow release, straight, compound, controlled release, chelates); application methods to include: fertigation, drip and foliar feeding; formulation (to include: granules, powders, prills, frits); purity of soluble fertilisers.
5. Understand organic growing.	5.1 Describe how organic status is certified in the UK.	State the various bodies that oversee organic status to include: IFOAM, EU, DEFRA and UK certification bodies (e.g. Soil Association, Organic Farmers & Growers Ltd).

		Discuss the reasons for the need to regulate organic status.
	5.2 Discuss the benefits and limitations of certified organic status for growers.	Benefits: to include philosophy, marketing niche, product premium. Limitations: to include conversion to organic (time and cost required to convert), availability of approved inputs (propagation material, manures), growing in soil only (hydroculture and growing in containers may not be permitted).
	5.3 Identify management techniques available to the organic grower.	State the fundamental role of soil health and fertility in organic growing. Describe practices of soil management to include: maintaining humus levels, green manures, crop rotation, soil coverage and use of minimum cultivation. Compare the impacts on soil of organic and non-organic soil management techniques. Describe practices of nutrient management in organic growing and give the reasons for the following classification of fertiliser groups: 'acceptable/permitted', 'prior approval required' and 'never acceptable/prohibited'. Give **ONE NAMED** example in **EACH** group. Describe practices of organic weed, pest, and disease management. Weed management to include: hygiene, mulching, flame weeding, mechanical weeding, stale seedbed, green manuring. Pest management to include: biological and cultural control, chemical control, beneficial organisms. Disease management to include: hygiene, cultural control, chemical control. State the importance of varietal selection. Describe organic practices to control **ONE** annual & **ONE** perennial weed, aphids, caterpillars, potato blight and apple scab.

The management of plant health

RHS reference number: R3103
Unit reference number: D/505/2934
Unit equivalent to M/601/1038
Unit guided learning hours: 24
Unit level: Level 3

Unit purpose and aim(s): This unit provides the underpinning knowledge of pest and disease life cycles and plant disorders. It provides knowledge of control methodology and sources of information on relevant legislation.

Learning outcome	Assessment Criteria	Indicative column
1. Know the characteristics of a range of pests, diseases and weeds of horticultural significance.	1.1 Describe symptoms and damage caused by a range of pests, diseases and weeds in specific horticultural situations.	To include: **Pests:** Codling moth Two spotted spider mite Peach potato aphid Horse chestnut leaf mining moth Vine weevil Mealybug Western flower thrips Stem and bulb eelworm **Diseases:** Rose rust Phytophthora ramorum and Phytophthora kemoviae Clematis wilt Cucumber mosaic virus Fireblight Potato leaf curl virus **Weeds:** couch annual meadow grass dock Japanese Knotweed bindweed hairy bittercress
	1.2 Describe the life-cycles of a range of plant pests and diseases.	Describe the life-cycles of a range of plant pests and diseases to include survival, spread and/or transmission. **Pests:** Two spotted spider mite Vine weevil, Western flower thrips Stem and bulb eelworm

		Diseases Rose rust Fireblight Phytophthora ramorum Cucumber Mosaic virus
	1.3 Describe the biology of a range of weeds.	Describe how the following weeds spread and/or maintain themselves in horticultural situations: Japanese knotweed bindweed hairy bittercress dock annual meadow grass
2. Review the control of pests, diseases and weeds in horticulture.	2.1 State a range of appropriate methods for control of pests, diseases and weeds.	To include: physical, cultural, chemical (including partial sterilisation of soils and other media), biological for each of the pests, diseases and weeds. Sources of information e.g. current UK Pesticides Guide. Define Integrated Pest Management. Review the use of Integrated Pest Management in horticultural situations: Explain what is meant by 'Economic Damage threshold' Appropriate selection of integrated control methods for pests, diseases and weeds listed in 1.1.
	2.2 Explain how pests and diseases develop resistance to chemical control.	Examples to include: Peach potato aphid Two spotted spider mite Rose rust Mice
	2.3 Review the requirements for the safe use of chemicals used for plant protection.	Be aware of the current legislation and codes of practice relating to the storage, handling and disposal of pesticides as it relates to professional users and domestic gardeners and allotment holders. www.pesticides.gov.uk provides guidance for those using pesticides in gardens and allotments and the Code of Practice for Using Plant Protection Products applies to professional users. **Storage:** How to store chemicals

		Assess risk (who or what might be harmed) Control & exposure (Personal Protective Equipment) Record keeping Criteria for security of store Protect people/wildlife **Handling:** Methods of application (spraying/fog & mist units) Pesticide containers including Personal Protective Equipment Transport of chemicals Loading and unloading Dilution of concentrates **Disposal:** How to reduce pesticide waste Legal requirements and code of practice for disposing of pesticide and waste pesticide containers in professional and domestic situations. Identify the necessary certificates of competence which must be held in order to store and apply pesticides in a professional situation. Knowledge of and advantages of Environmental Management Schemes, to include: water courses wildlife and plants being protected; designated areas.
	2.4 Describe how biosecurity measures, are intended to prevent the distribution of pests, diseases and weeds.	To include prevention of the spread through trade and plant movement: Phytosanitary legislation Plant passports (e.g. plants & plant products which must be accompanied by a plant passport at all stages down to final retailer) Codes of practice Notifiable pests and diseases (e.g. Phytophthora ramorum, Colorado Beetle and Ash Dieback). Describe **THREE** biosecurity issues; case studies to include: Japanese Knotweed Colorado Beetle Ash Dieback

Understanding applied plant propagation

RHS reference number: R3104
Unit reference number: J/505/8534
Unit equivalent to A/601/1043
Unit guided learning hours: 21
Unit level: Level 3

Unit purpose and aim(s): This unit provides an understanding of the relevance of plant anatomy and physiology to applied propagation by seed, spores and vegetative methods. The management of the associated equipment and aftercare is also covered.

Learning outcome The Learner will	Assessment criteria The learner can	Indicative column The learner should be able to
1. Understand how knowledge of seed anatomy, physiology and environmental factors can be applied to propagate and conserve seeds successfully.	1.1 Explain the function of anatomical features in germinating seeds.	Explain the function of the following seed structures and their significance in germination: testa, cotyledon, endosperm, embryo, radicle, plumule, hypocotyl, epicotyl, hilum, micropyle, scutellum, coleoptile and coleorhiza. Distinguish between an endospermic Zea mays and non-endospermic (*Phaseolus vulgaris*) seed.
	1.2 Describe the physiological and environmental factors in seed dormancy.	State what is meant by 'primary' (innate) dormancy: dormancy present when seed is shed. State that 'secondary' (induced) dormancy develops from conditions that delay germination after primary dormancy is broken and will result in difficulties in subsequent germination. State a range of primary dormancy mechanisms, giving **ONE** plant example for **EACH** mechanism: External imposed seed coat: interference with water uptake due to impermeable seed coat (*Lathyrus odoratus*); Seed coat interferes with gas exchange (*Beta vulgaris, Paeonia delavayi*); Mechanical restraint of the embryo/hard testa (*Prunus* spp). Fruit tissue inhibiting germination: Fruit tissue contains germination inhibitors (e.g. tomato (*Solanum lycopersicum*)). Internal/embryo imposed: Seed remains dormant even though seed coat is removed. Internal germination inhibitors (*Fraxinus excelsior*)

		Embryo may be immature (*Ilex aquifolium)* State the role of abscisic acid, gibberellic acid and cytokinin in dormancy.
	1.3 Describe methods used to overcome dormancy.	State what is meant by the terms: 'stratification', 'scarification'. State what is meant by the term: 'after ripening' a process where warm temperature without moisture allows embryo to complete development. E.g. *Ilex aquifolium*, *Fraxinus excelsior*. Explain how dormancy is overcome by **EACH** of the following treatments: stratification (moist, warm and cold treatments), scarification (nicking, chipping and abrasion); soaking (hot or cold), chemical treatments (hormones, smoke and acids). Describe the methods of stratification and scarification giving a **NAMED** plant example suitable for **EACH** method, to include: (*Fraxinus excelsior, Lathyrus odoratus*).
	1.4 Describe methods of seed treatments, preparation and sowing used to enhance germination.	Describe a range of germination tests: percentage germination capacity, tetrazolium test, cutting test, floating test. Describe the purpose of a range of seed treatments to include: priming (*Allium porrum*), fluid sowing (*Pastinaca sativa*), pesticide treatment (*Zea mays*), coatings/pelleting (prills), (*Begonia Semperflorens Cultorum Group).*
	1.5 Describe the significance of seed conservation and propagation for planting.	State how plants can be conserved ex situ in seedbanks. Review the role of seedbanks in the conservation of UK native species. State the significance of 'provenance' in seed propagation for conservation purposes. State what is meant by the term hedgerow planting. Describe the production of **ONE NAMED** UK species for hedgerow planting, under **EACH** of the following headings: seed collection; seedbed preparation;

		method of sowing; aftercare; grading and lifting; transplanting.
2. Understand the relevance of anatomy, physiology and environmental factors to methods of vegetative propagation.	2.1 Describe how plant anatomy and plant physiology are relevant to vegetative propagation.	Define the term propagule. Explain the importance of the cambium, node, petiole, stem, leaf, root and axillary bud for **NAMED** methods of vegetative propagation. Explain why transpiration, respiration and photosynthesis are controlled to achieve successful vegetative propagation.
	2.2 Describe the preparation of a range of propagules.	Describe a range of propagation techniques to include: whip and tongue graft, T-Budding, chip budding, bulb scaling, scooping and scoring.
	2.3 Describe the propagation of plants by micro-propagation.	State what is meant by the terms 'micro-propagation' and 'totipotency'. Describe the processes of micro-propagation to include: plant material; facility and growth media; sterile techniques; weaning off. State the uses of micro-propagation in commercial horticulture, to include: propagation of difficult plants, rapid multiplication of stock, production of virus free stock.
	2.4 Describe the maintenance of stock plants used for the commercial production of stem cuttings.	Describe the annual maintenance of **ONE NAMED** stock plant (any named shrub) used for the production of stem cuttings, under **EACH** of the following headings: plant nutrition; pruning method and timing; pest and disease control; weed control.
3. Understand methods of propagation used in horticultural production.	3.1 Describe a range of propagation facilities.	Describe a range of propagation facilities and their use. To include: heated propagator, mist unit, fog unit, cold frame, low polythene tunnels, hot pipe callusing.

	3.2 Describe the production of a range of plants in the horticultural industry.	Describe the propagation of the shrub named in 2.4 under **EACH** of the following headings: cutting type and timing; propagation environment; weaning and potting.
		Describe the production of: **ONE NAMED** grafted fruit tree, **OR ONE NAMED** chip-budded ornamental tree and **ONE NAMED** rose under **EACH** of the following headings: rootstock selection. grafting/budding technique (**IN OUTLINE ONLY**) field or container grown. aftercare timetable to saleable stock

Understanding garden survey techniques and design principles

RHS reference number: R3111
Unit reference number: M/507/5862
Unit equivalent to T/601/3633
Unit guided learning hours: 28
Unit Level: Level 3

Unit purpose and aim(s): This unit will provide an understanding of garden styles, site appraisal and survey techniques, and the principles that underpin garden design.

Learning Outcomes	Assessment Criteria	Indicative content
1. Understand how to develop a client brief.	1.1 Identify the information required from the client.	To include: likes and dislikes, aspirations, user profile (age, gender, disabilities, numbers, animals), intended usage (e.g. seating areas, children's play area, sport/recreation, sunbathing, entertaining, growing fruit and vegetables), utility areas (e.g. waste bins, compost, shed, clothes drying, parking facilities). Maintenance arrangements, time scale, budget.
	1.2 Describe how information is gathered to develop the client brief.	Questionnaire, photographic (e.g. magazines, brochures, mood boards), digital technology.
2. Understand how to conduct a site appraisal.	2.1 State what existing features and characteristics need to be recorded.	Features to include: Access, buildings, hard landscaping, (e.g. paving, steps, walls, fences, pergolas, utility areas), trees and vegetation, services (underground and overhead). Characteristics to include altitude, orientation, aspect, changes in level (topography), pollution, soil type, soil depth, soil pH, soil water content, drainage, views (from off-site, from house, within site, borrowed landscape), screening, exposure, shade, microclimate.
	2.2 State what methods are used to collect and record site information.	Check list, questionnaire, photographic, digital technology, public records.

	2.3 Explain the influence of features and characteristics on choice of design.	Access from road, access around site. Architecture of house and style of existing hard landscaping, (e.g. form, materials, colours, textures). Trees and vegetation: Tree Preservation Orders (TPOs), Conservation area, roots. Service benefits (water and electricity supply) and limitations (e.g. manhole covers, telegraph pole). Influence of site characteristics from 2.1 on plant choice and positioning of proposed features (e.g. seating areas, summer houses, steps, terracing, water features, statues, glass houses, vegetable and fruit plots, utility areas). Explain how the design process may be used to enhance the attributes and offset the limitations imposed by the site.
3. Understand a range of basic surveying techniques.	3.1 Describe the linear surveying of a site using appropriate equipment.	Definitions: base lines, triangulation, off-sets, tie lines, running measurements. Methods used including conventional recording. Equipment to include: tape measures, pegs, ranging poles, field book, compass.
	3.2 Describe the level surveying of a site using appropriate equipment.	Definitions: datum level/benchmark, back sight, intermediate sight, foresight, reduced level, change point, line of collimation. Methods used including conventional recording by the rise and fall method. Equipment to include: optical (Quickset/automatic) level and tripod, staff, booking sheets.
	3.3 Interpret survey measurements from standard documentation.	Standard data produced from the surveys carried out from 3.1 and 3.2.
	3.4 Describe scale drawings produced from survey data.	To include: site plans, sections and elevations, contour plans, the use of graphic symbols, scale and technical terminology.

4. Understand the principles of garden design.	4.1 Explain the principles of garden design.	To include: unity, symmetry and asymmetry, form and space, balance, focal point, scale and proportion, movement and rhythm, texture, colour, harmony.
	4.2 Describe examples of the application of the principles in 4.1 to the design process.	Using examples of both hard and soft landscaping to illustrate the principles in the indicative content of 4.1.
5. Understand the historical development of garden design styles.	5.1 Describe representative characteristics of the following historical garden design styles.	To include: Medieval, Moorish, Renaissance (Italian, French and Dutch), English Landscape, Victorian, Modernist, Japanese.
	5.2 Review the factors that influence the design of domestic gardens in the UK today	To include: historical style, foreign travel, TV/Media, horticultural shows/show gardens, environmental awareness, modern technology, materials and equipment available, outdoor living space.

Understanding the selection and use of landscaping elements in the garden

RHS reference number: R3112
Unit reference number: A/507/5864
Unit equivalent to A/601/3794
Unit guided learning hours: 28
Unit Level: Level 3

Unit purpose and aim(s): This unit provides an understanding of the contribution of hard and soft landscape features to the design and function of ornamental gardens open to the public and domestic gardens.

Learning Outcomes	Assessment Criteria	Indicative content
1. Understand the contribution made by hard landscaping features to garden design.	1.1 Identify how hard landscaping features may contribute to garden design.	This relates to both ornamental gardens open to the public and domestic gardens. Features to include: paths, seating areas, driveways, walls, fences, pergolas, ramps and steps, children's play areas, rock gardens, water features, containers.
	1.2 Describe a range of materials suitable for these hard landscape features to meet aesthetic, functional and sustainable design requirements.	Materials to include: brick, stone, gravels, concrete, wood, bark, rubber, plastics, glass, fibre glass, metals, tarmac. Description of significant characteristics to include: - Aesthetic requirements: colour, contrast, unity, harmony, texture; - Functional: soft/hard, non-slip, hard wearing, life- span, maintenance requirements, safe (e.g. free of splinters, safety glass); - Consider factors such as environmental sustainability, Forest Stewardship Council (FSC), locally sourced, recycled, carbon footprint, reclaimed, permeability.

	1.3 Evaluate the suitability of hard landscaping materials and features to ensure accessibility for all garden users.	To include: those with visual impairment and limited mobility. Selection of appropriate features and materials e.g. ramps, steps, handrails, textures, lighting, widths of paths and entrances, signage (e.g. wheelchair accessible, braille). Awareness of Disability Discrimination Act (DDA) and accessibility legislation for public gardens.
	1.4 Review how considerations of safety may influence the choice of features and materials in the garden.	Risk analysis (identification of hazard, garden user, risk level, consequences) of proposed features and materials. **HAZARDS OF CONSTRUCTION NOT TO BE INCLUDED**
2. Understand the contribution made by soft landscaping features to the design of a garden.	2.1 Describe soft landscaping features that contribute to garden design.	This relates to both ornamental gardens open to the public and domestic gardens. Features to include: hedges, beds for seasonal planting, herbaceous borders, shrub borders, trees, containers and lawns. Describe the characteristics of **FIVE NAMED** plants to meet design requirements for **EACH** of the above features (excluding lawns).
	2.2 Select plants suitable for a range of soft landscaping situations.	Describe **FIVE NAMED** plants suitable for **EACH** of the following: ground cover, sensory impact, north facing walls, south facing walls, dry shade, shallow chalk, heavy clay, free draining sand, acid soils (below pH 5.5), coastal areas. Describe **FIVE NAMED** plants from different genera which will together provide continuity of interest through the year. Significant characteristics of plants to include: height, spread, form, decorative merits and season of interest

	2.3 Select plants suitable for rock and water features.	Describe **FIVE NAMED** plants suitable for **EACH** of the following: - permanently wet areas e.g. bog garden and marginal; - ponds: to include deep water aquatics, oxygenators, floaters; - scree/gravel gardens and rock gardens. Significant characteristics of plants to include: height, spread, form, decorative merits and season of interest.
	2.4 Describe the design possibilities of grassed areas.	Design possibilities to include: - Aesthetic requirements: colour, contrast, texture, space (void), mowing effects and heights, turf mazes, parterres; - Functional: recreation and relaxation, access, viewing area; - Sustainability: permeability, biodiversity. Maintenance considerations for all of the above.
	2.5 Describe the use of planting plans.	State what is meant by a planting plan and the information that it conveys: plant names, positioning, spacing, list of plants (to include quantities, supply size and specification). The use to include: informing the client and instructing the landscaper/gardener for costing and setting out purposes.

Understanding the setting out and construction of landscaping elements in the garden

RHS reference number: R3113
Unit reference number: F/507/5865
Unit equivalent to D/601/3836
Unit guided learning hours: 27
Unit level: Level 3

Unit purpose and aim(s). This unit provides an understanding of the principles of setting out a site and constructing hard-landscape features in gardens.

Learning Outcomes	Assessment Criteria	Indicative content
1. Understand the planning involved in the realisation of a garden design.	1.1 Explain the need to plan landscape works	Describe and state the significance of **EACH** of the following: - site assessment; - risk assessments (for all operations and materials in this unit); - specialist services; - setting out; - ground work; - construction (surfaces, vertical structures, rock and water). Site assessment to include: e.g. access for construction, services, storage areas, site security, toilet facilities, waste disposal. Specialist services which may need to be involved e.g. structural engineers, electricians, machine operators, **(Their specialist knowledge does not form part of this unit).** State the importance of planning an appropriate sequence for all tasks. Explain what is meant by a specification for landscape works.

2. Understand the practical procedures for setting out a site.	2.1 Describe how to set out the major features of a design on the ground.	Describe the information that is provided by scale plans to include: hard and soft landscape design plans, technical setting- out plans (planting and construction). Methods and equipment for transferring features from scale plans to the ground, to include: points, straight lines, squares, rectangles, circles, irregular curved shapes. Methods - base line; - triangulation; - off-sets; - right angles. Equipment (role and limitations) - measuring tapes; - pins; - pegs; - string lines; - spray paint; - sand lines. **NOT REQUIRED, BUT HAVE AN AWARENESS OF:** - digital measuring methods; - global positioning systems (GPS).
	2.2 Describe how to set out the required levels on site.	Describe the information that is provided by scale drawings to include: sections and elevations, contour plans, technical setting-out plans (spot levels). Methods and equipment for establishing a site datum (ordnance benchmark, temporary benchmark) and transferring levels (including falls), To include the role and limitations of: - measuring tapes; - pegs; - string lines; - boning rods; - spirit levels/straight edges; - optical (Quickset/automatic) level, - laser level; - site rails/profile boards.

		NOT REQUIRED BUT HAVE AN AWARENESS OF: - total stations, theodolites; - digital measuring methods; - global positioning systems (GPS).
3. Understand the reasons for correct groundwork procedures.	3.1 Describe the correct handling, storage and reinstatement of soil during site construction.	For the preparation of hard and soft landscape areas using mechanised and manual methods for **EACH** of the following situations: - to achieve levels where re-grading is to take place; - where hard landscaping is to take place; - machinery movement and storage areas. Describe the following procedures: - vegetation removal (including methods); - stripping of top soil; - transportation; - storage (including the separation of topsoil and subsoil, storage heaps/mound/ bunds/stockpiles, size, angle of repose, location, weed control, covering, short term cropping, fencing, signage); - subsoiling; - reinstatement (levels and depths). State where **EACH** of the above is appropriate and explain how soil quality is maintained. Describe how biosecurity measures are used to prevent the distribution of weeds, pests and diseases.

	3.2 Select the type of drainage system required in various situations.	Situations to include subsoil and surface water disposal. Types of drainage system to include: - open ditches; - french drains; - pipe systems. Describe the construction for **EACH** of the above drainage systems to include where appropriate: patterns, depths, falls, types of pipes. soakaways, gulleys/channels, traps, inspection chambers, aggregates, membranes. Significance of Regulations (e.g. local byelaws, planning law relating to Sustainable Urban Drainage Systems (SUDS), Environment Agency and building regulations) affecting disposal of water from gardens. Identify water storage and recycling opportunities arising from the drainage systems above.
	3.3 Describe the foundations for hard landscaping	State the purposes of foundations. Preparing the site prior to the installation of foundations to include where, appropriate: - subgrade; - formation level; - membranes; - consolidation; - dimensions. Describe appropriate foundations for: - an in-situ concrete path; - an aggregate/gravel driveway; - a concrete slab patio; - a permeable car parking area; - a low, brick freestanding garden wall; - a concrete block retaining garden wall; - a panel fence; - a pergola.

4. Know materials and construction procedures for garden surfaces.	4.1 Describe a range of appropriate materials for garden surfaces.	To include: paths, seating areas, driveways (for parking and light use), steps and ramps. To include: concrete (in-situ, units), gravels (chippings/shingle, self-binding), clay pavers/bricks, natural stone, timber decking. Edging as appropriate to include: wood, brick, pre-cast concrete, natural stone. Specifications to include as appropriate: colour, dimensions, surface finish, durability, maintenance requirements. Sustainability issues (e.g. reuse, recycling, reclamation, carbon footprint). Define the terms 'flexible' (e.g. block paving, gravels), 'rigid' (e.g. in-situ concrete). Define the term 'permeable' in relation to hard surfaces (e.g. specialised blocks, grasscrete and gravels). Significance of planning law relating to Sustainable Urban Drainage Systems (SUDS).
	4.2 Describe the procedures for laying the surface materials mentioned in 4.1.	Describe the construction of: - an in-situ concrete path; - a block paved driveway; - an aggregate/gravel driveway; - a concrete slab patio; - a permeable car parking area; - a short flight of steps; - a ramp. To include edging for the above as appropriate.

5. Know materials and construction procedures for garden walls, fences and pergolas.	5.1 Describe materials suitable for the construction of garden walls.	To include: free standing and retaining walls. Materials and components to include: bricks, concrete blocks (reconstituted stone and dense aggregate), natural stone, wood, gabions, damp proof courses, mortar mixes, pointing, coping, drainage. Specifications to include as appropriate: colour, dimensions, surface finish, durability and maintenance requirements. Sustainability issues (e.g. reuse, recycling, reclamation, carbon footprint).
	5.2 Describe materials suitable for garden fences.	To include: panel (including trellis), close boarded and picket, strained wire. Materials and components to include: timber, metal and concrete posts, gravel boards, rails, panels, pales, post caps, fixings, strainers. Specifications to include as appropriate: colour, dimensions, durability (to include timber types and pre-treatment), maintenance requirements. Sustainability issues e.g. carbon footprint (including end of life), Forestry Stewardship Council (FSC).
	5.3 Describe the materials suitable for pergolas and arches.	Components to include: timber, metal and brick/stone uprights; timber, rope, metal beams; fixings. Specifications to include as appropriate: colour, dimensions, durability (to include timber types and pre-treatment), maintenance requirements. Sustainability issues e.g. carbon footprint (including end of life), ForestryStewardship Council (FSC).

	5.4 Describe the construction of walls, fences and pergolas.	To include: the procedures for construction of: - a low brick freestanding garden wall; - a concrete block retaining garden wall; - timber sleeper raised bed; - a panel fence; - a strained wire fence; - a close boarded fence; - a pergola. Details to include: - overall dimensions of features; - sequence of construction; - tools and equipment (manual/mechanised).

Understanding a range of specialist elements in the establishment of garden and urban plantings

RHS reference number: R3114
Unit reference number: J/507/5866
Unit equivalent to T/601/3857
Unit guided learning hours: 24
Unit level: Level 3

Unit purpose and aim(s). This unit provides an understanding of the opportunities that exist for the use of specialist elements in the planting of a variety of gardens, including urban and amenity green spaces.

Learning Outcomes	Assessment Criteria	Indicative content
1. Understand the practices of establishing and maintaining planting in a range of specialist areas.	1.1 Describe the characteristics of a range of specialist areas.	Garden and urban situations to include the following: - woodland; - prairie; - wildlife; - wildflower meadows; - sensory; - potager; - courtyards; - container gardens; - roof gardens; - living walls; - green roofs; - street plantings; - community gardens; - amenity bedding (to include: traditional, carpet, three-dimensional and sub-tropical). Please note for assessment 1.1 (describe the characteristics of a range of specialist areas), plant examples are needed where appropriate.
	1.2 Identify establishment and management issues associated with specialist areas.	For the situations listed in 1.1 To include (where appropriate): - site selection; - site preparation; - hazards; - vandalism; - security; - micro climates;

		- shade; - temperature; - irrigation; - nutrition; - pollution; - litter; - weeds; - pests; - diseases.
	1.3 Prepare a seasonal schedule for amenity bedding schemes.	To include: establishment and maintenance of traditional spring **OR** summer bedding from ground preparation to removal of display. **NOT TO INCLUDE PROPAGATION**
	1.4 Understand how water conservation can be applied in soft landscaping.	Water conservation issues related to situations listed in 1.1. Describe how hard surfaces can be adapted to reduce run-off through the use of plants. Considerations to include: - recycling of rainwater and grey water; - use of mulches (organic and inorganic); - choice of plants; - use of rain gardens.
2. Understand pruning in the establishment and maintenance of specialist plantings.	2.1 Describe the use of specialist pruning techniques.	To include fruit, ornamental trees and shrubs. To include the following forms of apple - espalier, cordon, stepover, and fan-trained peach. - pollarding (e.g. *Salix*); - pleaching, (e.g. *Tilia cordata, Carpinus betulus*); - topiary (e.g. *Buxus, sempervirens, Taxus baccata*); - cloud pruning (hedge and tree forms).
	2.2 Describe establishment and maintenance pruning.	To include formative and maintenance pruning, (where appropriate) for the techniques listed in 2.1. - tools and equipment; - timing (formative year 1, year 2, year 3); - timing (time of year); - position of cut; - tying in.

		Reasons to be given for **EACH** of the above.

Collecting and testing of soil samples and specifying adjustments for horticulture

RHS reference number: R3121
Unit reference number: A/601/7683
Unit guided learning hours: 18
Unit level: Level 3

Unit purpose and aim(s): This unit provides the learner with the knowledge and skills to collect and test soil samples and to specify adjustments for horticulture.

Learning Outcomes The learner will**:**		**Assessment Criteria** The learner can**:**	
1	Understand potential hazards and risks	1.1	Define the hazards associated with soil to include (a) foreign objects (b) animal waste (c) diseases
		1.2	Assess the risks of working with soil and the tools used for collecting soil samples
2	Be able to select and use appropriate personal protective equipment and clothing	2.1	Select and use appropriate personal protective equipment and clothing
3	Understand reasons for soil testing	3.1	Explain why soil texture testing is carried out
		3.2	Explain why pH testing is carried out
4	Be able to collect and prepare a soil sample for laboratory testing	4.1	Collect a representative soil sample from a given site using the 'ADAS' method
		4.2	Prepare a soil sample for testing
5	Be able to accurately measure by weight the constituent components of different soil samples	5.1	Separate particle sizes using appropriate laboratory equipment
		5.2	Accurately measure by weight the constituent components of two distinctly different soil samples
		5.3	Interpret the data from 5.2 and use a soil texture chart to classify soil type

6	Be able to measure the pH of soil	6.1	Perform a series of pH tests using an industry standard soil testing kit
		6.2	Interpret the results to accurately identify the pH of different soil samples
7	Be able to specify suitable materials to amend the PH value of soils	7.1	Specify a suitable material to a) raise the pH of the soil b) lower the pH of the soil
8	Be able to measure the area of a given site and make calculations	8.1	Perform calculations to estimate the material requirements to alter the pH of the area
		8.2	Perform calculations to estimate the fertiliser requirements of the area
9	Be able to diagnose nutrient deficiencies and recommend remedial action	9.1	Correctly diagnose nutrient deficiencies from pictures and samples
		9.2	Specify materials to correct nutrient deficiencies

Collecting, preparing and propagating from seed

RHS reference number: R3122
Unit reference number: F/601/7684
Unit guided learning hours: 22
Unit level: Level 3

Unit purpose and aim(s): This unit will provide learners with the skills, knowledge and understanding required for planning and managing the propagation of plants from seed.

Learning Outcomes The learner will**:**		**Assessment Criteria** The learner can:	
1.	Be able to plan seed propagation	1.1	Prepare a programme of work activities to maximise the success of the operation
		1.2	Calculate and collect the quantities of seed and growing medium required
2.	Be able to implement seed propagation	2.1	Prepare the growing medium in accordance with the requirements of the programme
		2.2	Check, store and handle seeds in a way that minimises damage and maximises viability
		2.3	Sow seeds evenly, accurately and at the correct depth and density for the species
		2.4	Provide immediate aftercare to encourage rapid germination
3.	Be able to monitor germination of seeds	3.1	Identify problems with germination and take the appropriate remedial action
		3.2	Remove and hygienically dispose of unwanted seedlings
		3.3	Accurately identify seedlings suitable for the next stage of the production process
		3.4	Provide suitable post propagation aftercare conditions
		3.5	Ensure the following records are completed accurately: (i) propagation activities (ii) success rates

4.	Be able to maintain and use equipment during seed propagation	4.1	Ensure equipment is prepared, used and maintained in a safe and effective condition
5.	Be able to promote health and safety and environmental good practice	5.1	Work in a way which promotes health and safety, is consistent with relevant legislation, codes of practice and any additional requirements
		5.2	Ensure work is carried out in a manner which minimises environmental damage
		5.3	Manage and dispose of waste in accordance with legislative requirements and codes of practice
		5.4	Maintain effective working relations with all relevant people

Establishing and maintaining a range of plant types and forms

RHS reference number: R3123
Unit reference number: Y/601/7688
Unit guided learning hours: 28
Unit level: Level 3

Unit purpose and aim(s): This unit provides the learner with the knowledge and skills to plant a tree; to carry out maintenance pruning and training on a range of plants; and to provide aftercare to promote growth and fruition.

Learning Outcomes The learner will**:**		**Assessment Criteria** The learner can:	
1.	Understand the potential hazards and risks associated with establishing and maintaining plants	1.1	Define the hazards associated with soil
		1.2	Define the hazards associated with the growing medium
		1.3	Define the risks of working with tools, equipment and material used for establishing and maintaining plants
		1.4	Assess the hazards associated from working with plants
		1.5	Assess the hazard from working at height
2.	Be able to select and use appropriate personal protective equipment and clothing	2.1	Select and use appropriate personal protective equipment and clothing
3.	Be able to select and use effectively a range of tools and equipment	3.1	Select and use a range of tools and equipment effectively
		3.2	Clean and appropriately store tools, equipment and materials after use
4.	Be able to plant, stake and tie a tree	4.1	Prepare a planting pit (square or round) with appropriate dimensions
		4.2	Evaluate the condition of the tree, prune appropriately, plant, stake and tie one tree (a) container tree (10 – 15 litre) (b) bareroot tree (light standard)
		4.3	Protect and mulch the planted tree appropriately

5.	Understand the principles of pruning	5.1	Define the term 3 D's associated operations and the order in which they should be carried out
		5.2	Define pruning terminology
6.	Be able to carry out maintenance pruning and training on a range of plants	6.1	Evaluate the maintenance requirements for a range of plants
		6.2	Carry out pruning and maintenance in a safe and competent manner
		6.3	Dispose of all arisings in an environmentally aware manner leaving the site clean and tidy
7.	Be able to provide aftercare to promote growth and fruition	7.1	Provide appropriate aftercare
		7.2	Respond to changes in plant health

Identification of a range of common garden plants, weeds, pests, diseases and disorders

RHS reference number: R3124
Unit reference number: R/601/7690
Unit guided learning hours : 23
Unit level: Level 3

Unit purpose and aim(s): This unit provides the learner with the knowledge required to identify and describe a range of common garden plants, weeds, seeds, pests, diseases and disorders.

Learning Outcomes The learner will:		**Assessment Criteria** The learner can:	
1.	Be able to identify a range of plants and know their characteristics and decorative merits	1.1	Identify a range of plants by botanical name from each of the following categories and describe their characteristics and decorative merits. a) deciduous and evergreen trees b) conifers c) deciduous shrubs d) evergreen shrubs e) non-woody herbaceous plants f) climbing plants/wall shrubs g) rock garden and alpine plants h) aquatic plants
2.	Be able to identify a range of weeds by botanical name and know their characteristics and methods of control	2.1	Identify a range of weeds by botanical name and describe their characteristics and cultural and chemical methods of control
3.	Be able to identify a range of seeds	3.1	Identify a range of seeds by botanical name
4.	Be able to identify a range of pests and diseases and know their characteristics and methods of control	4.1	Identify a range of pests and diseases by common name and describe their characteristics and methods of prevention and cultural, biological and chemical control
5.	Be able to identify disorders and describe appropriate treatment	5.1	Identify a range of disorders and describe appropriate methods of treatment

Planning, Collecting, Preparing and Establishing Propagation Material

RHS reference number: R 3125
Unit reference number: Y/601/7691
Unit guided learning hours: 21
Unit level: Level 3

Unit purpose and aim(s): This unit provides the learner with the knowledge and skills to collect, prepare and establish propagation material in a growing environment.

Learning Outcomes The learner will**:**		**Assessment Criteria** The learner can**:**	
1.	Be able to plan the collection of propagation material	1.1	Plan the timing of the collection of propagation material to maximise the success of the operation and to fit in with the production programme
		1.2	Determine the source of the propagation material and the method of collection in accordance with the needs of the plant species and the propagation method
2.	Be able to collect propagation material	2.1	Correctly identify plants from which material is to be collected
		2.2	Handle plant material in a manner which minimises damage and wastage
		2.3	Select and use suitable facilities for the storage of collected material
		2.4	Provide clear and accurate information for recording purposes
3.	Be able to prepare propagation material	3.1	Handle plant material in a manner which minimises damage and wastage, and optimises growth
		3.2	Select and use a suitable propagation method
		3.3	Prepare and treat propagation materials appropriately
		3.4	Provide clear and accurate information for recording purposes

4.	Establish propagation material in a growing environment	4.1	Identify and source the materials for preparing a suitable rooting medium
		4.2	Prepare a suitable environment to establish the propagation material
		4.3	Position propagation material correctly in the growing medium and place in a suitable environment
		4.4	Promote and sustain plant development after propagation
5.	Be able to maintain and use relevant equipment	5.1	Ensure equipment is prepared, used and maintained in a safe and effective condition
6.	Be able to promote health and safety and environmental good practice	6.1	Work in a way which promotes health and safety, is consistent with relevant legislation, codes of practice and any additional requirements
		6.2	Ensure work is carried out in a manner which minimises environmental damage
		6.3	Manage and dispose of waste in accordance with legislative requirements and codes of practice

Management of green spaces, landscaped areas, and ornamental gardens

RHS reference number: R3126
Unit reference number: K/601/7694
Unit guided learning hours: 22
Unit level: Level 3

Unit purpose and aim(s): This unit provides the learner with the knowledge and skills to assess the management requirements of horticultural areas; to produce management and maintenance plans for specified periods of time; and to monitor and maintain the health, safety and security of the work area.

Learning Outcomes The learner will**:**		**Assessment Criteria** The learner can**:**	
1.	Be able to carry out site surveys	1.1	Carry out a site survey to assess the condition of a the following (a) hard landscape features (vertical and horizontal elements) (b) accessories (c) soft landscape features (plants)
2.	Be able to assess the management requirements of horticultural areas	2.1	Evaluate the management requirements of (a) hard landscape features (vertical and horizontal elements) (b) accessories (c) soft landscape features (plants)
3.	Be able to produce management and maintenance plans for specified periods of time	3.1	Describe the factors to consider in developing a 5 year management plan for a specified area.
		3.2	Produce an annual maintenance programme for a specified area to include (a) preparation and cleaning of hard landscape features (vertical and horizontal elements) (b) preparation and cleaning of accessories (c) pruning, feeding, weeding and watering of soft landscape features (plants)
		3.3	Provide verbal advice to clients in respect of managing and maintaining the area specified in 3.2

4.	Understand the importance of biosecurity in protecting horticultural areas	4.1	Explain the meaning of biosecurity and its importance in preventing the spread of diseases or invasive plants to established horticultural areas.
5.	Understand how to monitor and maintain the health, safety and security of the work area	5.1	Explain the legal and organisational responsibilities in relation to health, safety and security covering: (i) people (ii) equipment and materials (iii) the work area
		5.2	Explain the importance of carrying out risk assessments for all work activities including assessing risks from new and non-routine activities
		5.3	Describe how to carry out and evaluate a risk assessment
		5.4	Explain the hierarchy of measures to control risks
6.	Be able to monitor and maintain the health, safety and security of the work area	6.1	Carry out risk assessments in accordance with relevant legal and organisational requirements
		6.2	Evaluate the risks which have been identified and implement appropriate control measures