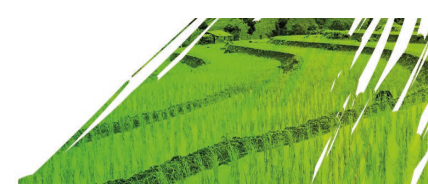


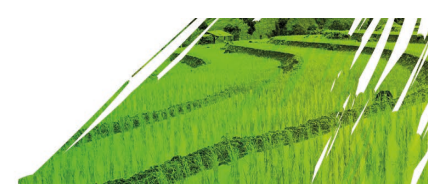
Unit title	Plant and Soil Science
Guided learning hours	60
Number of lessons	25
Duration of lessons	2 hours (unless otherwise stated)
Links to other units	
This is a mandatory unit and underpins knowledge throughout the qualification.	

Key to learning opportunities			
AW	Assignment writing	V	Visit
GS	Guest speaker	GW	Group work
IS	Independent study		

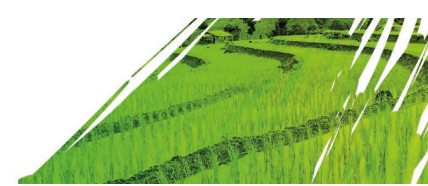
Lesson	Topic	Lesson type	Suggested activities	Classroom resources
1	Unit introduction	IS/GW	<ul style="list-style-type: none"> • Lead in: Introduce the unit by outlining the nature of the topics, and the Pearson Set Assignment that learners will be expected to complete for this unit. • Individual/pair activity: Learners work individually or in pairs to demonstrate any prior knowledge in the subject area. • Tutor presentation: Talk through the SAMs assessment documents to give learners an understanding of the outcomes they will be expected to produce and link this to the assessment criteria, highlighting the command verbs. Ask your learners to use the SAMs as a working document throughout the course, so they complete them as they go along and learn new relevant knowledge. These can then be written up at appropriate points in the course and used for 	<ul style="list-style-type: none"> • Paper and pens • Whiteboard • SAMs documentation • Copies of the specification



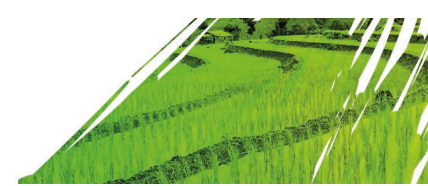
Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			formative assessment.	
Learning aim A: Understand plant structures and systems				
2	A1: Plant cell structure and specialisations	GW	<ul style="list-style-type: none"> • Pair work: In pairs, learners research then produce a poster of a typical plant cell, showing the required structure and cell organelles. The poster should be annotated with the function of the structures and organelles. • Pair work: Learners then swap partners, and research and produce annotated diagrams to display with the posters to show how cells in stems, leaves and roots are specialised. • Plenary: The whole group compare and explain their diagrams and posters. 	<ul style="list-style-type: none"> • Paper and pens
3	A1: Plant cell structure and specialisations	GW	<ul style="list-style-type: none"> • Group activity: In small groups, learners examine samples of plants with each of the different types of root structure and storage structure. Wash the samples, where required, to allow closer inspection. • Individual activity: Learners draw diagrams of each sample examined. • Individual activity: Learners research then annotate each diagram with the appropriate functions, to include anchorage, osmosis, the absorption of minerals and food storage. 	<ul style="list-style-type: none"> • Range of plants with different root structures
4	A2: Plant structure and function	IS	<ul style="list-style-type: none"> • Individual activity: Learners examine a range of plants that demonstrates the different shoot structures. They then produce sketch diagrams that demonstrate each of the different structures. 	<ul style="list-style-type: none"> • Range of plants with different shoot structures • Microscopes and prepared slides



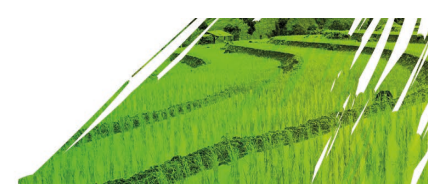
Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			<ul style="list-style-type: none"> • Tutor presentation: Give input to the whole class on the structure and function of vascular bundles, linked to the root and stem samples learners have examined, including translocation in phloem. • Paired practical activity: In pairs, learners examine a range of microscope slides of sections of roots and stems that show the vascular bundles. They then produce annotated diagrams to show the bundles and the position of cambium, xylem and phloem in a flowering plant, including notes on the function of all three. • Paired practical activity: In pairs, learners examine, draw and label a range of samples to illustrate the different leaf types showing the different leaf characteristics. 	<ul style="list-style-type: none"> • of vascular bundles in roots and stems • Range of leaf types
5	A3: Plant processes	GW	<ul style="list-style-type: none"> • Tutor presentation: Give whole class input on photosynthesis, including chloroplast structure. • Group work: Conduct a small group experiment on the effect of different factors on the rate of photosynthesis. (Elodea/pondweed is an appropriate subject but this may be dictated by local availability.) Each group should do a different factor and then pool the results. • Class activity: Hold a whole class discussion of the results. • Tutor presentation: Give input on aerobic/anaerobic respiration in plants, linked to soil/cultivation conditions (e.g. waterlogged soils). • Class activity: Hold a whole class discussion of application to commercial crop production. 	<ul style="list-style-type: none"> • Equipment for rate of photosynthesis experiment
6	A3: Plant processes	GW	<ul style="list-style-type: none"> • Class activity: Hold a whole class recap on osmosis. • Group work: As a small group experiment, learners examine plant tissues in solutions of different osmotic potential. They draw and 	<ul style="list-style-type: none"> • Plant tissues, e.g. beetroot, solutions of



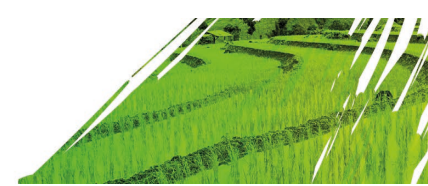
Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			<p>label diagrams of flaccid/turgid and plasmolysed cells.</p> <ul style="list-style-type: none"> • Tutor presentation: Give input on opening/closing and function of guard cells/stomata and movement of CO₂, O₂ and water vapour. 	<p>different osmotic potential, microscopes</p>
7	A3: Plant processes	GW	<ul style="list-style-type: none"> • Class activity: Hold a whole class recap on guard cells/transpiration. • Paired practical activity: Working in pairs, learners experiment with use of the potometer to investigate rates of transpiration (different pairs investigate different factors affecting the rate). • Plenary: Hold a class plenary on the results of the experiments, linked to crop production (especially glasshouse production). 	<ul style="list-style-type: none"> • Potometers and plant tissue
8	A4: Plant nutrition	GW	<ul style="list-style-type: none"> • Group work: In small groups, learners conduct research for a short presentation on the role of nutrients in plant growth, and the effects and causes of deficiency on that growth. Each group should cover a macro and micro nutrient. (No group should have the same pairing of nutrients, if practicable.) 	<ul style="list-style-type: none"> • Paper and pens
9	A5: Reproduction systems	GW/IS	<ul style="list-style-type: none"> • Tutor presentation: Give input on monoecious, dioecious and hermaphrodite flower structure, including a definition of the terms. • Pair work: In pairs, learners work on a different flower to cover the three types identified above. This may be based on real samples, diagrams or both. They should produce an annotated poster showing the different structures and their function. • Class activity: Learners present their poster to the rest of the group. • Individual activity: Learners research and make notes on pollination processes. 	<ul style="list-style-type: none"> • Range of flower types, and/or diagrams • Fast germinating seeds, suitable dishes, e.g. petri dishes, and absorbent material • The ability to set up the different



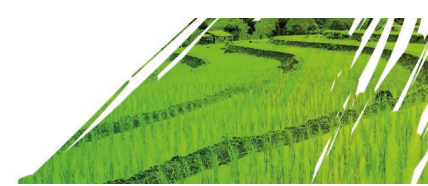
Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			<ul style="list-style-type: none"> • Small group work: Set up a small-scale experiment to investigate factors affecting germination. Each group should look at a different factor. 	conditions for each group
10	A5: Reproduction systems	GW/IS	<ul style="list-style-type: none"> • Small group work: Learners record and report back to the whole group on the results of the germination experiment. • Individual activity: Learners examine germinating seeds and produce annotated diagrams to show parts of the seed. • Individual research: Learners make notes on seed dispersal, hypogeal and epigeal germination, including links to horticultural relevance such as frost hardiness, speed of germination and nutrient demand in early growth. • Tutor input – whole class: Cover asexual reproduction, including rhizomes and stolons, with examples to demonstrate. If time/facilities allow, learners could take cuttings of a suitable plant stock to demonstrate commercial relevance. 	<ul style="list-style-type: none"> • Hand lenses • Examples of plants with rhizomes and stolons • Cutting material (dependent on time of year and location)
11	Formative assessment opportunity	AW	Use notes and ongoing work to complete activity 1 of the SAMs.	<ul style="list-style-type: none"> • SAMs, activity 1
12	Formative assessment	GW	Give whole group feedback on SAMs work, and individual feedback as required.	
Learning aim B: Understand the importance and use of soil				
13 (4 hours)	B1: Soil types and texture	GW	<ul style="list-style-type: none"> • Tutor presentation: Give an overview of soil types – sand, silt, clay, chalk, peat and loam. • Paired practical work: in pairs, learners investigate the properties of each soil type (water-holding capacity, permeability, workability, 	<ul style="list-style-type: none"> • Samples of different soil types, balances etc., depending on methods



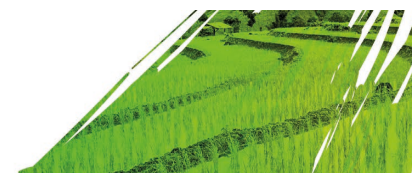
Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			<p>organic matter) and soil grading, including hand texturing.</p> <ul style="list-style-type: none"> • Plenary: Discuss the results, linking to previous knowledge of plant growth. 	chosen
14	B2: Soil structure	GW	<ul style="list-style-type: none"> • Tutor presentation: Give an overview of soil profiles/horizons and the effects of weathering. • Small group investigation: Expose the soil profile in a suitable location (e.g. college growing area). Learners sketch and identify the features. • Individual activity: Learners research and make notes on soil profiles, weathering etc., and link to rooting depths of appropriate crop plants. 	<ul style="list-style-type: none"> • Spades/trowels, depending on local conditions
15	B3: Biological and chemical activities affecting soil health and fertility	GW	<ul style="list-style-type: none"> • Small group work: Learners research and present how biological and biochemical activities affect soil health and fertility. Depending on the number and size of groups, the specification section could be broken down to give each group a different focus for their presentation. • Plenary: Discuss the implications of learners' findings for soil management. 	<ul style="list-style-type: none"> • Paper and pens
16	B3: Biological and chemical activities affecting soil health and fertility	GW	<ul style="list-style-type: none"> • Tutor presentation: Give an overview of the carbon and nitrogen cycles. • Pair work: In pairs, learners discuss and feed back to the whole group on the links between the cycles and soil health and fertility, taking into account biological and biochemical activities. 	
17	B4: Soil acidity and alkalinity	IS	<ul style="list-style-type: none"> • Tutor presentation: Explain the pH scale, the effects of pH on plant growth etc., and methods of changing soil pH. 	<ul style="list-style-type: none"> • Plants previously grown in a range



Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			<ul style="list-style-type: none"> • Individual work: Learners inspect samples of plants grown in different pH conditions and make notes on the effect (dependent on available resources and technical help, this could range from duckweed grown in petri dishes to crop plants in an outside area). • Individual research: Make notes on the effect on pH of the application of lime, aluminium sulfate, ferrous sulfate and organic matter, and the positive and negative effects this may have on plant growth. 	of pH conditions (use a pH-sensitive plant, e.g. brassicas)
18	Formative assessment opportunity	AW	Use notes and ongoing work to continue working on activity 2 of the SAMs.	<ul style="list-style-type: none"> • SAMs, activity 2
19	Formative assessment	GW	Give whole group feedback on SAMs work, and individual feedback as required.	
Learning aim C: Understand management of plant growth media				
20	C1: Soil management	IS/GW	<ul style="list-style-type: none"> • Tutor presentation: Give an overview of soil management techniques. • Individual research: Learners prepare notes on a given area of soil management, e.g. aeration, draining, irrigation, use of organic material. • Small group work: In groups containing someone with each area of soil management, learners review each other's notes. Then, reviewing across the group, choose the best sets of notes and combine them into a booklet, with a copy for everyone to cover the entire specification. • Plenary: as a class, review the finished booklet. 	<ul style="list-style-type: none"> • Paper and pens
21	C1: Soil management	IS/GS	<ul style="list-style-type: none"> • Tutor presentation: Give an overview of the characteristics of 	<ul style="list-style-type: none"> • External speaker



Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			<p>fertilisers' adjustments to soil pH levels, and practices that can lead to leaching.</p> <ul style="list-style-type: none"> • Whole class discussion: Evaluate the use of fertilisers – pros, cons, etc. • Guest speaker: Invite a speaker from an agricultural/ horticulture industry body (as available/appropriate) to discuss the use of fertilisers and changing practices in the industry. 	
22 (3.5 hours)	Formative assessment opportunity	AW	Use notes and ongoing work to complete activity 2 of the SAMs.	<ul style="list-style-type: none"> • SAMs, activity 2
23 (3.5 hours)	Formative assessment	GW	Give whole group feedback on SAMs work, and individual feedback as required.	
24 (10 hours)	Pearson Set Assignment	AW	<p>Part A: monitored preparation</p> <ul style="list-style-type: none"> • Monitored preparation is given when learners produce materials that are used in any formally supervised session. Monitored sessions are where learners are being directly observed. They may have, where specified, access to their own outcomes from preparation, access to the internet and use of appropriate resources. • We advise that time allowed for monitored preparation comes to a total of 10 hours. At the end of the monitored preparation centres will retain the notes, which will be given to learners during the supervised Part B: Set Assignment. 	<ul style="list-style-type: none"> • Pearson set assignment pre-release
25 (3 hours)	Pearson Set Assignment	AW	<p>Part B: supervised session</p> <p>Conditions of supervision:</p>	<ul style="list-style-type: none"> • Pearson set assignment



Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			<ul style="list-style-type: none"> • The Pearson Set Assignment should be carried out under supervised conditions. • We advise that the Set Assignment be taken in one or more supervised sessions that come to a total of 3 hours. 	
<p><i>Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling students to access them through the school/college intranet.</i></p>				