

## Plants, Ecology and Behaviour

Core Lesson 1	Option lesson 1a	Core Lesson 2	Option lesson 2a	Core Lesson 3	Option lesson 2a	Core Lesson 3
1-2 hours	30-40 minutes	1 hour	20-30 minutes	1-2 hours	1 hour	1-1 ½ hours
Photosynthesis	Making a Green Machine	Respiration and photosynthesis	Comparing respiration and photosynthesis	Human Impact on habitats and food chains	Is organic farming better for wildlife?	Acid rain
<b>Biology Objectives</b> Pupils learn that in photosynthesis plants produce new biomass, using carbon dioxide and water to produce glucose, with oxygen as the by-product and that chlorophyll enables plants to use light energy.	<b>Biology Objectives</b>	<b>Biology Objectives</b> Pupils learn that plants respire and distinguish between respiration and photosynthesis using word equations: they learn about the global significance of plant biomass and oxygen production.	<b>Biology Objectives</b>	<b>Biology Objectives</b> Pupils learn that maximizing food production has benefits but also drawbacks, with impacts on wildlife through habitat loss and the effect of pesticides on organisms higher in the food chain.	<b>Biology Objectives</b>	<b>Biology Objectives</b> Pupils look at the causes of acid rain, the evidence that human activity affects the environment.
<b>Key concepts and processes</b> Pupils investigate photosynthesis in algal balls, testing different variables such as light intensity.	<b>Key concepts and processes</b> Pupils design and build a model plant to reinforce understanding of how the structure of a leaf is adapted for photosynthesis and how roots are adapted to take in water.	<b>Key concepts and processes</b> Pupils interpret graphs of CO <sub>2</sub> and O <sub>2</sub> concentration to understand the relationship between photosynthesis and respiration.	<b>Key concepts and processes</b> Pupils apply their knowledge and understanding to compare and contrast the two life processes of respiration and photosynthesis.	<b>Key concepts and processes</b> Pupils evaluate secondary evidence on the issue of decline of wildlife populations, deciding whether there is a causal link with herbicide and pesticide use. They use data and scientific ideas to support recommendations for managing a population.	<b>Key concepts and processes</b> Pupils plan and carry out a research enquiry on the principles of organic farming, selecting sources of reliable information and using scientific ideas to explain why it is beneficial to wildlife.	<b>Key concepts and processes</b> Pupils collect real air quality data from secondary sources, analyse data to look for daily or seasonal patterns and suggest explanations for these patterns
<b>PLTS -</b>	<b>PLTS -</b> Connect their own and others' ideas and experiences in inventive ways, by designing a model plant that would be adapted for photosynthesis	<b>PLTS -</b> Analyse and evaluate information, judging its relevance and value by interpreting and explaining CO <sub>2</sub> and O <sub>2</sub> concentration graphs and relating this to the processes of photosynthesis and respiration.	<b>PLTS -</b> Review progress, acting on the outcomes, by assessing how well they are able to use their knowledge to compare the two processes of respiration and photosynthesis	<b>PLTS -</b> Analyse and evaluate information, judging its relevance and value, by analysing information from a herbicide impact study, using it to support conclusions and suggest solutions.	<b>PLTS -</b> Consider the influence of circumstances, beliefs and feelings on decisions and events by taking into account that not all farmers will wish to go organic because yields are less, or consumers find it too expensive	<b>PLTS -</b> Generate ideas and explore possibilities, by raising questions about air quality and finding appropriate data to provide answers.
<b>Technician's notes</b> Algal culture and alginate balls will need to be prepared 3 weeks in advance, see SAPS method at: <a href="http://www.saps.plantsci.ac.uk/worksheets/ssheets/tec23.pdf">www.saps.plantsci.ac.uk/worksheets/ssheets/tec23.pdf</a> <b>Bench lamps, metre rulers, small glass containers with lids, 10 cm<sup>3</sup> measuring cylinders, hydrogencarbonate indicator, graph paper</b>		<b>Technician's notes</b> Bright light source, sprig of Elodea in a conical flask with sodium hydrogencarbonate, pH sensor, oxygen and carbon dioxide probes. This needs to be set in advance, linked to a datalogger and run for several days before the lesson		<b>Technician's notes</b>		<b>Technician's notes</b>

**Assessment:** During each lesson each student should assess their own level using the pupil speak level ladders and show their partner where the evidence is for that level. They should record this in the grid at the front of the book. The member of staff should then assess the level of a maximum of 2 students work each lesson. At the end of each lesson there will be an end of topic test to check the content level.

**Homework:** For each topic there is a task booklet that students should use for homework.

Option lesson 3a	Core Lesson 4	Option lesson 4a	Option lesson 4b	Core Lesson 5	Option lesson 5a	Core Lesson 6
20-30 minutes + independent study time	1 hour	20-30 minutes + independent study time	30-40 minutes + independent study time	1 hour + independent study time	20-30 minutes + independent study time	40-50 minutes
Reducing acid rain	Changes to the global environment	Investigating effects of global warming on the population	Natural causes of global warming	Sustainable development	Local Agenda 21	Behaviour and the brain
<b>Biology Objectives</b>	<b>Biology Objectives</b> Pupils consider climate change resulting from a combination of human activities and natural processes.	<b>Biology Objectives</b>	<b>Biology Objectives</b>	<b>Biology Objectives</b> Pupils consider the means by which sustainable development can take place by using non-renewable energy sources more responsibly, and the importance of sustainability in meeting future needs. They recognise the impact of human actions on the environment and the conflict between the production of energy and environmental effects.	<b>Biology Objectives</b>	<b>Biology Objectives</b> Pupils learn that behaviour is influenced by many internal factors (e.g. brain structures, hormones) and external factors (e.g. light affecting sleep). New evidence suggests there are physical differences between male and female brains, resulting in different abilities of males and females to perform different kinds of tasks
<b>Key concepts and processes</b> Pupils find out about ways of reducing acid rain, and consider some of the alternatives to using fossil fuels in vehicles and power stations.	<b>Key concepts and processes</b> Pupils evaluate the evidence for the effect of human activity on global warming and appreciate that some scientists interpret the same data in different ways. They appreciate the difference between correlation and cause.	<b>Key concepts and processes</b> Pupils find out about the short-term and long term effects of global warming on a specific animal or plant. They relate survival to availability of resources, and behaviours such as hunting, feeding and mating, and whether new behaviours could be learned that would adapt to the changes in the environment.	<b>Key concepts and processes</b> Pupils find out about different natural processes that can cause global temperature. They analyse secondary evidence of long-term temperature changes, realising that global temperature changes have always occurred, over different timescales, and compare these with current rates of change which can be described as unusual.	<b>Key concepts and processes</b> Pupils consider how the growth of renewable and sustainable energy sources can help to fulfil the growing energy needs of developing countries while at the same time addressing climate change issues.	<b>Key concepts and processes</b> Pupils find out what their council is doing to fulfil the terms of LA21 by researching what facilities they provide to reduce waste, and the wider implications for the environment.	<b>Key concepts and processes</b> Pupils identify and carry out tasks that test different abilities of the brain, to find whether evidence supports a gender difference in brains.
<b>PLTS</b> - Generate ideas and explore possibilities, by researching possible solutions to the acid rain problem	<b>PLTS</b> – Question their own and others' assumptions, by looking at the evidence that supports the view that human activity is causing increased global warming, using data to support the claim.	<b>PLTS</b> - Identify questions to answer and problems to resolve, by identifying the effects of global warming on a named animal or plant	<b>PLTS</b> – Discuss issues of concern, seeking resolution where needed by weighing up the evidence to come to an informed opinion about the causes of the current global warm period	<b>PLTS</b> - Identify improvements that would benefit others as well as themselves, by explaining how the growing energy needs of developing countries can be met at the same time as climate change issues addressed.	<b>PLTS</b> - Present a persuasive case for action by finding out about ways to reduce landfill and making a case for taking action in the school or local area	<b>PLTS</b> – Analyse and evaluate information, judging its relevance and value, by testing the idea that there are differences in the capabilities of males and females for different kinds of tasks
<b>Technician's notes</b>		<b>Technician's notes</b>		<b>Technician's notes</b>	<b>Technician's notes</b>	

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Option lesson 6a	Core Lesson 7	Option lesson 7a	Option lesson 7b
1 ½ hour	40-50 minutes	20-30 minutes	20-30 minutes
Learning from experience	Behaviour and the environment	Phototaxis in simple animals	More choices for woodlice
<b><u>Biology Objectives</u></b>	<b><u>Biology Objectives</u></b> Pupils learn that, in response to external stimuli, animals and plants exhibit behaviours that are advantageous to their survival and the survival of the species	<b><u>Biology Objectives</u></b>	<b><u>Biology Objectives</u></b>
<b><u>Key concepts and processes</u></b> Pupils consider examples of animals that show changes in learned behaviour and the benefit to the organism of this response to an external stimulus. They plan and carry out a focused research enquiry, selecting and analysing relevant information from secondary sources to find out and explain a further example of how a change in learned behaviour can benefit an animal, and consider the methods ethologists use to study animal behaviour.	<b><u>Key concepts and processes</u></b> Pupils plan an approach to test the idea, ensuring that other environmental variables are controlled and analyse their data to answer their enquiry question.	<b><u>Key concepts and processes</u></b> Pupils investigate the effect of light on brine shrimps ( <i>Artemia</i> ) or water fleas ( <i>Daphnia</i> ) to determine whether they show positive or negative phototaxis (movement towards or away from light). They relate this response to an external stimuli to advantages for survival.	<b><u>Key concepts and processes</u></b> Pupils apply knowledge about differences in habitats to suggest a hypothesis for the survival advantage of certain behaviour. Pupils alter the physical conditions, e.g. damp/dry or light/dark to find out in which environment woodlice are most frequently observed and relate this to their usual habitat.
<b>PLTS</b> - Identify questions to answer and problems to resolve by raising an enquiry question and planning how to answer this	<b>PLTS</b> – Generate ideas and explore possibilities, by designing a maze to test the effect of external stimuli on turning behaviour of woodlice.	<b>PLTS</b> - Identify questions to answer and problems to resolve by raising an enquiry question and planning how to answer this	<b>PLTS</b> - Generate ideas and explore possibilities, by identifying and creating different environments to test the behaviour of woodlice under different conditions
<b>Technician's notes</b>			<b>Technician's notes</b>

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