

Focus on Photosynthesis

KS4 RHS Wisley lesson plan

Topics: Photosynthesis, limiting factors, adaptations to woodland, tropical and desert environments. How Science Works: designing, making measurements (use data loggers), presenting data, drawing conclusions, limitations of scientific evidence.

Every Child Matters: main areas covered: *Stay Safe* 2.3; 2.4 *Enjoy & achieve* 3:6 *Make a positive contribution* 4.2; 4.3; 4.4



<i>Learning Objectives</i>	<i>Structure</i>	<i>Plenary</i>
<p>Students should learn:</p> <ul style="list-style-type: none"> • The word equation for photosynthesis. • to state the requirements for photosynthesis. • to be aware of the 'law of limiting factors'. • to explain how the rate of photosynthesis may be limited by environmental factors e.g. low. temperature, shortage of carbon dioxide and shortage of light • be aware of the benefits of artificially manipulating the environment in which plants are grown. • to describe adaptations of plants in three different 	<p>Introduction Introduction to photosynthesis, why plants are important, the requirements for photosynthesis, concept of limiting factors, photosynthesis word equation. How habitats differ and environmental challenges for plants in those habitats.</p> <p>Activities 1. Discuss environmental factors in each of the habitats (teaching garden, woodland, tropical and arid) that may limit the rate of photosynthesis. Make predictions about the most important limiting factor in each of the habitats. Decide on which would be the most appropriate method for recording results and draw up a suitable table. Using a data logger, collect data on light intensity, air temperature and relative humidity from the teaching garden, woodland, the tropical and temperate arid areas of the garden and glasshouse. Download data onto laptops and manipulate data to create bar charts. Discussion of the main environmental factors in each of the four areas and how these affect the rate of photosynthesis. Discuss the experimental procedure.</p>	<p>Link the environmental factors studied today to photosynthesis. Which environmental factor do you think was rate limiting in each of the habitats studied? Give your reasons why that factor would be rate limiting. How was the environment in the tropical zone and arid zone manipulated to reduce or eliminate limiting factors? Describe with reasons how a plant was adapted to the one of the habitats studied.</p>

<p>habitats.</p> <ul style="list-style-type: none"> to link the types of plants found with different habitats with environmental factors found in those habitats. <p>Investigative knowledge and skills:</p> <p>Students should:</p> <ul style="list-style-type: none"> be able to distinguish between categorical and continuous variables appreciate that in field investigations and surveys there are particular requirements to ensure fair test. be able to ascertain whether a measure or observation is reliable or valid. should decide upon the most appropriate method of presenting and analysing data to be collected. be able to recognise and describe patterns in data and draw conclusions from them. 	<p>2. Visit the glasshouse and discuss how plants in the tropical and arid environments are adapted to photosynthesise efficiently. Use worksheet 'Photosynthesis around the world' as a guide. Discuss how the environment has been artificially manipulated to enable the specific plants to be grown in the tropical and arid zones of the glasshouse. What do you think are the benefits of growing these specifically adapted plants in the glasshouse? What are the main adaptations of the plants grown in the tropical and arid zones?</p> <p>3. Visit the Root Zone to find out how roots are adapted to absorb water and how we use roots in our everyday lives e.g. medicines, spices etc. Write down five facts about roots that you did not know before.</p> <div data-bbox="647 1035 1677 1278"> <p>Key vocabulary:</p> <p>Photosynthesis, chlorophyll, chloroplasts, converting energy, light energy, chemical energy, glucose</p> <p>Limiting factor</p> <p>Categorical, continuous variable</p> <p>Habitat, environment, tropical, temperate, arid</p> </div>	<div data-bbox="1729 145 2087 531"> <p>Resources:</p> <p>Laptops</p> <p>Data loggers</p> <p>PowerPoint introduction</p> <p>Data recording Sheets</p> <p>Worksheets</p> <p>'Photosynthesis around the World'</p> <p>Clip boards, pencils, plain paper</p> </div> <div data-bbox="1729 892 2087 1086"> <p>Links with ICT:</p> <p>Use of data loggers</p> <p>Processing information</p> </div>
---	---	---

<ul style="list-style-type: none"> • able to explain why further evidence may be needed in order to draw a firm conclusion and how this extra data may be obtained. • realise that it is sometimes difficult to collect sufficient evidence to answer a question. <p>Assessment questions</p> <ul style="list-style-type: none"> • What was the limiting factor in each of the habitats studied? • How confident can you be in the results and your conclusions? • What would need to be done to improve the reliability of the evidence? • What are the limitations of your evidence obtained? • What further evidence may be needed to draw a firm conclusion and how may this extra evidence be obtained? 	<p>Differentiation:</p> <p>All students know the word equation for photosynthesis. State the requirements for photosynthesis. In each of the areas studied, identify the conditions and describe how these conditions can affect the growth of plants. Make a prediction about which of the conditions may have the most effect. Record data in tables provided. Using the data collected, see if their predictions were correct. Evaluate their experimental method and make suggestions for improvement. Describe some adaptations of the plants to the environmental conditions in the tropical, woodland and arid areas studied.</p> <p>Most students Decide on which would be the most appropriate method for recording data and draw up a suitable table. Manipulate data to produce bar charts. Explain how the rate of photosynthesis may be limited by environmental factors in each of the areas studied. Evaluate the experimental procedure and make suggestions for improvement. Make a clear link between the adaptations of the plants and the environmental conditions present in the tropical, arid and woodland areas.</p> <p>Some students can explain the concept of 'limiting factors' and how the limiting factors affect the rate of photosynthesis. Explain clearly and in detail, the adaptations of plants and how these adaptations enable the plants to thrive in the habitats studied. Discuss the benefits of artificially manipulating the environment in glasshouses with a clear link to photosynthesis and limiting factors. Can distinguish between categorical and continuous variables. Evaluate their results critically. Discuss the reliability and validity of their results.</p>	
--	--	--