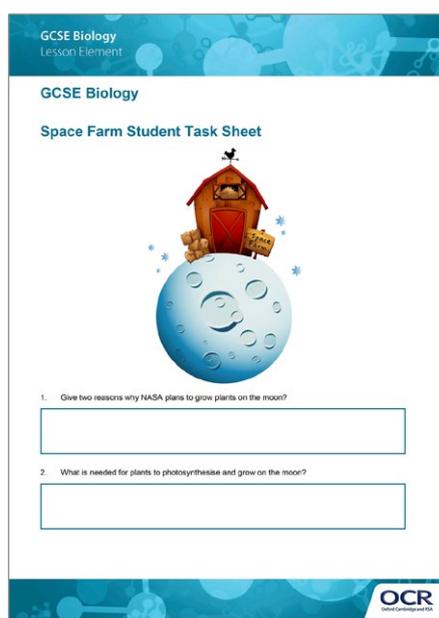


GCSE Biology

Space Farm

Instructions and answers for teachers

These instructions should accompany the OCR resource 'Space Farm' activity which supports OCR GCSE Biology.



The Activity:

Learning outcomes:

- To recall and use the word and balanced symbol equation for photosynthesis
- Describe the conversion of glucose and starch to energy and other substances in plants and their use.
- Explain the effects of limiting factors on the rate of photosynthesis



This activity offers an opportunity for English skills development.

Associated materials:

'Space Farm' Lesson Element Student Task Sheet.

Introduction

This exercise aims to use class discussion, learner research, creative thinking and practical activities to explore the fundamental concepts of photosynthesis. This topic is linked to respiration, transport in plants, plant growth and nutrition. The activity addresses the difficulty learners have in remembering that plants do not just obtain nutrients from soil and that the process of photosynthesis uses light from the Sun and not heat. There is often confusion with the idea that plants are taking in and releasing gases during photosynthesis, and that this is not respiration or 'breathing'. It is important to clarify the difference between respiration and photosynthesis with learners before undertaking this activity.

Notes for teachers

Learners will learn how plants make food, how they use glucose and how scientists plan to grow plants on the moon. Learners will use this information to design and build models of a system they would need to grow plants on the moon. These ideas can then be extended to cover intensive production of plants on the moon, how plants could be used to sustain other life forms on the moon and other experiments that could be carried out to further investigate photosynthesis.

Activity

Create a big introduction to the activity by showing learners some pictures of astronauts growing plants on board the space station or a short video clip about growing plants in space.

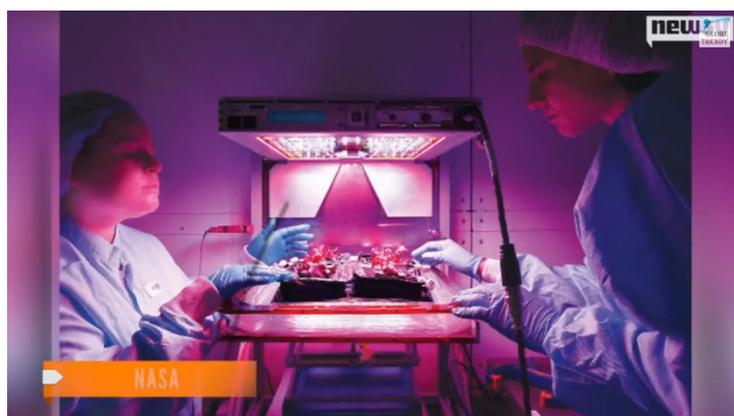
Suggested short video clips:

<http://www.bbc.co.uk/news/science-environment-13852801>



This two minute long clip is from 2011 but gives a good introduction to the activity by talking about the things needed for plants to grow, how they are grown in space and also the reasons for doing this.

<https://www.youtube.com/watch?v=gjr46xOT00A>



This short clip contains good information on reasons for growing crops in space and how this is achieved.

- Use the introductory images or video clips to discuss with learners their ideas on why scientists experiment with growing plants in space or on the moon.
- Introduce learners to the aims of the Space Farm activity on the Student Task Sheet. They need to undertake research in groups and work through the Student Task Sheet. Working together they should design a moon greenhouse.
- This activity can be a group activity that is then peer assessed on its merits and improvements that can be made.

Provide learners with access to information on photosynthesis including commercial crop production, either through text books, printed articles or access to the internet.

Suggested information for learners:

<http://www.independent.co.uk/life-style/gadgets-and-tech/nasa-to-grow-plants-on-the-moon-by-2015-if-they-can-thrive-we-probably-can-too-8972642.html>

<http://www.dailymail.co.uk/sciencetech/article-2515480/Nasa-grow-PLANTS-moon-Space-agency-sow-seeds-humans-day-live-Earths-neighbour.html>

<http://www.telegraph.co.uk/science/space/10483133/Nasa-to-send-seeds-to-Moon-to-grow-lunar-salad.html>

Suggested items to use to build models:

- Clear plastic empty drinks bottles
- Drinking straws
- Plastic tubing
- small cardboard boxes
- lollipop sticks
- Thin sheets of sponge or cotton wool
- Coloured card and paper
- Yoghurt pots
- Tin foil
- Sticky tape
- Modelling clay

Extension ideas

Learners could undertake further research into the following areas:

Why are insoluble substances such as starch used for storage?

Provide learners with graphs to show limiting factors of photosynthesis. Ask learners to use the graphs to explain the effects of limiting factors on the rate of photosynthesis.

Why do plants take in carbon dioxide and give out oxygen during the day and do the reverse at night, in terms of both photosynthesis and respiration?

Supporting information

Ensure that you have a good understanding of respiration and photosynthesis. The recycling of carbon may come up during discussion with learners.

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