

Science KS4: Blended Learning Booklet



B2 Photosynthesis

Name:

Form:

Aim to complete four lessons each week. Watch the videos and follow the four part lesson plan

All video clips are online using the ClassCharts link. Upload all work onto ClassCharts for feedback.

The online textbook has all the key information and vocabulary to help you with this unit

To log on to the online textbook:

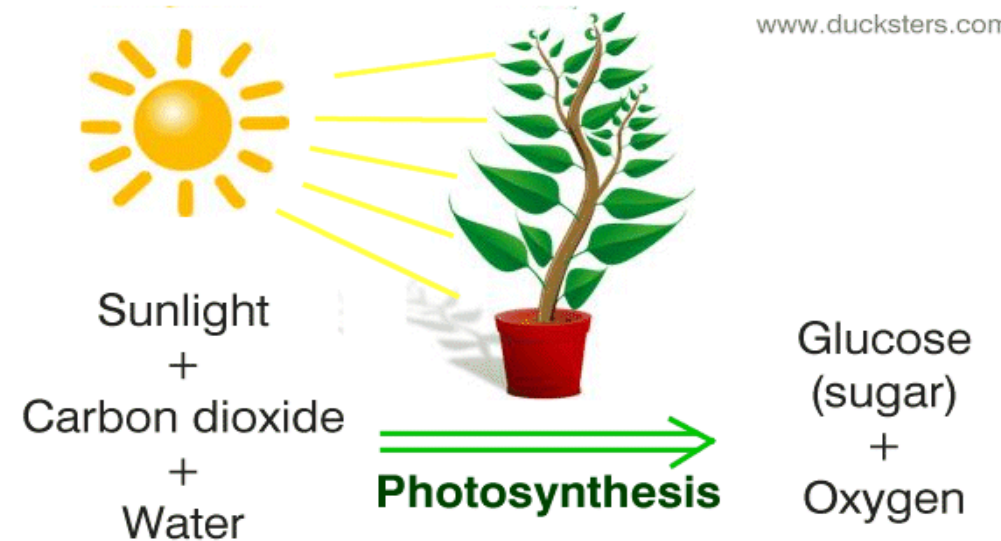
- <https://connect.collins.co.uk/school/portal.aspx>
- Type in “stewards” and select Stewards Academy
- Login using your date of birth, initial of your surname and your academic year

School name: Stewards Academy - CM18 7NQ(CM18 7NQ) : [Not your school?](#)

Date of birth: 25 Decembe First letter of surname: C

Year group: Year 11

Login



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Key Questions

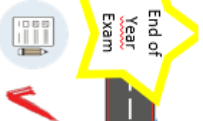
Knowledge organiser

SAL

(T) = Triple scientists only



Big Picture – Year 9 Overview Science



Next Year

Particle motion in gases (T)

Specific latent heat

Specific heat capacity

Changing state

Density

UNIT P3

End of Unit Test

Volumes and concentrations (T)

Percentage yield (T)

Amounts of substance (moles)

Apparent changes in mass

Matter

I will be able to calculate the specific heat capacity of water and be able to describe the difference between the specific latent heat of vaporization and the specific latent heat of fusion. I will be able to explain the effect heat energy has on gas particles and how this is related to volume (T).

I will be able to explain and apply the law of conservation of mass. I will be able to explain how we measure amounts of substances and how we can use these values to in calculations. I will be able to determine chemical yields (T)

Chemical Quantities

Osmosis and active transport

Enzymes and digestion

Plants and minerals

Heart and circulatory system

Gas exchange

End of Unit Test

UNIT C3

Conservation of mass

I will be able to explain the principles behind static electricity (T) and the key concepts in electricity. I will investigate and be able to describe the characteristics of electrical components. I will be able to explain how electricity is used safely in the home

Electricity



UNIT B3

Moving materials



I will be able to explain the difference between diffusion and active transport. I will be able to explain why some organisms need organ systems and different organisms move things in different ways. I will be able to explain how enzymes work.

Chemical Bonds



I will be able to explain what happens when substances change state and why some substances need a lot of energy for a change of state to occur. I will be able to describe different types of chemical bond and how they give different substances different properties.

End of Unit Test

UNIT P2

Static electricity (T)

Circuit components

Series and parallel circuits

States of matter

Bond properties

Giant covalent structures

Nano particles (T)

Translocation

End of Unit Test

UNIT C2

Chemical bond formation

Bond properties

States of matter

Giant covalent structures

Transpiration

I will be able to explain how plants are adapted to survive and get what they need from the environment. I will be able to explain how factors affect photosynthesis. I will be able to describe how water moves through a plant and how other substances diffuse in/out of plant cells

Photosynthesis



Diffusion

Increasing food production

Investigating photo-synthesis

UNIT B2

End of Unit Test

Energy Resources

Energy transfer (T)

Specific heat capacity

Work done & Power

I will be learning about the connections between energy and power, and energy and temperature. I will be able explain how energy is transferred and describe how different energy resources have an impact on the environment

Energy



Atomic Structure

Atoms, element compounds & mixtures

Sub-atomic structure

The periodic table

Groups 1, 9, & 0

Transition metals (T)

End of Unit Test

UNIT P1

Energy

I will be able to describe how scientists have developed their understanding cell structure and function. I will be able to explain how a fertilized egg develops into a complex organism. I will be able to explain how organisms get their energy from food. I will be able to explain how microorganisms are grown in the lab and how their growth is affected by disinfectants and antibiotics (T).

Cell Biology



UNIT C1

End of Unit Test

Microbes and antibiotics (T)

Respiration

Stem cells

Cell division and differentiation

Structure and function of cells

UNIT B1

Year 9



Connection

Have a look at the topic overview and the B2 zoom in.

Populate what you know and your personal objectives.

Lesson 1: B2.1 –Explaining photosynthesis.

Activation

LI: Identify the raw materials and products for photosynthesis; describe photosynthesis by an equation and explain gas exchange in leaves.

1. Make a note of the title and the LI
2. <https://www.twig-world.com/film/photosynthesis-1186/>
3. Read pages 56-57
4. Copy word and symbol equation for photosynthesis.
5. Copy table –Figure 2.3

Consolidation

Complete and self-assess the relevant past paper question for this topic - From the B2 DIP file

Demonstration

Attempt questions 1-6.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Answers: B2.1 –Explaining photosynthesis.

Demonstration

1 Raw materials: carbon dioxide and water. Products: glucose and oxygen

2 a The leaf did not contain starch

b The plant was kept in the dark

3 The control was unchanged. It is used as a comparison with Tubes 1 and 2.

Tube 1: The indicator changed from orange to yellow as conditions became more acidic

Tube 2: The indicator changed from orange to red as the conditions became less acidic

4 Tube 1: more carbon dioxide was in the tube because the leaf was respiring and producing carbon dioxide. The foil blocked light from reaching the leaf and prevented it from photosynthesising so no carbon dioxide was being used. This caused a net increase in carbon dioxide in the tube which dissolved in the solution, turning the indicator yellow.

Tube 2: the leaf was still respiring, but because

light was present it was using up the carbon dioxide produced during photosynthesis. Oxygen gas was released as a waste product, making the solution less acidic so the indicator became red.

5 Light provides the energy needed for the reaction. Chlorophyll absorbs the light energy for the reaction

6 It would change from yellow to red as the light would allow photosynthesis to take place which uses carbon dioxide. The reduction of carbon dioxide dissolved in the water would make it less acidic therefore turning red.

Connection

N/A

Lesson 2: B2.2 –Looking at photosynthesis.

Connection

1. What 3 components plants need to survive?
2. Write a word equation for photosynthesis.
3. Write balanced symbol equation for photosynthesis.



Activation

- LI: Explain the importance of photosynthesis and explain how plants use the glucose they produce
1. Make a note of the title and the LI
 2. <https://www.youtube.com/watch?v=X81OIkeuHJw>
 3. Copy and define **key words: endothermic, veins, oil, cellulose, amino acids.**
 4. Read pages 58-59
 5. Copy the diagram Figure 2.7 How plants use the products of photosynthesis.
 6. Copy table –Figure 2.3



Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Demonstration

Attempt questions 1-6.
In 15 mins answer as many questions as you can.
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Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Answers: B2.2 –Looking at photosynthesis.

Connection

1. Water, carbon dioxide and sun energy.
2. Carbon dioxide + water → Glucose+Oxygen

Demonstration

- 1 The increase in the mass of the willow tree was not just because of minerals in the soil
- 2 Take two similar plants, put one in a dark place and one in a bright light place. Leave for 24 hours and then test a leaf from both plants for starch.
- 3 Plants respire all of the time to produce the energy they need for the chemical reactions in cells
- 4 1. For respiration 2. To produce insoluble starch for storage
3. To produce cellulose for cell walls 4. combine glucose with nitrate ions and other minerals to produce amino acids for protein synthesis
5. To produce fats and oils for storage
- 5 Plants use carbon dioxide to photosynthesise and produce oxygen. They use some of the oxygen for respiration and produce carbon dioxide (for photosynthesis)
- 6 Plants do release oxygen during photosynthesis but it is a waste product of the reaction and plants do not photosynthesise so humans can breathe.
They photosynthesise to make glucose a source of energy.



Lesson 3: B2.3 –Investigating leaves.

Connection

1. Describe the main function of the leaf organ.
2. Name the reactants and products in photosynthesis reaction.



Activation

LI: identify the internal structures of a leaf and explain how the structure of a leaf is adapted for photosynthesis

1. Make a note of the title and the LI
2. <https://www.youtube.com/watch?v=Q8mphPjPnIU>
3. Copy and define **key words: epidermal tissue, palisade mesophyll, spongy mesophyll, vascular bundle.**
4. Read pages 60-61
5. Copy the diagram Figure 2.8 A diagram of a vertical section through a leaf.
6. Copy table on page 61 –Leaf adaptation & function.



Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

Answers: B2.3 –Investigating leaves.

Demonstration

Connection

1. Photosynthesis.
 2. Reactants: water, carbon dioxide (light , chlorophyll).
- Products: Oxygen , Glucose.

1 Broad: large surface area to absorb light. Thin: carbon dioxide only needs to diffuse a short distance

2 Support the leaf and transport water to the leaf and glucose away from it

3 Palisade mesophyll cells photosynthesise and spongy mesophyll cells allow the diffusion of gases.

4 Roots are underground and receive no light energy so are unable to photosynthesise and need no chloroplasts. However, leaf cells can receive light energy and photosynthesise so they have chloroplasts.

5 The cuticle is thin to allow light to pass to the mesophyll. It is waxy to provide protection from insects and to stop water loss. The wax is transparent to allow light through for photosynthesis.

6 To reduce water loss by evaporation as the underside of the leaf is more protected from direct sunlight and wind.

7 The cells are arranged end on so that more cells can fit along the upper surface of the leaf and the chloroplasts are more concentrated towards the upper surface so that they can absorb the maximum amount of light energy possible.

Lesson 4. : B2.4 Investigate the effect of light intensity on the rate of photosynthesis

Activation

LI: use scientific ideas to develop a hypothesis and use the correct sampling techniques to ensure that readings are representative, present results in a graph.

1. Make a note of the title and the LI
2. <https://www.youtube.com/watch?v=cBCKedXdFeE>
3. Read pages 62-63
4. Follow the instructions and perform required practical.
5. Record your observations and collect the data.

Demonstration

Attempt questions in your required practical book.
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Connection

List factors that effect photosynthesis.

State 4 ways glucose is used in plants.

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Answers: B2.4 — Investigate the effect of light intensity on the rate of photosynthesis

Demonstration

- 1 When the lamp is closest to the pondweed, at a distance of 10cm.
- 2 Increasing light intensity will speed up the rate of photosynthesis.
- 3 As the rate of photosynthesis increases, more oxygen will be produced.
- 4 Temperature of the water; volume of water; size of the pondweed; angle of lamp.
- 5 As the light intensity increases more bubbles of oxygen will be produced because the rate of photosynthesis increases.
- 6 The results in test 1 are all higher, than in the the subsequent tests, expect for the first reading at 10cm, which was much lower.
- 7 In the first test, the apparatus may not have been set up correctly; or consistently; the number of bubbles was mis-counted; the water was warmer; the lamp was closer (distance not accurately measured).
- 8 If they identified that problem with Test 1 results was experimental error, they should consider not using these results. It would be best to repeat the investigation a 3rd time to make sure.
- 9 To reduce the effects of random variation by making more measurements and reporting a mean value.
- 10 As a line graph, because photosynthesis is a continuous process.
- 11 Independent variable (lamp distance) on x axis, number of bubbles on y axis. Axes labelled, including units. Sensible scale used on both axes. Points plotted accurately. Points joined together

Connection

1. Light intensity, carbon dioxide concentration, water level.
2. 1) Building glucose into starch for storage.
2) Building sugar into cellulose
3) Making amino acids
4) Building fats and oils for storage

Lesson 5: B2.5 –Increasing photosynthesis.

Connection

1. How plants are adapted to shady conditions?
2. Why did we add sodium hydrogen carbonate to the water in practical last lesson ?

Activation

LI: Identify factors that affect the rate of photosynthesis, interpret data about the rate of photosynthesis and explain the interaction of factors in limiting the rate of photosynthesis.

1. Make a note of the title and the LI
2. <https://study.com/academy/lesson/limiting-factors-of-photosynthesis.html>
3. Copy and define **key words: limiting factor, tundra.**
4. Read pages 64-65

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-6
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Extension

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Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9



Answers: B2.5 –Increasing photosynthesis

Demonstration

Connection

1. Wide, broad leaves.
2. As a source of carbon dioxide

1 Tropical forest: very warm and plenty of rain

Tundra: extremely cold and ice most of the year

Desert: very hot days (cool nights) and little rain

2 Tropical forest: ideal conditions for maximum rate of photosynthesis

Tundra: low temperature and liquid water availability will result in little photosynthesis most of the time

Desert: very high temperatures and low water availability will result in little photosynthesis most of the time

3 The temperature, carbon dioxide availability and the amount of chlorophyll

4 Early morning/sun rise/6 am: temperature and light availability

Noon: carbon dioxide availability

Evening/ sunset/6 pm: carbon dioxide availability, (temperature) and light availability

Midnight: temperature and light availability

5 Higher ratio of leaves to roots increases the proportion of the plant that can photosynthesise

Thinner leaves with larger surface area and more chloroplasts to maximise the rate of photosynthesis

6 Advantage of having needles: Less water loss through transpiration as less surface area and fewer stomata than broad, flat leaves. Stomata in pine needles are also very deep.

Disadvantage: Less surface area for absorbing light compared to a broad flat leaf.

Lesson 6: B2.6 –Increasing food production.

Connection

1. List limiting factors of photosynthesis.
2. Why a plant breeder placed open bags containing a fungus around his greenhouse.

Activation

LI: Explain how factors that increase food production can be controlled and evaluate the benefits of manipulating the environment to increase food production.

1. Make a note of the title and the LI
2. https://www.youtube.com/watch?v=r9-3Tl8_wgg
3. <https://www.bbc.co.uk/bitesize/guides/zg8nrwx/revision/7>
4. Copy and define key words: hydroponics, yield, inverse square law.
5. Read pages 66-67

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-5

In 15 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Extension

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Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

Answers: B2.6 – Increasing food production.

Demonstration

Connection

1. Light, temperature, carbon dioxide levels.
2. The fungi will respire and release carbon dioxide into the greenhouse.

1 To maintain carbon dioxide levels and protect plants from excessive heat

2 To increase levels of carbon dioxide and maintain an optimum temperature

3 Conditions in the greenhouses can be controlled to optimise limiting factors and maximise the rate of photosynthesis,

4 Benefits: can maximise photosynthesis throughout the year to produce large yields quickly.

Drawbacks: cost of heaters, extra lighting, etc. and computer technology needs to be balanced against increased crop yield and income to ensure it is economically viable.

5 Students should draw a graph of $1/d^2$ on x -axis against rate of photosynthesis (y -axis).

Lesson 7: B2.7 –Diffusion in living system.

Activation

Connection

1. Recall word and symbol equation (balanced) for photosynthesis.
2. Define term hydroponics.

LI: describe the conditions needed for diffusion to occur, calculate and compare surface area to volume ratios and explain how materials pass in and out of cells.

1. Make a note of the title and the LI
2. <https://www.youtube.com/watch?v=jhszFBtBPol>
3. Copy and define key words: random, concentration gradient, equilibrium, passive transport, .
4. Read pages 68-69
5. Copy figure 2.23 A cell membrane model.

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-7
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

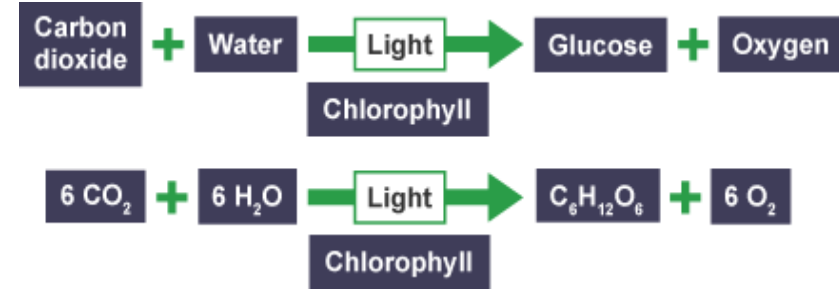
Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9



Answers: B2.7 – Diffusion in living systems.

Connection

1. 1.



2. Hydroponics A system that involves growing plants in a porous material (other than soil) and allowing water containing nutrients to filter through it.

Demonstration

1 It will increase the speed of diffusion.

2 Temperature; surface area of the cell

3 As cells photosynthesise the concentration of oxygen in cells increases so it diffuses across the cell membrane into the spongy mesophyll. The concentration of oxygen in the leaf is then higher than outside the leaf. This results in a concentration gradient, and oxygen diffuses out of the leaf

4 a They have a large surface area with many guard cells and stomata on the underside to allow gases to diffuse in and out of the leaf.

b They are very thin so gases only have a short distance to diffuse.

c Spongy mesophyll has air spaces to allow diffusion to occur.

These adaptations maximise the concentration gradient to facilitate diffusion.

5 As the temperature rises the molecules gain energy and move faster, so the rate of diffusion will increase.

6 Partially permeable membranes allow smaller molecules to diffuse through the gaps along a

concentration gradient, but block larger molecules. Look at Figure 2.20

7 It will appear to stop when an equilibrium is reached. The particles will always be moving randomly but there is no change in concentration

Lesson 8: B2.8 –Looking at stomata

Connection

1. List the functions of: upper epidermal tissue and palisade mesophyll.
2. How do we test a leaf for a starch?

Activation

LI: describe transpiration in plants, describe the function of stomata and explain the relationship between transpiration and leaf structure.

1. Make a note of the title and the LI
2. <https://www.youtube.com/watch?v=oT4jvKRYBjA>
3. Copy and define key words: guard cell, transpiration, xylem.
4. Read pages 70-71
5. Copy figure 2.24 and Figure 2.25

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-6

In 15 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



Answers: B2.8 – Looking at stomata.

Connection

1. - Allows light to pass to the mesophyll, protects leaf, stops water loss.
- Absorbs maximum amount of light.
2. – insert leaf in boiling water; place leaf in test tube with methylated spirit; wash the leaf and add few drops of Iodine solution on the leaf. Black colour indicates starch.

Demonstration

1 The movement of water through a plant

2 Water enters the root hairs, passes into the roots and travels up the stem to the leaves, where it escapes through the stomata.

3 High temperatures, increased light intensity, increased wind and lower humidity

4 Stomatal density can depend on the environment where the plant species is found. Plants found in hot dry environments have less stomata to decrease water loss by evaporation. Plant species found in humid/wet environments have more stomata as there is no need to conserve water.

5 Leaves have stomata to allow gas exchange during photosynthesis. When stomata are open for gas exchange, water loss occurs too.

Because leaves are thin for rapid diffusion of gases, water only has a short distance to diffuse too.

6 Marram grass leaves are cured and rolled. The stomata are sunk in pits inside the roll making diffusion more difficult. They have interlocking hairs which hold water vapour; this increases humidity which decreases the concentration gradient, slowing down diffusion even more. They also have very thick cuticles to prevent water loss.

Lesson 9: B2.9 –Moving water.

Connection

1. Where stomata cells can be found?
2. What is the function of stomata cells?
3. How plants are adapted to survive in desert ?

Activation

LI: describe the structure and function of xylem and roots; describe how xylem and roots are adapted to absorb water and explain why plants in flooded or waterlogged soil die.

1. Make a note of the title and the LI
2. <https://www.twig-world.com/film/plant-transport-1187/>
3. Copy and define key words: lumen, phloem, translocation, xylem, lignin.
4. Read pages 72-73
5. Copy figure 2.28 and Figure 2.29.

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-7

In 15 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Extension

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Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

Answers: B2.9 – Moving water.

Connection

1. On the lower surface of each leaf.
2. The stomata control gas exchange in the leaf.
- 3. Waxy skin - some leaves have a thick, waxy skin on their surface. This reduces water loss by transpiration. Small number of stomata cells.

Demonstration

- 1 Water is a reactant in photosynthesis
- 2 Xylem transports water and dissolved minerals from the roots up through the plant; phloem transports sugars from the leaves around the plant
- 3 Translocation is the movement of sugar around the plant
- 4 Roots have a large surface area and have root hair cells to increase the surface area even more for absorption of water. There is only a short distance for the water to diffuse across to reach the xylem
- 5 Xylem long cells reinforced by lignin to make them strong and they are waterproof to prevent water escaping before it reaches the leaves. The internal cell walls and contents breakdown to leave a hollow tube
- 6 To prevent wilting, stomata close and photosynthesis stops
- 7 Waterlogged soil contains little air which means that the root cells do not receive the oxygen they need for respiration. Therefore, they die if waterlogging lasts a long time.

Lesson 10: B2.10 –Investigating transpiration.

Connection

1. What is translocation?
2. What is the role of lignin?
3. How does waterlogging affects the plants?

Activation

LI. describe how transpiration is affected by different factors and explain the movement of water in the xylem.

1. Make a note of the title and the LI
2. <https://www.twig-world.com/film/plant-transport-1187/>
3. Copy and define key words: potometer.
4. Read pages 74-75
5. Copy figure 2.33 A potometer.

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-10

In 15 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Extension

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Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

Answers: B2.10 — Investigating transpiration.

Demonstration

Connection

1. Movement of dissolved sugars in plants.
2. Lignin is substance in cell wall which gives them strength and rigidity.
3. If waterlogging lasts a long time the root cells don't receive the oxygen they need for respiration and plant die and rot.

- 1 Leaves in the dark will not be photosynthesising so the stomata will be closed and no transpiration will occur. These photosynthesising leaves kept in the light can be compared to these leaves
- 2 Mass before and after the investigation to calculate percentage weight loss Surface area of each leaf to calculate percentage water loss for a given area
- 3 The leaves put in the light will begin to show signs of wilting. This is because leaves put in the light will photosynthesis so the stomata will open to allow carbon dioxide in which will also increase transpiration and therefore water loss. Leaves put in the dark will show less signs of wilting because their stomata will close which in turn will reduce transpiration and water loss.
- 4 Set up two shoots in potometers. Put one in front of a fan (wind) and one in an area with no wind for a set period of time and measure the distance moved by the air bubble
- 5 As humidity decreases transpiration increases
- 6 Most stomata are on the underside of the leaves; they have a waxy, cuticle; leaves maybe spiny, needles or rolled; stomata may be in sunken pits
- 7 Stomata on the underside of leaves are protected from direct sunlight and wind to reduce water loss; the waxy cuticle is waterproof to prevent water loss from the leaf; spiny, needles or rolled leaves all have a reduced surface area to reduce water loss; rolled leaves and stomata in pits trap water vapour, to increase humidity and reduce water loss
- 8 Some water is used for chemical reactions in the cells
- 9
 - a. As temperature decreases transpiration will not change at first, but then it will decrease rapidly until at 0oC it almost zero too.
 - b. As the wind increases the rate of transpiration increases.
 - c. As light intensity decreases transpiration will not change at first, but then it will decrease rapidly until at 0oC it almost zero too.
 - d. As humidity increases transpiration decreases.
- 10 Plants grown in cooler cloudy and humid conditions will lose less water because the evaporation concentration gradient will be lower. However cool temperatures may limit the rate of photosynthesis. Cloud cover may reduce light intensity which could also limit the rate of photosynthesis.

Lesson 11: B2.11 –Moving sugar.

Connection

1. What is the job of xylem?
2. List how plants control water loss
3. What affects transpiration rate in plants?

Activation

LI:describe the movement of sugar in a plant as translocation and explain how the structure of phloem is adapted to its function in the plant

1. Make a note of the title and the LI
2. <https://www.youtube.com/watch?v=QXdujo4PZ7c>
3. Copy and define key words: potometer.
4. Read pages 76-77
5. Copy figure 2.35

Consolidation

Complete and self-assess the relevant past paper question for this topic -
From the B2 DIP file

Demonstration

Attempt questions 1-10

In 15 mins answer as many questions as you can.

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Extension

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Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

Answers: B2.11 — Moving sugar.

Demonstration

Connection

1. Xylem moves water from roots to the leaves.
2. - Thick waxy cuticle
 - Most stomata are on the underside of the leaf
 - needle-like, spiny or rolled leaves
 - Stomata in pits on the leaf surface.
3. Concentration gradient inside and outside the leaf.

1 Carbohydrates and proteins are insoluble but amino acids and sucrose are soluble.

2 The movement of sugar around the plant

3 Diagram might show glucose being:

stored as starch, converted to cellulose, used to make fruits/seeds, converted into lipids and proteins, used for growth and repair.

4 Phloem cells have end walls with sieve plates, cytoplasm but no nucleus and a companion cell with a nucleus next to them.

5 Phloem cells have end walls with sieve plates but xylem are hollow tubes. Phloem cells contain cytoplasm but xylem cells do not.

6 Phloem are living cells with no nucleus; the companion cells have a nucleus to control the phloem cells' activities and lots of mitochondria to supply the energy needed for translocation to take place in the phloem cells.

7 Sieve plates allow the movement of soluble substances in the phloem.

B2- Revision

Connection

1. What does cell sap contain?
2. Describe the role of companion cell.
3. Where sieve plates can be found?

Activation

LI: Create a topic summary sheet

1. Fold an A3 sheet so it is divided into 8 sections
2. Look back over your lesson and group them into 8 main headings
3. Summarise the key points into each section, use keywords and diagrams and symbols rather than sentences



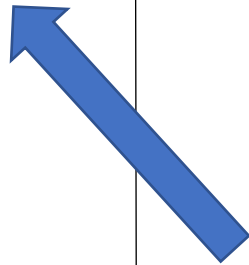
Consolidation

Look through the relevant past paper questions for this topic - From the B1 DIP file – see if you can complete any additional questions



Extension

Make a list of anything that you would like to ask your teacher to go over again



Demonstration

Test yourself by working with the person sitting next to you by talking through each box on your summary sheet and seeing how many key facts you can remember



Answers: B2 Revision

Connection

1. Cell sap contains sugars and amino acids.
2. The companion cell controls the activities of the phloem but does not help with translocation.
3. Phloem has sieve plates.

B2 DART – Increasing Food Production

Neil Mattson, School of Integrative Plant Science, Horticulture Section, spent his childhood on a farm with flower and vegetable gardens. “If you know how to grow your own food, you’ll never go hungry,” Mattson recalls his grandmother, who grew up during the Great Depression, saying. “That ethos has carried with me.” And it has carried into his research projects, which aim to better understand controlled environment agriculture (CEA)—the cultivation of crops in controlled environments such as greenhouses, plant factories, or vertical farms.

Mattson is particularly interested in CEA. He says, “It integrates technology and agriculture and enables year-round production of high quality products.” For example, one can produce 20 to 50 times more lettuce per acre in a greenhouse than in a field in California.

Even so, there are challenges and drawbacks to growing crops in controlled environments, including the amount of energy and labor costs required. Given the challenges, one of the main questions driving Mattson’s work is essential: Is it realistic and economically viable to scale up CEA to feed the masses? “I’m trying to understand the pros and cons of this higher tech production system and want to understand its constraints and improve upon the constraints,” Mattson says.

For this project, Mattson’s team studies the use of LED lights. LEDs are significantly more energy efficient than legacy lights and also have more control capabilities—such as adjusting light intensity and spectrum—whereas legacy lights can only be turned on and off. Currently two-percent of lit areas in greenhouses use LEDs. One barrier is the high upfront cost of the new technology. Since it’s new, growers don’t fully understand how to use its capabilities.

“The hardware has advanced more quickly than our understanding of the underlying plant physiology and how to operate the lights to promote plant yield and quality,” Mattson says. “We’re beginning to understand plant responses to lights and developing better control strategies for energy efficiency.”

The GLASE project specifically aims to understand the use of LEDs to best grow three economically important crops for New York State: lettuce, tomato, and strawberry. To do this, Mattson and his collaborators begin by collecting data in enclosed indoor environments, with no outside light. That drives greenhouse research, where Mattson tests hypotheses on campus greenhouse facilities with supplemental light. Finally, the researchers bring the technology to industry partners in pilot projects, to both drive adoption and collect real-world data.

Given the applied nature of the research, GLASE is already organizing an industry-funded consortium, which currently has 13 industry members. “When the project ends, we want it to be self-sustaining from private support, since there will continue to be new technology and challenges and questions in plant lighting,” says Mattson.

Reference: Growing the Worlds Food in Greenhouses by Alexandra Chang 8th February 2018

URL: <https://research.cornell.edu/news-features/growing-worlds-food-greenhouses>

B2 DART - Increasing Food Production

1a) What does 'CEA' stand for?

1b) Which type of lights are being used in the study?

LED

1c) Which three foods are being grown for the study?

2a) Compare the capabilities of LED lights to legacy lights.

2b) Describe one disadvantage using LED technology in greenhouses.

2c) Explain the procedures taken to collect data for the study.

3a) What is the motive to carry out this study?

3b) Suggest a factor that could be added in the study to improve the yield.

3c) How would you test the factor you suggested in question 3b?

B2 DART Answers - Increasing Food Production

1a) What does 'CEA' stand for? controlled environment agriculture

1b) Which type of lights are being used in the study? LED

1c) Which three foods are being grown for the study? lettuce, tomato, and strawberry

2a) Compare the capabilities of LED lights to legacy lights.

LEDs are significantly more energy efficient than legacy lights and also have more control capabilities—such as adjusting light intensity and spectrum—whereas legacy lights can only be turned on and off.

2b) Describe one disadvantage using LED technology in greenhouses.

One barrier is the high upfront cost of the new technology. Since it's new, growers don't fully understand how to use its capabilities.

2c) Explain the procedures taken to collect data for the study.

. To do this, Mattson and his collaborators begin by collecting data in enclosed indoor environments, with no outside light. That drives greenhouse research, where Mattson tests hypotheses on campus greenhouse facilities with supplemental light. Finally, the researchers bring the technology to industry partners in pilot projects, to both drive adoption and collect real-world data.

3a) What is the motive to carry out this study?

To be able to supply the demand for food with a growing population.

3b) Suggest a factor that could be added in the study to improve the yield.

A factor that increases the rate of photosynthesis.

3c) How would you test the factor you suggested in question 3b?

???



Attainment Band :		Knowledge and Understanding
Yellow Plus/ Yellow		<p>Recall and use the balanced symbol equation for photosynthesis.</p> <p>Explain that chloroplasts absorb energy to drive chemical reactions.</p> <p>Describe the difference in gas exchange in plants between day and night.</p> <p>Explain the effects of limiting factors on photosynthesis.</p> <p>Explain how the leaf's structure is adapted for photosynthesis.</p> <p>Explain how substances pass in and out of cells.</p> <p>Explain adaptations of xylem and phloem.</p> <p>Explain how different factors affect transpiration.</p> <p>Explain how concentration gradients affect processes.</p>
Blue		<p>Recall and use the symbol equation for photosynthesis.</p> <p>Describe the use of light and chloroplasts in photosynthesis.</p> <p>Explain why photosynthesis is an endothermic reaction.</p> <p>Explain why plants carry out respiration.</p> <p>Describe how the rate of photosynthesis can be increased.</p> <p>Describe how leaves are adapted for efficient photosynthesis.</p> <p>Explain diffusion using the idea of particles.</p> <p>Describe adaptations in xylem and phloem.</p> <p>Describe how different factors affect transpiration.</p> <p>Describe how proteins and carbohydrates are transported in plants.</p>
Green		<p>Use the word equation to describe photosynthesis.</p> <p>Know that chloroplasts absorb light and convert it to chemical energy.</p> <p>Understand that photosynthesis is an endothermic reaction.</p> <p>Understand that plants respire and photosynthesise.</p> <p>Name the factors that affect photosynthesis.</p> <p>Identify the parts of a leaf and their function.</p> <p>Know the definition of diffusion.</p> <p>Describe how water travels in plants.</p> <p>Describe experiments on the rate of transpiration.</p> <p>Recall that the movement of sugars is called translocation.</p>
White		<p>Some elements of the above have been achieved</p>