# Planning Support Booklet

**J247, J250**

**For first teaching in 2016**

This support material booklet is designed to accompany the OCR GCSE (9-1) specification in Biology A and Combined Science A (Gateway Science).

***DISCLAIMER***

This resource was designed using the most up to date information from the specification at the time it was published. Specifications are updated over time, which means there may be contradictions between the resource and the specification, therefore please use the information on the latest specification at all times.If you do notice a discrepancy please contact us on the following email address: resources.feedback@ocr.org.uk

# Introduction

This support material is designed to accompany the OCR GCSE (9-1) specification for first teaching from September 2016 for:

* [Biology A (Gateway Science – J247)](http://www.ocr.org.uk/Images/234594-specification-accredited-gcse-gateway-science-suite-biology-a-j247.pdf)
* [Combined Science A (Gateway Science – J250)](http://www.ocr.org.uk/Images/234596-specification-accredited-gcse-gateway-science-suite-combined-science-a-j250.pdf)

The Planning Guidance table on the following pages sets out suggested teaching times for the topics within the specification. Note that we always recommend that individual centres plan their schemes of work according to their individual needs. Actual teaching times for topics will depend on the amount of practical work done within each topic and the emphasis placed on development of practical skills in various areas, as well as use of contexts, case studies and other work to support depth of understanding and application of knowledge and understanding. It will also depend on the level of prior knowledge and understanding that learners bring to the course.

The table follows the order of the topics in the specification. It is not implied that centres teach the specification topics in the order shown, centres are free to teach the specification in the order that suites them.

## Delivery guides

The column ‘Delivery guides’ refers to individual teacher guides available from the [GCSE (9–1) Biology A](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/) and [Combined Science A](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-combined-science-a-j250-from-2016/) qualification pages.

These Delivery guides provide further guidance and suggestions for teaching of individual topics, including links to a range of activities that may be used and guidance on resolving common misconceptions.

## Practical work

Specification topic p7 (Practical skills) is not included explicitly in the Planning Guidance table. The expectation is that the practical skills are developed throughout the course and in support of conceptual understanding.

Suggestions for where the PAG techniques can be are included throughout the table. This is by no means and exhaustive list of potential practical activities.

| Topic | Teaching hoursSeparate / Combined | Delivery guides | PAG opportunities |
| --- | --- | --- | --- |
| **Topic 1: Cell level systems** |
| B1.1 Cell structures | 3.0 / 3.0 | Cell level systems – delivery guide | PAG B1: Microscopy – investigation of a range of cellsPAG B6: Physiology, responses respiration – Investigation of cytoplasmic streaming in Elodea spp. PAG B7: Microbiological techniques – Preparation of cheek cell slides |
| B1.2 What happens in cells (and what do cells need)? | 6.5 / 4.0 | Cell level systems – delivery guide | PAG B1: Microscopy – observation of mitosis in root tip cellsPAG B2: Testing for biological molecules – Investigation of DNA extraction from a living organismPAG B2: Testing for biological molecules – Investigations of enzyme activityPAG B2: Testing for biological molecules – Investigation into the effect of amylase on a baby rice pastePAG B4: Rates of enzyme controlled reactions – Investigation into the effect of amylaseon a baby rice pastePAG B4: Rates of enzyme controlled reactions including numerical analysis of data and graphical representation of results |
| B1.3 Respiration | 5.5 / 5.0 | Cell level systems – delivery guide | PAG B2: Testing for biological molecules – Investigation into respirationPAG B6: Physiology, responses respiration – research into whether plants respirePAG B6: Physiology, responses respiration – investigation into aerobic and anaerobic respiration using fungi |
| B1.4 Photosynthesis | 6.0 / 5.0 | Cell level systems – delivery guide | PAG B2: Testing for biological molecules – Investigation into photosynthesisPAG B5: Photosynthesis – Investigation of photosynthesis in algae using alginate beadsPAG B5: Photosynthesis – Investigation of photosynthesis e.g. the Priestley experiment using Cabomba to collect oxygen or the Ingenhousz experiment to show mass gainPAG B5: Photosynthesis – Experiments to show the consequences of light exclusion on photosynthesising plantsPAG B5: Photosynthesis – Investigation of photosynthesis in algae using alginate beads to immobilize the algae |
| **Total for topic 1 = 21.0 / 17 hours** |
| **Topic B2: Scaling up** |
| B2.1 Supplying the cell | 6.0 / 5.0 | Scaling up – delivery guide | PAG B6: Physiology, responses respiration – Investigation of ‘creaming yeast’ to show osmosisPAG B6: Physiology, responses respiration – Investigation into changes in mass of vegetable chips when placed in sucrose/salt concentrations of varying concentrations PAG B8: Transport in and out of cells – Investigation into changes in mass of vegetable chips when placed in sucrose/salt concentrations of varying concentrations |
| B2.2 The challenges of size | 9.0 / 9.0 | Scaling up – delivery guide | PAG B1: Microscopy – investigation of a blood smear/blood vesselsPAG B1: Microscopy – Examination of root hair cellsPAG B1: Microscopy – Measurement of plant stomatal densityPAG B1: Microscopy – Investigation of the position of the xylem/phloem in root, stem and leaf tissuesPAG B6: Physiology, responses respiration – Measurement of plant stomatal density and openingPAG B6: Physiology, responses respiration – investigations into environmental factors that affect water uptake in plants |
| **Total for topic 2 = 15.0 / 14.0 hours** |
| **Topic B3: Organism level systems** |
| B3.1 Coordination and control – the nervous system | 7.0 / 3.0 | Organism level – delivery guide systems | PAG B6: Physiology, responses respiration – Research into reflexes/reaction times |
| B3.2 Coordination and control – the endocrine system | 8.0 / 5.0 | Organism level systems – delivery guide | PAG B6: Physiology, responses respiration – Investigation of the effects of phototropism using seedlings |
| B3.3 Maintaining internal environments | 9.0 / 4.0 | Organism level systems – delivery guide | PAG B8: Transport in and out of cells – Demonstration of the different water potentials on different cells |
| **Total for topic 3 = 24.0 / 12.0 hours** |
| **Topic B4: Community level systems** |
| B4.1 Ecosystems | 9.0 / 5.0 | Community level systems – delivery guide | PAG B1: – Examination of the roots of a leguminous plant PAG B3: Sampling techniques – Investigation of the holly leaf miner or the horse-chestnut leaf miner (Cameraria ohridella)PAG B3: Sampling techniques – Identification of the biotic factors in an ecosystem using sampling techniquesPAG B4: Rates of enzyme controlled reactions – Investigation of the most favourable conditions for compostingPAG B7: Microbiological techniques – Investigation of the most favourable conditions for composting |
| **Total for topic 4 = 9.0 / 5.0 hours** |
| **Topic B5: Genes, inheritance and selection** |
| B5.1 Inheritance | 12.0 / 9.0 | Genes, inheritance and selection – delivery guide |  |
| B5.2 Natural selection and evolution | 6.0 / 4.0 | Genes, inheritance and selection – delivery guide |  |
| **Total for topic 5 = 18.0 / 13.0 hours** |
| **Topic 6 Global challenges** |
| B6.1 Monitoring and maintaining the environment | 5.0 / 4.0 | Monitoring and maintaining the environment – topic exploration pack | PAG B3: Sampling techniques – Investigation into the effects of lichen distribution against pollutionPAG B3: Sampling techniques – Investigation into the effectiveness of germination in different strengths of acid rainPAG B3: Sampling techniques – Investigation of ecological sampling methods |
| B6.2 Feeding the human race | 6.0 / 3.0 | Feeding the human race – topic exploration pack |  |
| B6.3 Monitoring and maintaining health | 22.0 / 16.0 | Monitoring and maintaining health – topic exploration pack | PAG B7: Microbiological techniques – Investigation into growth bacterial cultures using aseptic techniques |
| **Total for topic 6 = 33.0 / 23.0 hours** |

**Total teaching hours = 120 hours / 84 hours**

# Outline Scheme of Work: B2: The challenges of size

## Suggested teaching time for chapter: 15 hours biology / 14 hours combined science

### B2.1 Supplying the cell

| Lesson | Statements | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 | B2.1a explain how substances are transported into and out of cells through diffusion, osmosis and active transport examples of substances moved, direction of movement, concentration gradients and use of the term water potential (no mathematical use of water potential required) | ***Bigger or more?*****Starter**One can approach this topic by asking a simple question. What is the difference between you aged three and now? Most will say they are bigger. Do not underestimate the importance of simple questions. Many of the higher ability students will miss out simple marks. Then expand the question have you got more cells now or as you grow in size do your cells grow in size – this question will be answered/proved during this course.**Main**Introduce students to the three methods of transport into cells:* diffusion
* active transport
* osmosis

Demonstrate diffusion by spraying an air freshener in the room and getting students to raise their hands when they can smell it.Demonstrate osmosis by creaming yeast. This is an easy to do experiment that will engage pupils **Materials*** Fresh yeast. Obtain some fresh yeast from a suitable supermarket. You will need to choose a supermarket where they bake onsite. In 2016 I obtained 200g of this from one of the larger supermarkets and the cost was 20p
* Granular sugar
* Suitable stirring implement – this needs to be quite ridged and unlikely to break, a spoon works well
* 250ml beaker or tumbler
 | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the role of diffusion in the movement of materials in and between cells
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|  |  | **Method**Place approximately 75g of yeast into the beaker.You could discuss with the students the state of matter of the yeast. Most students will remember that it is a solid.Then add approximately the same amount of sugar (volume for volume works well). Discuss with the students the state of matter of sugar. Most will say that it is a solid. You could hit them with counter arguments saying that it can be poured like a liquid and that it fills the shape of the container. Stir the sugar and yeast with the spoon. At some point (approximately two minutes after starting stirring) the two solids become a liquid. Discuss where the liquid comes from. A class practical or even a demo of a raw egg in water and syrup to show osmosis occurring (B2.1 a). The following [link](https://serendipstudio.org/sci_edu/waldron/) contains a premade worksheet to allow learners to record their findings. It also provides more details for teachers. Point out to the students that the both of the above are forms of diffusion. Moving from a high concentration/water potential to low.Demonstrating active transport is more difficult. This can be done using a kinaesthetic method. Split the room into two using desks. Have a 1.5 m gap between the desks. Split the students evenly between the two halves of the room. Ask if diffusion will occur. How can we move learners if equilibrium has been achieved. You would need a pump**Plenary**Watch the following video clip: <https://www.youtube.com/watch?v=gksjprsbj5o> this starts by looking at each process separately and then, compares them together and shows how they differ. Students can then define each form of transport. They can then complete a table of comparison between of these methods.**Homework** Learn the definitions of diffusion, osmosis and active transport. |  |
| 2 | B2.1a explain how substances are transported into and out of cells through diffusion, osmosis and active transport examples of substances moved, direction of movement, concentration gradients and use of the term water potential (no mathematical use of water potential required)BM2.1i use percentiles and calculate percentage gain and loss of mass M1c | ***Can cells get bigger?*****Starter**Get students to write down a definition of osmosis.**Main**Practical investigation of osmosis in potato chips (PAG 8).**Plenary**Determine the concentration of the potato chip.Homework investigate how the ancient Egyptians mummified their pharaohs. | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the role of diffusion in the movement of materials in and between cells
 |
| 3 | B2.1b describe the process of mitosis in growth, including the cell cycle the stages of the cell cycle as DNA replication, movement of chromosomes, followed by the growth of the cell | ***Can we make more cells?*****Starter****Main**Demonstrate the process of mitosis kinaesthetically using shoes:<http://www.ocr.org.uk/Images/298837-scaling-up-learner-and-teacher-resources.zip> **Investigating mitosis in allium**A variety of class practicals and demonstrations are available from the Royal Society of Biology [here](https://pbiol.rsb.org.uk/cells-to-systems/cell-division/investigating-mitosis-in-a-root-tip-squash). This [video](https://www.youtube.com/watch?v=VJ678ceiiV0) also demonstrates the practical.The following animation can be used to illustrate mitosis: <http://www.cellsalive.com/mitosis_js.htm> A clear animation on mitosis in detail. Includes a pause and play button. Can be used bylearners as a revision tool or as a class.**Plenary** | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model
 |
| 4 | B2.1b describe the process of mitosis in growth, including the cell cycle the stages of the cell cycle as DNA replication, movement of chromosomes, followed by the growth of the cell | ***Cell cycle*** **Starter**Give students a lump of modelling clay and get them to roll it ball. What is the problem with cell division by mitosis? If cells kept dividing like this they would get smaller and smaller.**Main**Microscopic examination of mitosis in allium root tops. This can be done using root tip squashes. Learners should notice that recently divided cells are smaller and therefore need to grow. Students can draw cells at the different stages of mitosis and also sample the cells to determine which cells there are most of.**Plenary**This [interactive quiz](https://www.educationquizzes.com/gcse/biology/unit-2-mitosis/) could be used as a class or individually to check understanding in the lesson. **Homework**Find details of an unusual cell. This can be a plant cell, an animal cell, a bacterial cell a fungal cell or a protist. | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model
 |
| 5 | B2.1c explain the importance of cell differentiation to include the production of specialised cells allowing organisms to become more efficient and examples of specialised cellsB2.1e describe the functions of stem cells to include division to produce a range of different cell types for development, growth and repair | ***Division of labour*****Starter**Using modelling clay get students to produce one centimetre balls in the most efficient way that they can. Discuss how the division of labour can make you more efficient (e.g. one person tears the modelling clay into appropriate sized pieces, one rolls the clay into a ball and one quality controls the balls). Separating the job allows one person to become very good at that yob and makes them more efficient. This can occur with cells.**Main**List as many different cells as you can.Using the resource: <http://www.ocr.org.uk/Images/298837-scaling-up-learner-and-teacher-resources.zip> Introduce specialised cells. Here learners are provided with 4 specialised cells. They are to look at the descriptions provided and match them with the correct cells.Learners must realise that the cells that they may be given in an exam may not be the ones in the text book/specification etc. They must need to apply their knowledge of cells and organelles to the function of the cell they are presented. Collect in the cells from the homework and get learners to identify how the cell is adapted to its function.Students could model specialised cells for a display labelling the features that allow them to carry out their function.State that these cells are differentiated. Describe the function of stem cells.**Plenary**Give the learners photographs of specialised cells and allow them to suggest a function. Examples could be: bacteria with flagella (for motion), fungal basidium (for launching spores), receptor cell e.g. rods or cone from the eye (for light detection), paramecium (cilia for movement), goblet cell (for mucus (secretion) etc.**Homework**Find a news article describing the use of stem cells. | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope
* the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts
* the similarities and differences between plant and animal cells
 |
| 6 | B2.1d recall that stem cells are present in embryonic and adult animals and meristems in plantsB2.1e describe the functions of stem cells to include division to produce a range of different cell types for development, growth and repairB2.1f describe the difference betweenembryonic and adult stemcells in animals | ***How do we make different cells?*****Starter**Review news articles on stem cells.**Main**Define what are stem cells are. The following link may be useful: [http://www.eurostemcell.org/files/All\_about\_stem\_cells\_16+\_July2013\_all\_resources.pdf](http://www.eurostemcell.org/files/All_about_stem_cells_16%2B_July2013_all_resources.pdf) An activity which focuses on stem cells. It has many visual posters as part of the activity.A virtual lab can be used, which allows you to create your own stem cells <http://edheads.org/?page=Stem1>.Learners may find it difficult to distinguish between adult and embryonic stem cells. Allowlearners to read the following case study about adult stem cell <http://www.explorestemcells.co.uk/restoring-eyesight-after-chemical-burns.html> and then the case study aboutembryonic stem cells <http://www.npr.org/sections/health-shots/2014/10/14/346174070/embryonic-stem-cells-restore-vision-in-preliminary-human-test> question learners: what did they both have in common? How are they different? Are there any ethical issues?Illustrate there are stem cells in plants and where they are (meristem)**Plenary**Using the Activity 8 resources learners to produce an information leaflet for patients explaining how stem cells can be used in their treatment. To include following points:* What is a stem cell?
* How do stem cells work?
* What is an adult stem cell?
* What is an embryonic stem cell?
* How do they differ?

Finish the above for homework. | Prior knowledge from the KS3 programme of study:* cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope
* the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts
* the similarities and differences between plant and animal cells
 |
| 7 | BM2.2i calculate surface area : volume ratios (M1c)BM2.2ii use simple compound measures such as rate (M1a, M1c)BM2.2iii carry out rate calculations (M1a, M1c)BM2.2iv plot, draw and interpret appropriate graphs(M4a, M4b, M4c, M4d) | ***Is it better to be bigger or smaller?***Note this learning objective links together the B2.1 and B2.2 sub-topics.**Starter**Return to the initial question as we grow do our cells get bigger or are there more of them? Cells can get bigger osmosis proves that. Also we can make more cells mitosis. What are the advantages of smaller and many rather than bigger and fewer.**Main**Carry out the Activity 11 to calculate surface area to volume ratio:<http://www.nuffieldfoundation.org/practical-biology/effect-size-uptake-diffusion> Learners can be given the opportunity to investigate how surface area to volume ratioaffect rate of diffusion.**Plenary**Plot the surface area to volume ratio (y-axis) against the length of cubes for 1, 2, 3, 4, and 5 cm cubes (x-axis). This can be done if the ratio is converted to n:1 this will result in n being 6,3,2,1.5 and 1.2 . Students need to describe the graph.Lesson 7 graph image | Prior knowledge from the KS3 programme of study: |

|  |
| --- |
| Additional remote learning opportunities***As a response to the Covid-19 outbreak, additional online learning opportunities were identified for each topic in June 2020.*** |
| **Lesson** | **Statement** | **Teaching activities** |
| 1 & 2 | B2.1a | This Oak National Academy [interactive remote lesson](https://classroom.thenational.academy/lessons/diffusion-61jker) on diffusion contains a recap quiz, presentation slides and worksheets for students to work through.This [BBC class clip](https://www.bbc.co.uk/teach/class-clips-video/biology-ks3-gcse-osmosis-rap/zfv8xyc) could be used to introduce osmosis. Alternatively, this video from the Amoeba sisters about [osmosis and water potential](https://www.youtube.com/watch?v=L-osEc07vMs) can be used with students. [This video](https://ocr.org.uk/Images/topic-b2-elevate-video-plasymolysis-of-plant-cells.mp4) shows the effect of plasmolysis in cells from the petal of a tulip.This [video practical](https://ocr.org.uk/rpgbiol3) about osmosis on plant tissue demonstrates some of the skills required in PAG B8. It has a full video, interactive experiment and quiz questions.Further remote lessons from [Oak National Academy](https://classroom.thenational.academy/lessons/active-transport-6mtk2r) could be used to reinforce learning for Active Transport. This [video](https://www.youtube.com/watch?v=eDeCgTRFCbA) about active transport could also be given to students to reinforce learning. |
| 3 & 4 | B2.1b | This [mitosis quiz](https://www.footprints-science.co.uk/index.php?type=DNA) can be used to check students understanding about the process. This [clip](https://www.bbc.co.uk/bitesize/guides/zq4sk2p/video) from BBC bitesize can be used by students for independent learning of the cell cycle and cell specialisation. This Amoeba sisters [video](https://www.youtube.com/watch?v=f-ldPgEfAHI&t=2s) could be used alternatively for independent learning of mitosis |
| 5 & 6 | B2.1d – B2.1f | This Oak National Academy [interactive remote lesson](https://classroom.thenational.academy/lessons/stem-cells-and-the-use-of-stem-cells-69gkac) on stem cells contains a recap quiz, presentation and worksheets for students to work through. This [animation](https://www.saps.org.uk/secondary/themes/1290) demonstrates growth, mitosis and differentiation in plants. There is also a teacher guide that can be used alongside it.Students can use these revision pages about [mitosis and cell specialisation](https://www.bbc.co.uk/bitesize/guides/zq4sk2p/revision/1), which end in an interactive test to review learning. There are also relevant pages about the [challenges of size in animals](https://www.bbc.co.uk/bitesize/guides/z3pjsrd/revision/1) and the [challenges of size in plants](https://www.bbc.co.uk/bitesize/guides/z936gdm/revision/1) that students can also be directed to. |

### B2.2 The challenges of size

| Lesson | Statements | Teaching activities | Notes |
| --- | --- | --- | --- |
| 1 | B2.2a explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area : volume ratio to include surface area, volume and diffusion distancesB2.2b describe some of the substances transported into and out of a range of organisms in terms of the requirements of those organisms to include: oxygen, carbon dioxide, water, dissolved food molecules, mineral ions and urea | ***What do you need?*****Starter**Get learners to list organisms you need and what you have to get rid of. Also indicate the difference in requirement of plant and animals.**Main**Compile a class list of the molecules that cells need and what they are used for. Review the graph for surface area : volume ratio. As cells get bigger their relative surface area decreases. This means that cells may be able to get all their requirements and remove all waste products by diffusion alone. As organisms get larger they cannot do this by diffusion alone and will need specialised organs.Compile a list of the molecules that organisms need to get rid of, why the body has to get rid of them and which organs do this.Bring in a heart if you would like to dissect one for the next lessonDemonstrate how folding increases surface area this can be done with paper and paperclipsLesson 1 image | Working scientifically codes: WS1.4d, WS1.4e, WS1.4f, WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the structure and functions of the gas exchange system in humans, including adaptations to function
* the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume
 |
|  |  | Lesson 1 imageA lung demonstration may be included here. Looking at the structure of the lung may indicate how large a surface are this is (half a tennis court).Review the respiration and photosynthesis equation.Revise the test for carbon dioxide by blowing through lime water. Also demonstrate the effect of carbon dioxide on bicarbonate indicator. **Plenary****Homework** |  |
| 2 | B2.2c describe the human circulatory system to include to include the relationship with the gaseous exchange system, the need for a double circulatory system in mammals and the arrangement of vesselsB2.2d explain how the structure of the heart and the blood vessels are adapted to their functions to include the structure of the mammalian heart with reference to valves, chambers, cardiac muscle and the structure of blood vessels with reference to thickness of walls, diameter of lumen, presence of valves | ***How do you get it there?*****Starter**Label a heart diagram – learners should not panic if you cannot this activity is s there to test prior knowledge. A suitable heart can be found here: http://www.ocr.org.uk/Images/298837-scaling-up-learner-and-teacher-resources.zipLearners complete the diagram of the heart filling in the blanks.**Main***Heart dissection*One method of heart dissection is illustrated here: <https://www.tes.com/teaching-resource/heart-dissection-sheet-6147369>The following video can be used as the dissection is being cleared up: <https://www.youtube.com/watch?v=-s5iCoCaofc>**Plenary**Label the heart diagram again – in a different colour pen to show misconceptions and missed answers.**Homework:** Activity 10Learners to produce an informative leaflet for patients on behalf of the British heartfoundation, explaining how the heart works and the blood vessels.* Heart structure
* Blood vessels
* Blood
* Exchange of substances

<http://www.ocr.org.uk/Images/298837-scaling-up-learner-and-teacher-resources.zip>  | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the structure and functions of the gas exchange system in humans, including adaptations to function
* the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume
 |
| 3 | B2.2c describe the human circulatory system to include to include the relationship with the gaseous exchange system, the need for a double circulatory system in mammals and the arrangement of vesselsB2.2d explain how the structure of the heart and the blood vessels are adapted to their functions to include the structure of the mammalian heart with reference to valves, chambers, cardiac muscle and the structure of blood vessels with reference to thickness of walls, diameter of lumen, presence of valvesB2.2e explain how red blood cells and plasma are adapted to their transport functions in the blood | ***How do you deliver it?*****Starter**Card sort blood components, their diagram and function or a word search of components and their function. Following the word search the learners should marry up the answers e.g. red blood cells carry oxygen.Learners should complete a table of blood components and their function.**Main**Microscopic investigation of blood vessels. Learners should make plan diagrams of the blood vessels and then suggest which are designed for higher pressure/ low pressure and why.Learners could investigate the tensile strength of arteries and veins.Boardworks do have a good PowerPoint that can be used to illustrate the heart and circulation.**Plenary**Learners should label a diagram of the human circulatory system. The following link may be used: <https://quizlet.com/9709394/21-circulatory-system-diagram-flash-cards/> | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:the structure and functions of the human skeleton, to include support, protection, movement and making blood cells |
| 4 | B2.2f explain how water and mineral ions are taken up by plants, relating the structure of the root hair cells to their functionB2.2g describe the processes of transpiration and translocation to include the structure and function of the stomata | ***What do plants need?*****Starter**Label a root hair cell. Discuss what is special about this cell and how it is adapted to its function.**Main**Review photosynthesis equation.Look into how plants get the carbon dioxide they require and to lose oxygen. This can be done by measuring stomatal density (<http://www.saps.org.uk/secondary/teaching-resources/299-measuring-stomatal-density->)Demonstrate Vaseline coated leaves and the effect this has on the appearance of the leaf.**Plenary**Learners could do the question on the Vaseline experiment [here](https://www.tes.com/teaching-resource/transpiration-experiment-6125004):**Homework** investigate how plants can prevent water loss. This can be split up and used for a presentation at the plenary of lesson 7. Various methods could be given to students e.g. waxy cuticles, hair, sunken stomata. | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the role of leaf stomata in gas exchange in plants.
 |
| 5 | B2.2g describe the processes of transpiration and translocation to include the structure and function of the stomataB2.2h explain how the structure of the xylem and phloem are adapted to their functions in the plant | ***Transport system*** **Starter**What need to be transported in plants? Where does its journey start and finish?**Main**Learners should look at prepared slides of vascular bundles and produce a plan diagramDescribe the structure of a phloem and a companion cell. Describe the place where the glucose is made is the source and where is it used is the sink.**Plenary**Label a diagram of the vascular bundle of a leaf, root and stem. | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the role of leaf stomata in gas exchange in plants.
 |
| 6 | B2.2g describe the processes of transpiration and translocation to include the structure and function of the stomataB2.2h explain how the structure of the xylem and phloem are adapted to their functions in the plant | ***Water can flow up-hill*****Starter**Learners can make a long straw by taping straws together into a long straw and seeing if they can suck water through it. The longer the better. If they cannot they can shorten the straw with scissors until they can get water. Ask them why it did not work. The usual answer is that the straw has holes in it.**Main**Show the students a picture of a giant sequoia this can draw water up 100 m so they were beaten by a tree.Learners can prepare a slide of stained celery. Leave celery in coloured water overnight. Dissect out the vascular bundle and prepare a slide of a vascular bundle squash. Look for the secondary thickening of xylem tissue – helical, annular and reticulate (names do not need to be learned).Learners can be shown the following animation:<https://www.saps.org.uk/animations/plant_biology/index.html?video=1>and/or<http://www.ocr.org.uk/Images/298837-scaling-up-learner-and-teacher-resources.zip> Learners need to prepare a table of comparison between xylem and phloem.**Plenary**Re-ask the students why their straw did not work.  | Working scientifically codes: WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the role of leaf stomata in gas exchange in plants.
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| 7 | B2.2i explain the effect of a variety of environmental factors on the rate of water uptake by a plant to include light intensity, air movement, and temperatureB2.2j describe how a simple photometer can be used to investigate factors that affect the rate of water uptake | ***I need more water*** **Starter**Do plants sweat? Explain your answer. Show the students guttation.**Main**Carry out experiments to determine the rate of transpiration. This video talks through how to set up a potometer to determine how factors affect the rate of transpiration: <https://www.youtube.com/watch?v=FEfmTok3OCo>**Plenary**Present the presentation as to how plants can stop water loss. | Working scientifically codes: WS1.2b, WS1.2c, WS1.2e WS1.3a, WS1.3b, WS1.3c, WS1.3d, WS1.3e, WS1.3f, WS1.3g, WS2a, WS2b, WS2c, WS2dPrior knowledge from the KS3 programme of study:* the role of leaf stomata in gas exchange in plants.
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| 8 | Review knowledge | End of topic quiz |  |

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| Additional remote learning opportunities***As a response to the Covid-19 outbreak, additional online learning opportunities were identified for each topic in June 2020.*** |
| **Lesson** | **Statement** | **Teaching Activities** |
| 1 | B2.2a-b | This [virtual experiment](https://ocr.org.uk/rpgbiol4) demonstrates a model lung, and how gas exchange happens in the lung. There is a full video, interactive experiment and a quiz to check learning. This BBC Bitesize clip can be used to reinforce learning about [photosynthesis](https://www.bbc.co.uk/teach/class-clips-video/biology-ks3-gcse-photosynthesis-rap/zm638xs). |
| 2 & 3 | B2.2c-B2.2e | This [video](https://www.youtube.com/watch?v=CRh_dAzXuoU) can be used for remote learning about what is in blood. This [next video](https://ocr.org.uk/Images/587763-topic-b2-cup-elevate-video-gas-exchange-at-the-alveoli.mp4) describes how the circulatory system works with the respiratory system, focusing on gas exchange at the alveoli. This BBC Bitesize [clip](https://www.bbc.co.uk/teach/class-clips-video/science-biology-ks3-ks4-human-circulation/zfbd6v4) can be used to consolidate learning about the circulation journey.This interactive [online heart structure](http://www.klbict.co.uk/interactive/science/heart.htm) labelling exercise can be used to reinforce learning. This [virtual experiment](https://ocr.org.uk/rpgbiol5) demonstrates a heart dissection. There is a full video, interactive experiment and a quiz to check learning about heart structure. |
| 4, 5 & 6 | f-h | This [clip](https://www.channel4.com/programmes/the-royal-institution-christmas-lectures/videos/series-3/fast-phloem/2844935139001) can be used by students to find out what substances are transported in the phloem. This [animation](https://www.saps.org.uk/secondary/teaching-resources/1299-biology-animations-plant-transport-photosynthesis-and-cell-growth) shows how substances can be transported in a plant. |
| 7 | i-j | This [BBC revision page](https://www.bbc.co.uk/bitesize/guides/z3w4k7h/revision/5) demonstrates two ways to set up experiments to investigate transpiration. It gives example results and some questions for students to try. This [video](https://www.youtube.com/watch?v=D0S5Ly0Zij8) walks students through a virtual experiment, with some example results and explanations about what they mean. |
|  |  | Here are some [sample exam questions](https://www.bbc.co.uk/bitesize/guides/zq9f8mn/revision/1) with answers that students can work through and review their learning for all of B2. |



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