# 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](mailto: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)](https://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 an exhaustive list of potential practical activities.

| Topic | Teaching hours Separate / 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 cells  PAG 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 cells  PAG B2: Testing for biological molecules – Investigation of DNA extraction from a living organism  PAG B2: Testing for biological molecules – Investigations of enzyme activity  PAG B2: Testing for biological molecules – Investigation into the effect of amylase on a baby rice paste  PAG B4: Rates of enzyme controlled reactions – Investigation into the effect of amylase  on a baby rice paste  PAG 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 respiration  PAG B6: Physiology, responses respiration – research into whether plants respire  PAG 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 photosynthesis  PAG B5: Photosynthesis – Investigation of photosynthesis in algae using alginate beads  PAG B5: Photosynthesis – Investigation of photosynthesis e.g. the Priestley experiment using Cabomba substitute to collect oxygen or the Ingenhousz experiment to show mass gain  PAG B5: Photosynthesis – Experiments to show the consequences of light exclusion on photosynthesising plants  PAG 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 osmosis  PAG 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 vessels  PAG B1: Microscopy – Examination of root hair cells  PAG B1: Microscopy – Measurement of plant stomatal density  PAG B1: Microscopy – Investigation of the position of the xylem/phloem in root, stem and leaf tissues  PAG B6: Physiology, responses respiration – Measurement of plant stomatal density and opening  PAG 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 techniques  PAG B4: Rates of enzyme controlled reactions – Investigation of the most favourable conditions for composting  PAG 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 pollution  PAG B3: Sampling techniques – Investigation into the effectiveness of germination in different strengths of acid rain  PAG 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 of 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: B6: Global Challenges

## Suggested teaching time for chapter: 4 hours biology / 3 hours combined science

### B6.1 Monitoring and maintaining the environment

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| Lesson | Statements | Teaching activities | Notes |
| 1 | B6.1a explain how to carry out a field  investigation into the distribution  and abundance of organisms in a  habitat and how to determine their  numbers in a given area | Starter  How many organisms live in the school garden/grounds or local park?  How could we find out?  Main  Introduce sampling techniques and explain how the following techniques are used to measure the abundance of organisms:  Quadrats  Transects  Pooter  Sweep nets  Kick sampling  Tree beating  Students work in groups to investigate the abundance of common plants such as daisies and dandelions in the school garden/field/local park. Use data to calculate the estimated population size.  [PAG Activity – Sampling Techniques - Suggestion 2](https://www.ocr.org.uk/Images/324539-pag-activity-biology-sampling-techniques-suggestion-2.docx)  Using transects worksheet: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368273-lr2-v3-rw.docx>  Teacher notes: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368289-tr2-v3-rw.docx> | From the Key Stage 3 Programme of Study:  The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops.   * PAG: Sampling techniques suggestion 2: Investigation of ecological sampling methods |
| Lesson | Statements | Teaching activities | Notes |
|  |  | The following websites give instructions on how to carry out random sampling:  [Nuffield Foundation – Biodiversity in your backyard!](https://pbiol.rsb.org.uk/environment/fieldwork-techniques/biodiversity-in-your-backyard?highlight=WyJyYXRpbyJd)  SAPS – [Questions about quadrats](https://www.saps.org.uk/secondary/teaching-resources/260-questions-about-quadrats)  Paper-based activity for taking random quadrat samples to investigate the distribution and abundance of organisms in two areas (sunny and shaded or more/less trampling by foot) used in the case of poor weather or as an extension task –  [Student worksheet](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368271-lr1-v3-rw.docx)  Teacher notes: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368285-tr1-v2-rw.docx>  Explain how to use identification keys including branched and numbered.  Plenary  Students complete an identification key in pairs.  Homework  Design an investigation to find the number of insects in your garden. | Ensure students understand the difference between random and non-random sampling. |
| Lesson | Statements | Teaching activities | Notes |
| 2 | B6.1a explain how to carry out a field  investigation into the distribution  and abundance of organisms in a  habitat and how to determine their  numbers in a given area | Starter  Discuss pitfall traps and how they are used to sample organisms.  Main  Pros and cons of the pitfall trap sampling technique.  Demonstrate how to set up a pitfall trap.  Students investigate the number of organisms in the school garden/field/local park using pitfall traps.  Record class data in a table and plot a bar graph of the results.  PAG Activity – Sampling techniques – Suggestion 1: <http://www.ocr.org.uk/Images/324538-pag-activity-biology-sampling-techniques-suggestion-1.docx>  Plenary  Calculations using data from PAG activity.  Homework  Card sort: [Student sheet](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368277-lr3-v3-rw.docx) and [teacher instructions](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368294-tr3-v3-rw.docx). | PAG: Sampling techniques suggestion 1: Investigation of ecological sampling methods |
| Lesson | Statements | Teaching activities | Notes |
| 3 | B6.1b describe both positive and negative  human interactions within  ecosystems and explain their impact  on biodiversity | Starter  Tropical rainforests have the highest biodiversity in the world. What does biodiversity mean?  Discussion on the importance of biodiversity e.g. food, shelter, medicines etc.  Main  Explain how biodiversity is lost by deforestation, agriculture, pollution, hunting and fishing.  Investigate the effect of palm oil plantation on the orang-utan population in Sumatra.  Students use their information to create a newspaper article on the effect of palm oil plantation on orang-utans.  Watch the following videos and discuss what can be done to save the orang-utans:  [The Problem with Palm Oil video](https://www.youtube.com/watch?v=LSumTLrJzdU)  [Protect Paradise: An animation about Palm Oil](https://www.youtube.com/watch?v=0o6WHN4NDTk)  Plenary  Questions for students to answer in pairs/groups.  [http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368284-lr6-v2-rw.docx](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367747-lr1-v2.docx)  Teacher notes and answers to questions:  <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-368299-tr6-v2-rw.docx>  Homework  Look in your kitchen cupboards at home and look at the ‘ingredients’ section of a product. Record any products which contain palm oil. | From the Key Stage 3 Programme of Study:  How organisms affect and are affected by, their environment, including accumulation of toxic materials. |
| Lesson | Statements | Teaching activities | Notes |
| 4 | B6.1c explain some of the benefits and  challenges of maintaining local and  global biodiversity | Starter  Which species is most at risk of extinction: polar bear, snow leopard, black rhino or giant panda?  Main  Define conservation.  Students make a mind map of the different methods used to maintain biodiversity.  Captive breeding debate: split the class into two groups; for and against captive breeding.  Research endangered species and make a poster on the conservation methods used to save the species.  Plenary  Students present their posters to the rest of the class.  Biodiversity quiz: <https://www.khanacademy.org/science/biology?t=practice>  Homework  Find out what ‘Ecotourism’ is and how it helps maintain biodiversity in Snowdonia, Wales. | From the Key Stage 3 Programme of Study:  Changes in environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. |
| Lesson | Statements | Teaching activities | Notes |
| 5 | **B6.1d**  **evaluate the evidence for the**  **impact of environmental changes**  **on the distribution of organisms,**  **with reference to water and**  **atmospheric gases** | Starter  Discuss the meaning of ‘indicator species’.  Main  Describe the use of indicator species to monitor levels of pollution in different environments.  Indicator species for clean water: mayfly larva, freshwater shrimp, stonefly larva.  Indicator species for polluted water: water louse, sludge worm, rat tailed maggot.  Sample freshwater invertebrates from local water e.g. school pond.  Describe how lichen can be used as an indicator species for pollution levels in air.  Students survey local area for different types of lichen:  Record the abundance of lichen (crusty lichen, leafy lichen and bushy lichen) found in area.  Compare the results from each area and explain your findings.  Plenary  Card sort: students group organisms into most and least polluted water indicator species.  Homework  Raw sewage is dumped into a river; name organisms that you would expect to be found near the sewage pipe where the sewage is spilling out. |  |

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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 & 2 | B6.1a | This [virtual experiment](https://ocr.org.uk/rpgbiol6) links well with PAG B3: Sampling techniques. There is a video of the practical, along with an interactive version and a quiz for students to complete. |
| 3 & 4 | B6.1b & B6.1c | This [video](https://www.youtube.com/watch?v=L9zWDtDKDS8) is a time-lapse series of satellite images, showing the deforestation of the Amazon rainforest. Forest is shown in dark green, while cleared areas are pale yellow (bare ground) or light green (crops and pastures). This second [video](https://www.nhm.ac.uk/our-science/our-work/biodiversity.html) discusses biodiversity and the effect of human impact on it. |
| 5 | **B6.1d** | This [video](https://www.youtube.com/watch?v=wXJiHr8jWBs) shows the ways humans are having an impact on biodiversity, including through climate change. This [TED talk](https://www.youtube.com/watch?v=ztWHqUFJRTs) relates the greenhouse effect to the carbon cycle and a game of tetris. This is a good resource to reinforce learning, and links well with GCSE Chemistry. |

# Outline Scheme of Work: B6: Global Challenges

## Suggested teaching time for chapter: 4 hours biology / 3 hours combined science

### B6.2 Feeding the human race

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| Lesson | Statements | Teaching activities | Notes |
| 1 | B6.2a  describe some of the biological factors  affecting levels of food security | Starter  How many people are there in the world?  <http://www.worldometers.info/world-population/>  Discuss the problems that could occur if the human population continues to grow at this rapid rate.  Main  Define ‘food security’ and discuss factors which threaten food security including increasing human population, changing diets, climate change, pests and pathogens.  [Mind map](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367762-lr2-v2.docx) for students to annotate  Discuss methods of increasing food production.  Outline the differences between intensive and organic farming.  Intensive vs. organic: student debate.  Plenary  Intensive vs. organic: student vote.  Homework  Find out what the estimated human population will be in 2050. Do you think we will be able to produce enough food to feed the human population in 2050? | From the Key Stage 3 Programme of Study:  The impact of plant reproduction through insect pollination in human food security. |
| Lesson | Statements | Teaching activities | Notes |
| 2 | B6.2b  describe and explain some possible  agricultural solutions to the demands  of the growing human population | Starter  Activity on the issues of food production and the effect of the growing population.  <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367747-lr1-v2.docx>  Students sort cards into true or false.  Teacher guide for activity: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367761-tr1-v3.docx>  Main  Define sustainable food production and describe:  Fish quotas  Use of natural fertilisers and crop rotation  Biological control e.g. ladybirds eat aphids  Hydroponics  Students work in groups to research the four main methods of sustainable food production and fill in the boxes on the following worksheet: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367752-lr4-v2.docx>  Useful websites for the above task. can be found in this [teacher guide](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367769-tr4-v2.docx).  Optional practical: [Hydroponic vs. Soil](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367773-tr5-v3.docx).  Plenary  Students present their work to the rest of the class and peer mark each other’s presentations.  Homework  Investigate the pros and cons of fish farming. |  |
| Lesson | Statements | Teaching activities | Notes |
| 3 | B6.2c explain the impact of the selective  breeding of food plants and  domesticated animals | Starter  Discuss the variety of dogs and how they have changed over the years.  The following video can be used: [What 100 years of selective breeding has done to dogs](https://www.youtube.com/watch?v=N6qZSwZSLnU)  Main  Define selective breeding and describe examples e.g. cows, sheep and wheat.  Explain the advantages and disadvantages of selective breeding.  Class discussion: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367754-lr6-v2.pptx>  <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367782-tr6-v3.docx>  Plenary  Revision quiz to summarise learning.  Homework  Exam style question on selective breeding. | From the Key Stage 3 Programme of Study:  Heredity as the process by which genetic information is transmitted from one generation to the next. |
| Lesson | Statements | Teaching activities | Notes |
| 4 | B6.2d describe genetic engineering as a  process which involves modifying the  genome of an organism to introduce  desirable characteristics | Starter  Revision quiz.  Main  Introduce the idea of genetic engineering using genetically modified (GM) organisms such as fluorescent rats, glow fish, golden rice etc.  Discuss the benefits and risks of genetic engineering.  [Bang goes the theory activities](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367781-tr7-v2.docx) – including card sort, worksheets, ethical considerations and extension tasks:  Plenary  The ‘Hot Seat game’ – students randomly chosen to ask each other’s questions.  Homework  Before genetic engineering was developed, pigs were used to produce insulin. Research the benefits of producing insulin using genetically engineered bacteria. |  |
| Lesson | Statements | Teaching activities | Notes |
| 5 | **B6.2e describe the main steps in the process**  **of genetic engineering** | Starter  Recap on the structure of DNA and discuss products of genetic engineering e.g. insulin, human growth hormone.  Main  Explain the steps involved in genetically engineering.  Create displays of the process of genetic engineering. Art/craft resources such as Plasticine, wool, pipe-cleaners, straws, card etc. Digital cameras/video recorders can be used to take snapshots of each stage of the process. Student can either use one image for each statement to make a storyboard/cartoon describing the process, or can take numerous snapshots and put together a moving 'film' that can be shown to the class whilst each stage is narrated by students from the group.  [Gene technology pack](http://www.ocr.org.uk/Images/222368-gene-technology-topic-exploration-pack.docx) – worksheets, ethical considerations, extension tasks and answers included:  Plenary  Put the statements in order and answer the questions: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367766-lr8-v3.docx>  Homework Complete the worksheet ‘The issues behind Genetic engineering’ in the gene technology pack: <http://www.ocr.org.uk/Images/222368-gene-technology-topic-exploration-pack.docx> |  |
| Lesson | Statements | Teaching activities | Notes |
| 6 | B6.2f explain some of the possible benefits  and risks of using gene technology in  modern agriculture  B6.2g  describe and explain some possible  biotechnological solutions to the  demands of the growing human  population | Starter  Photograph of a genetically modified (GM) tomato and a non-GM tomato. Ask students which one they would buy and why?  Main  Define ‘biotechnology’.  Describe examples of genetically modified plants including:  Golden rice, Bt corn, tomatoes with longer shelf life.  Discuss the benefits and risks of genetically modified plants.  The following [video](https://www.youtube.com/watch?v=7TmcXYp8xu4) outlines the pros and cons of GM crops.  Students sort cards into two groups- arguments for genetic modification and arguments against it:  <http://www.ocr.org.uk/Images/261240-agriculture-topic-exploration-pack-learner-activity-7.doc>  Plenary  Student vote/debate on GM crops. The teacher guide [here](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367785-tr9-v2.docx) has useful tips for how to carry out a classroom debate, and topic ideas for the debate.  Homework  Research golden rice and describe the benefits/risks of the genetically engineered plant. |  |

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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 | B6.2a | This is a [documentary](https://www.youtube.com/watch?v=3IgAe2bdoAc) about food security that students can watch to learn about this issue in context. |
| 3 & 4 | B6.2c & B6.2d | This [video](https://www.stem.org.uk/resources/elibrary/resource/28715/selective-breeding-and-genetic-modification) compares selective breeding and genetic engineering and can be used by students to reinforce learning. |
| 6 | B6.2f & B6.2g | This interactive [multiple choice quiz](https://www.educationquizzes.com/gcse/biology/unit-1-genetic-engineering/) can be used to review genetic engineering and benefits and risks. There are also other topics available. This [quiz and stimulus materials](https://www.stem.org.uk/resources/elibrary/resource/29267/genetic-engineering) could be used by students to learn about some of the advantages and disadvantages of genetic engineering. |

### B6.3 Monitoring and maintaining health

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| Lesson | Statements | Teaching activities | Notes |
| 1 | B6.3a describe the relationship between health  and disease | Starter  Define the meaning of the word ‘disease’.  Main  Two categories of disease:  Communicable – chicken pox, Ebola, flu.  Non-communicable – diabetes, cancer, arthritis.  Define ‘Pathogen’.  Student sort the [statements](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367964-lr1-v3.docx) into communicable and non-communicable diseases.  Teacher notes: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367972-tr1-v3.docx>  Plenary  Make glossary on all the key words in the B6 topic so far.  Homework  Find out what the most deadly disease to humans is. |  |
| Lesson | Statements | Teaching activities | Notes |
| 2 | B6.3b describe different types of diseases | Starter  Chicken pox, measles, HIV, athlete’s foot, cancer, diabetes. Students group the diseases into communicable and non-communicable.  Main  Students work in groups to research a disease.  Find out the following:  Type of microbe pathogen which causes the disease e.g. bacteria, fungus etc.  Symptoms of disease  How the disease is spread  Can the disease be treated?  How many cases of the disease are there in the UK/world?  Plenary  Students share their findings to the rest of the class.  Homework  Students investigate swine flu transmission. |  |
| Lesson | Statements | Teaching activities | Notes |
| 3 | B6.3c describe the interactions between different  types of disease | Starter  Watch video and discuss transmission of disease: <https://www.youtube.com/watch?v=ulK9XUd_hh8>  Main  Describe diseases in plants and animals caused by:  Viruses – HIV, HPV and cervical cancer  Bacteria – tuberculosis  Fungus- athletes foot  Protist- malaria  The following videos can be used:  [Malaria](https://www.youtube.com/watch?v=2O3YrdUZQ5U)  [Ebola](https://www.youtube.com/watch?v=XCrOde-JYs0)  [Cholera](https://www.youtube.com/watch?v=jG1VNSCsP5Q)  Plenary  Use the information sheets to complete the mind map on the spread of communicable disease.  Mind map template: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367968-lr2-v3.docx>  Information sheet: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367973-tr2-v3.docx>  Homework  Investigate the effectiveness of the HPV vaccine in preventing cervical cancer. |  |
| Lesson | Statements | Teaching activities | Notes |
| 4 | B6.3d explain how communicable diseases (caused  by viruses, bacteria, protists and fungi) are  spread in animals and plants | Starter  Discuss the effect of the HPV vaccine on cervical cancer.  Main  Describe the different ways disease can be spread including:  Skin  Food and drink  Air  Sexual intercourse  Vectors  Explain how pathogens cause disease, describing incubation period.  Students work in groups to carry out an experiment to investigate the abundance of microbes in the classroom.  Equipment needed: Swabs, agar plates, disinfectant as a spray and a solution in a beaker adhesive tape.  1. Choose areas in the class room to test and swab the area.  2. Place each swab onto an agar plate.  3. Seal agar plate appropriately using adhesive tape.  4. Leave agar plates at room temperature for a few days and observe microbial growth.  Plenary  Think of five ways to prevent the spread of disease.  Homework  Find out who Ignaz Semmelweis was and how he prevented the spread of disease. |  |
| Lesson | Statements | Teaching activities | Notes |
| 5 | B6.3e explain how the spread of communicable  diseases may be reduced or prevented in  animals and plants | Starter  Observe agar plates from previous lesson and determine which area in the classroom contains the highest abundance of microbes.  Discuss Ignaz Semmelweis and how he prevented the spread of disease. (antiseptics and Puerpural fever)  Main  Describe the different ways to prevent the spread of disease:  Covering your mouth and nose when you cough/sneeze.  Not touching infected human/animals.  Using protection during sexual intercourse.  Not sharing needles.  Washing hands.  Cooking food properly.  Drinking clean water.  Protection from animal bites.  Practical activity: Students investigate the effectiveness of various antibacterial products e.g. hand soap, antibacterial hand gel etc.  Equipment:  Agar plates spread with bacteria.  Antibacterial products  Distilled water  Swabs  Adhesive tape  Marker pens  Student work in groups to:   1. Mark 4 equal areas on the petri dish using a marker pen. 2. Place measured amounts of different antibacterial products onto each of the 3 areas of the petri dish. 3. Ensure you keep one quarter of the pertri dish spare for distilled water to act as a control. 4. Use adhesive tape to seal petri dish appropriately and leave for a few days at room temperature.   Plenary  Revision quiz on topic so far.  Homework  Complete [worksheet](https://www.tes.com/teaching-resource/semmelweis-information-and-question-sheet-6096303). |  |
| Lesson | Statements | Teaching activities | Notes |
| 6 | B6.3f describe a minimum of one common human  Infection, one plant disease and sexually  transmitted infections in humans including  HIV/AIDS | Starter  Observe results on agar plates from the previous lesson.  Main  Discuss and investigate:  Common human infections including athlete’s foot, food poisoning.  Plant diseases such as: Tobacco mosaic virus, Dutch elm disease, Agrobacterium tumefaciens, powdery mildew.  Sexually transmitted infections such as: HIV/AIDS, chlamydia, gonorrhoea, and genital herpes.  The following video can be used:  [HIV/AIDS](https://www.youtube.com/watch?v=FDVNdn0CvKI)  Students research plant diseases and create an information leaflet for farmers. The leaflet will explain causes of the disease, symptoms and steps to control the spread of the disease..  Optional practical: [How healthy are your trees?](http://www.saps.org.uk/attachments/article/1277/SAPS%20-%20How%20healthy%20are%20your%20trees%20-%20ID%20sheet.doc)  Student notes: <http://www.saps.org.uk/attachments/article/1277/SAPS%20-%20How%20healthy%20are%20your%20trees%20-%20student%20notes.doc>  Teacher notes: <http://www.saps.org.uk/attachments/article/1277/SAPS%20-%20How%20healthy%20are%20your%20trees%20-%20teacher%20notes.doc>  Plenary  True/false quiz. |  |
| Lesson | Statements | Teaching activities | Notes |
| 7 | B6.3g  describe physical plant defence responses  to disease  B6.3h  describe chemical plant defence responses | Starter  Show students a variety of plants (e.g. cacti). How do pants defend themselves against disease?  Main  Define physical defences: cuticle and cell wall.  Build a 3D model leaf section and extension tasks: <http://www.ocr.org.uk/Images/221757-plant-disease-topic-exploration-pack-teacher-pack.pdf>  Define chemical defences:  Insecticides, antibacterial and antifungal compounds, cyanide.  Student complete exam question on plant defences: <https://www.tes.com/teaching-resource/new-ocr-a-level-biology-communicable-diseases-11289035>  Plenary  Key word bingo.  Homework  Complete plant diseases worksheet (found in the resources at this link): <https://www.tes.com/teaching-resource/new-ocr-a-level-biology-communicable-diseases-11289035> |  |
| Lesson | Statements | Teaching activities | Notes |
| 8 | **B6.3i**  **describe different ways plant diseases can**  **be detected and identified, in the lab and**  **in the field** | Starter  How do we know if a plant is diseased?  Main  Explain how plant diseases can be detected both in the field and laboratory:  Observation – show students examples/photographs of diseased plants.  Microscopy  DNA analysis  Identification of antigens  Plant disease detectives:  Students work in groups to fill in the following worksheets: <http://www.saps.org.uk/secondary/teaching-resources/1362-plant-disease-detectives>  Plenary  C’est la vie game: <http://www.ocr.org.uk/Images/267041-plant-diseases-lesson-element.docx>  Homework  [Research task](http://www.ocr.org.uk/Images/267041-plant-diseases-lesson-element.docx), with teacher instructions. |  |
| Lesson | Statements | Teaching activities | Notes |
| 9 | B6.3k describe the non-specific defence systems  of the human body against pathogens | Starter  How do we stop pathogens getting into the body?  Main  Explain the body’s non-specific defence system including:  Skin, stomach acid, cilia and mucus in airways, nasal hairs and tears.  Students label and annotate [diagram of body](https://www.tes.com/teaching-resource/defences-against-disease-6398488).  How mucus keeps us healthy - [video](https://www.youtube.com/watch?v=WW4skW6gucU).  Students read worksheet and answer the questions: <https://www.tes.com/teaching-resource/immune-response-6325698>  Plenary  Revision quiz on mini whiteboards.  Homework  Investigate the foot and mouth disease outbreak in the UK and describe the measures that were taken to prevent the spread of disease. |  |
| Lesson | Statements | Teaching activities | Notes |
| 10 | B6.3j explain how white blood cells and platelets are adapted to their defence functions in the blood  B6.3l explain the role of the immune system of the human body in defence against disease | Starter  Recap non-specific immune system.  Main  Describe the role of platelets in blood clotting. Explain how a scab is formed.  Define ‘antigen’ and ‘antibodies’.  Describe the roles of white blood cells:  Phagocytes and lymphocytes.  Students label diagrams of each type of white blood cell.  Define the word ‘immunity’.  Students work in groups to write a play showing how the body defends itself against microorganisms once they have entered the body: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367982-tr4-v3.docx>  Plays performed to the rest of the class.  White blood cells attacking and engulfing sperm cells - [video](https://www.youtube.com/watch?v=MoAUfnKcA3I).  Plenary  Students can comment on what they liked about each play (content and performance) as well as constructive comments for improvements.  Homework  Create a comic strip on the action of white blood cells in defending the body from microorganisms. |  |
| Lesson | Statements | Teaching activities | Notes |
| 11 | **B6.3m**  **describe how monoclonal antibodies are**  **produced**  **B6.3n**  **describe some of the ways in which**  **monoclonal antibodies can be used** | Starter  Recap quiz on the immune system.  Main  Introduce monoclonal antibodies (using diagrams) and how they are produced.  Card sort and use statements to make a cartoon strip: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367971-lr5-v3.docx>  Teacher notes: [http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367983-tr5-v3.docx](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367964-lr1-v3.docx)  Explain how monoclonal antibodies are used in pregnancy testing, detecting diseases (e.g. prostate cancer) and potentially treating disease (targeting cancer cells).  Worksheet on pregnancy testing: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367976-lr6-v3.docx>  Teacher notes: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367985-tr6-v3.docx>  Plenary  Key word quiz.  Homework  Investigate and find evidence of treating cancer with monoclonal antibodies. |  |
| Lesson | Statements | Teaching activities | Notes |
| 12 | B6.3o  Explain the use of vaccines and medicines in  the prevention and treatment of disease | Starter  What is a vaccine?  Main  Describe what vaccines are and how they are used to prevent disease.  Explain which vaccines children have at different ages.  Students make a [flow chart of](https://www.tes.com/teaching-resource/vaccines-6356377) the vaccines children receive at different ages.  Discuss successful vaccination programmes e.g. whooping cough.  How we conquered the deadly smallpox virus - [video](https://www.youtube.com/watch?v=yqUFy-t4MlQ).  Students answer questions on page 229 of the OCR Gateway GCSE Biology textbook.  Describe how pathogens are killed by:  Antiseptics  Antivirals  Antibiotics  Plenary  Shelia has chicken pox, she goes to the doctor to ask for antibiotics. The doctor does not give her antibiotics. Can you explain why?  Homework  Investigate the pros and cons of vaccination; do you think children should be routinely vaccinated? |  |
| Lesson | Statements | Teaching activities | Notes |
| 13 | B6.3p    explain the aseptic techniques used in  culturing organisms | Starter  Show a picture of a laboratory and ask students identify the areas of poor hygiene.  Main  Describe and demonstrate aseptic technique.  Discuss the meaning of ‘sterile’.  Students work in pairs to carry out aseptic technique in the lab.  PAG Activity – Microbiological techniques – [Suggestion 1](https://www.ocr.org.uk/Images/310655-b5-microbiological-techniques-suggestion-one.docx)  Plenary  Statement sort: antiseptics, antibiotics and antivirals: <http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-biology-a-j247-from-2016/delivery-guide/Images/123-367987-tr7-v3.docx>  Homework  Find out more about a new medicine that is currently undergoing clinical trials. Write notes on the stages of its production and potential for treating disease. |  |
| Lesson | Statements | Teaching activities | Notes |
| 14 | B6.3q describe the processes of discovery and  development of potential new medicines | Starter  Who was Alexander Fleming and what did he contribute to Science?  Main  Describe the process of how new drugs can be discovered using the example of Alexander Fleming and Penicillin.  Discuss the stages of how new drugs are tested.  Define ‘placebo’ and the ‘placebo effect’.  Students construct flow chart of the stages in drug testing using the following statements: <https://www.tes.com/teaching-resource/how-are-medicinal-drugs-tested-11045777>  Discuss ethical considerations of drug testing.  Students debate on animal testing.  Documentary on a drug trial that went wrong - [video](https://www.youtube.com/watch?v=a9_sX93RHOk)  Students watch documentary, take notes and come up with a conclusion on why the drug trial went wrong.  Plenary  Answer questions on page 233 of the OCR Gateway GCSE Biology textbook.  Homework  Match the key words to their definitions [worksheet](https://www.tes.com/teaching-resource/how-are-medicinal-drugs-tested-11045777) |  |
| Lesson | Statements | Teaching activities | Notes |
| 15 | B6.3r recall that many non-communicable human  diseases are caused by the interaction of a  number of factors | Starter  State three examples of non-communicable diseases.  Main  Describe symptoms of the following diseases: cardiovascular disease, cancer, bronchitis, liver, cirrhosis, obesity and type 2 diabetes.  Explain how alcohol and smoking tobacco are risk factors for a variety of non-communicable diseases.  Students make an information leaflet on the risks of smoking/drinking too much alcohol.  Risks of smoking [video](https://www.youtube.com/watch?v=bA-s39UH4QY).  Plenary  Quiz on the mini whiteboards to summarise learning.  Homework  Alcohol and tobacco are legal drugs. Research the effect of illegal drugs (e.g. cocaine, heroin) on the body. |  |
| Lesson | Statements | Teaching activities | Notes |
| 16 | B6.3s evaluate some different treatments for  cardiovascular disease | Starter  What is obesity and what is it caused by?  Main  Define what cardiovascular disease is and what the risk factors are (smoking, not enough exercise etc.)  Explain treatments for cardiovascular disease:  Medicines – statins, beta blockers.  Lifestyle changes- Exercising regularly, no smoking.  Surgery – valve replacements, widening partially blocked arteries (stent).  Students work in groups to create a TV advert on lifestyle choices and diet to prevent cardiovascular disease.  Present TV adverts to peers in class.  Plenary  Peer marking of adverts.  Homework  A patient has cardiovascular disease and obesity. S/he struggles to exercise due to painful joints. S/he has already had an angioplasty to widening her/his arteries. What treatment do you recommend for her/him? | From the Key Stage 3 Programme of Study:  The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. |
| Lesson | Statements | Teaching activities | Notes |
| 17 | B6.3t analyse the effect of lifestyle factors  on the incidence of non-communicable  diseases at local,  national and global levels | Starter  Map of the UK showing the incidence of cardiovascular disease (CVD). Students identify areas with the highest and lowest incidence of CVD using this data from [British Heart Foundation](https://www.bhf.org.uk/-/media/files/research/heart-statistics/bhf-cvd-statistics-uk-factsheet.pdf?la=en&rev=69e97d7d661a49d984e797d02478d2d7&hash=3507C418A837AE7BA4FCB3E3999EA89E47A73537).  Main  Discuss the incidence of non-communicable diseases (NCD) at local, national and global levels.  Analyse and explain data correlations between lifestyle factors and incidence of non-communicable diseases:  <http://www.who.int/topics/noncommunicable_diseases/en/>  Worksheet on analysing data: <https://www.tes.com/teaching-resource/b7-1-non-communicable-diseases-11443655>  Plenary  Revision quiz.  Homework  Research a NCD and write a fact sheet on it, include a table/graph to support the information. |  |
| Lesson | Statements | Teaching activities | Notes |
| 18 | B6.3u describe cancer as the result of  changes in cells that lead to  uncontrolled growth and division | Starter  Recap on mitosis.  Main  Describe how cancer is caused by uncontrolled cell division.  Students work in groups/pairs to research a type of cancer (e.g. prostate, lung) and find out the following:  Risk factors  Incidence in the UK and the rest of the world.  Treatments  Plenary  Key word bingo  Homework  What type of cancer is the most common in the UK/world? |  |
| Lesson | Statements | Teaching activities | Notes |
| 19 | B6.3v discuss potential benefits and risks  associated with the use of stem cells  in medicine | Starter  What are stem cells?  Main  Define stems cells.  State the differencebetween adult and embryonic stem cells.  Uses for stem cells in medicine  Discuss the risks of using stem cells.  Mini lab-grown organs – [video and article](https://www.eurostemcell.org/mini-lab-grown-organs-good-bad-and-mucousy)  Students complete worksheets about stem cells found [here](https://www.eurostemcell.org/activity-whats-missing) about stem cells  Stem cell ethics discussion [activity](https://www.eurostemcell.org/activity-points-view).  Plenary  Stem cell puzzles: <http://www.eurostemcell.org/stem-cell-puzzles>  Homework  Stem cells are controversial. Describe why some people agree/disagree with the use of stem cells. |  |
| Lesson | Statements | Teaching activities | Notes |
| 20 | B6.3w explain some of the possible benefits  and risks of using gene technology  in medicine | Starter  Recap: What is a gene?  What is a genetic disease?  Main  Describe the process of ‘gene therapy’ in medicine.  Discuss uses of gene therapy e.g. BRCA1 gene mutation in preventing cancer.  Advantages/disadvantages involved in gene therapy.  Students read through newspaper articles on gene therapy.  Students work as a group to write a script for a news broadcast. Each member of the group has different role: presenter, script writer, journalist, interviewer etc  Cameras can be used to record the news broadcast.  Plenary  Student broadcasts and peer marking/feedback.  Homework  Investigate how gene therapy can be used to save lives now and the potential to save lives in the future. |  |
| Lesson | Statements | Teaching activities | Notes |
| 21 | B6.3x discuss the potential importance  for medicine of our increasing  understanding of the human genome | Starter  Discuss the ‘Human Genome Project’ and it’s potential for the future of medicine:  <http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/genes/dnarev3.shtml>  <https://www.genome.gov/human-genome-project>  The race to sequence the human genome – [video](https://www.youtube.com/watch?v=AhsIF-cmoQQ)  Main  Explain the importance of understanding the human genome, including:  Personalised medicines  Gene therapy  Drugs that target disease -causing genes  Locating genes that might be linked to inherited diseases  Discuss the ethics of gene therapy.  Plenary  Recap quiz on the topic.  Homework  Revise for end of topic quiz. |  |
| Lesson | Statements | Teaching activities | Notes |
| 22 |  | Starter  Provide learners with revision time  Main  End of topic quiz  Plenary  Peer mark 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** |
| 2, 3,4 | B6.3b & B6.3.d | A [BBC class clip](https://www.bbc.co.uk/teach/class-clips-video/biology-ks3-gcse-microorganisms-and-bacteria/zrkxy9q) about bacteria, and how they grow. It also includes bacteria growing on agar plates. Students can watch the video and complete the worksheet about [communicable diseases](https://www.tes.com/teaching-resource/gcse-biology-9-1-communicable-infectious-disease-worksheet-and-video-12030882) and how they spread. There are also answers that students can check themselves against. |
| 10 | B6.3j & B6.3l | This Amoeba sisters [video](https://www.youtube.com/watch?v=fSEFXl2XQpc) can be used for independent learning about the immune system. This [interactive website](https://www.abpischools.org.uk/topic/infectiousdiseases-immunity) contains information, glossaries, animations and quizzes that students can work through about the immune system. |
| 11 | **B6.3m & B6.3n** | These [revision pages and interactive quiz](https://www.bbc.co.uk/bitesize/guides/zy6dpbk/revision/1) can be used by students to review their learning about monoclonal antibodies. There are several other revision pages and interactive quizzes on BBC Bitesize that are suitable for this topic, as well as the rest of the topics in GCSE Biology. |
| 12 & 14 | B6.3o & B6.3q | This [interactive website](https://www.abpischools.org.uk/topic/infectiousdiseases-medicines) contains information, glossaries, animations and quizzes that students can work through independently about medicines and antibiotic resistance. |
| 19 | B6.3v | Part or all of this [presentation](https://www.abpischools.org.uk/topic/stem-cells) could be given to students to learn about the use of stem cells in medicine. They can use the information to complete the revision page provided or to complete one of their own. It also recaps information learnt in B2. |
| 20 | B6.3w | This [video](https://www.youtube.com/watch?v=CfTnVx31pr0) recaps genetic engineering. It then goes on to explain gene therapy and talk through pros & cons of genetic engineering. |



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