# Scheme of work

## Combined Science: Trilogy

## Biology – Infection and response

This resource provides guidance for teaching the Infection and response topic from our new GCSE in Combined Science; Trilogy (Biology) 8464. It has been updated from the draft version to reflect the changes made in the accredited specification.

Some minor changes have been made to the specification in sections 4.3.1.1 Communicable diseases, 4.3.1.6 Human defence system and Discovery and development of drugs. These alterations have not required changes to the scheme of work.

The scheme of work is designed to be a flexible medium term plan for teaching content and development of the skills that will be assessed.

It is provided in Word format to help you create your own teaching plan – you can edit and customise it according to your needs. This scheme of work is not exhaustive; it only suggests activities and resources you could find useful in your teaching.

### 4.3 Infection and response

### 4.3.1 Communicable diseases

Students should understand the differences between non-communicable diseases, covered in sections 4.2.2.5 to 4.2.2.7 and communicable diseases.

The structure of bacterial cells is covered in 4.1.1.1, Eukaryotes and prokaryotes.

Antibiotics, 4.3.1.8, links with antibiotic resistance covered in 4.6.3.4, but which could be taught here, after antibiotics and before drug development.

Students are only required to know specific details of the microorganisms listed in the specification.

| **Spec ref.** | **Summary of the specification content** | **Learning outcomes**  *What most candidates should be able to do* | **Suggested timing (hours)** | **Opportunities to develop Scientific Communication skills** | **Opportunities to develop and apply practical and enquiry skills** | **Self/peer assessment opportunities and resources**  *Reference to past questions that indicate success* |
| --- | --- | --- | --- | --- | --- | --- |
| 4.3.1.1 | Communicable diseases  Communicable diseases are infectious diseases caused by pathogens.  Pathogens may be viruses, bacteria, protists or fungi. They may infect plants or animals.  Pathogens can be spread by direct contact, by water or by air.  The spread of diseases can be reduced or prevented by:   * simple hygiene measures * destroying vectors * isolation of infected individuals * vaccination (see 4.3.1.7). | Define the term pathogen and state the four main groups of pathogen.  Explain how pathogens can be spread to plants or animals and cause infection.  Describe the main differences between bacteria and viruses.  Explain how the spread of disease can be reduced or prevented. | 1 | Show BBC video clip on microorganisms (see resources).  Mini-whiteboard recap – draw and label a bacteria cell.  Provide images of bacteria, viruses, protists and fungi on the internet.  Construct a table comparing fungi, virus, bacteria and protists to include size, site of reproduction and effects in the body.  Show BBC video clip on effect of proper hand washing (see resources).  Use card sort matching diseases to transmission and prevention.  Prepare advice leaflet for a doctors’ surgery explaining how people can reduce their chances of catching diseases. | Use UV powder on door handles at start of lesson and black light to show transfer of pathogen. | BBC Bitesize video clips – [Microorganisms](http://www.bbc.co.uk/education/clips/zbbygk7)  Images of pathogens  BBC Bitesize video clips – [The importance of handwashing in food hygiene](http://www.bbc.co.uk/education/clips/z9swhyc)  [Exampro user guide PowerPoint](http://filestore.aqa.org.uk/resources/science/AQA-GCSE-SCIENCE-EXAMPRO-UG.PPTX) |
| 4.3.1.2 to 4.3.1.4 | Viral, bacterial and fungal diseases in humans  Viral diseases include measles and AIDS, which is caused by the HIV.  Viral disease cannot be treated with antibiotics.  Bacterial diseases include salmonella food poisoning and the sexually transmitted disease gonorrhoea.  Humans can also be infected with fungal diseases. | Describe the symptoms, mode of transmission, prevention and treatment for measles, HIV and AIDS, salmonella and gonorrhoea.  Describe colds and flu as viral diseases.  Describe athlete’s foot as a fungal disease. | 1 | Small group project using ICT, researching to find out about the symptoms, mode of transmission, prevention and treatment for measles, HIV and AIDS, salmonella and gonorrhoea.  Present findings in a table and illustrate with images of these microorganisms.  Students prepare class presentations and fill out summary table for all. | Carry out research and explain application of science and personal and social implications related to diseases. | ABPI – Resources for Schools [Infectious diseases](http://abpischools.org.uk/page/modules/diseases/diseases1.cfm?coSiteNavigation_allTopic=1)  Microbiology Online/Society for General Microbiology – [Downloadable resources](http://www.microbiologyonline.org.uk/students/resources-1) |
| 4.3.1.5 | Protist diseases – malaria  Malaria is caused by a protist transmitted by mosquitos.  Spread of malaria is controlled by preventing the vectors (mosquitos) from breeding and by using mosquito nets to avoid being bitten. | Describe the life cycle of the malarial protist.  Describe the symptoms, mode of transmission, prevention and treatment for malaria. | 0.5 | Watch BBC video clip showing the effect of the malarial protest on red blood cells (see resources).  Card sort key ideas into correct order, or use for ‘back-to-back’ or collective memory activity.  Research the symptoms, mode of transmission, prevention and treatment for malaria. See links and BBC reports.  Produce an illustrated report on the findings.  Role play – Aid workers visit a remote village to help educate residents on preventing malaria infection. | Carry out research and explain application of science and personal, social, economic and environmental implications related to malaria. | BBC Bitesize – [Infested with malaria](http://www.bbc.co.uk/education/clips/z2tq2hv)  ABPI – Resources for Schools - [Malaria](http://abpischools.org.uk/page/modules/diseases/diseases8.cfm?coSiteNavigation_allTopic=1)  TED Talk – [Bill Gates: Mosquitos, malaria and education](http://www.ted.com/talks/bill_gates_unplugged?language=en)  [Parasitic Protists](http://www.biologycorner.com/bio1/parasitic-protists.html) |
| 4.3.1.6  4.3.1.1 | Human defence systems  The body defends itself against the entry of pathogens  Bacteria may produce toxins that make us feel ill and damage tissues.  Viruses live and reproduce inside cells, causing damage.  The immune system tries to destroy pathogens that enter the body.  White blood cells help to defend against pathogens by:   * phagocytosis * antibody production * antitoxin production. | Describe the body’s first line defences  Explain how microbes make us feel ill and how viruses damage cells.  Explain how the immune system defends against disease  Describe what white blood cells do.  Explain why antibodies are specific for one pathogen/ antigen. | 1–2 | Post it notes on a body outline to recap KS3.  Label a diagram to show how the body defends itself against the entry of pathogens.  Watch BBC video clip showing phagocytosis (see resources).  Research how white blood cells defend the body.  ABPI animations of white blood cell activity.  Observe white blood cells under the microscope or bio-viewer.  Draw diagrams or a cartoon strip to show the actions of white blood cells using key words: ingest, phagocytosis, antibodies and antitoxins.  Draw diagrams or use cut-outs to model antibody specificity. | Observe prepared blood smears using a microscope or bio-viewer. Draw the cells.  Use models to represent phagocytosis and antibody specificity. | Blood smears materials:   * prepared slides * microscopes * bio-viewers.   BBC Bitesize video clips – [White blood cells](http://www.bbc.co.uk/education/clips/z77b9j6)  BBC Bitesize – [Defending against infection activity](http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/human/defendingagainstinfectionact.shtml)  ABPI – Resources for Schools – [White blood cells/ response to infection](http://abpischools.org.uk/page/modules/infectiousdiseases_immunity/immunity2.cfm?coSiteNavigation_allTopic=1) |
| 4.3.1.7 | Vaccination  A vaccine contains a small amount of dead or inactive pathogens. These stimulate white blood cells to produce antibodies.  Immunity allows a person to produce specific antibodies quickly to prevent infection.  If a large proportion of the population is immune to a pathogen, the spread of the pathogen is very much reduced. | Describe what a vaccine contains.  Explain how vaccines prevent disease.  Explain the idea of ‘herd immunity’. | 1 | Watch BBC video about Edward Jenner. Evaluate the method he used in developing the first vaccine and compare with modern methods.  Discuss what a vaccine contains and how it works.  Use ABPI animation to show how a vaccine works.  Role play the level of immunity within a population and its effect on the spread of a pathogen.  Interpret graph showing primary and secondary response to a pathogen (ABPI site).  Consider the actions of Dr Wakefield and the MMR vaccine.  Role play whether to give your child vaccinations.  Interpret data about vaccination rates and reported cases of diseases, eg whooping cough, MMR.  Spain has had its first case of diphtheria in nearly 30 years – additional example. | Consider the ethical issues and risks associated with Jenner’s method. Discuss how methods and theories develop over time.  Use a model to explain herd immunity.  Interpret graph showing primary and secondary response to a pathogen; explain the responses.  Evaluate risk in relation to practical design and data review to avoid bias.  Evaluate risks related to vaccinations. | BBC Bitesize video clip – [The life and work of Edward Jenner](http://www.bbc.co.uk/education/clips/zt7gd2p)  ABPI – Resources for Schools – [Vaccination](http://abpischools.org.uk/page/modules/infectiousdiseases_immunity/immunity4.cfm)  [BBC search on MMR debate](http://www.bbc.co.uk/search?q=MMR%20debate)  WHO/Europe – [Diphtheria detected in Spain](http://www.euro.who.int/en/countries/spain/news/news/2015/06/diphtheria-detected-in-spain) |
| 4.3.1.8 | Antibiotics  Antibiotics, eg penicillin, are used to kill infective bacteria inside the body.  Specific bacteria should be treated with specific antibiotics.  The emergence of strains resistant to antibiotics is of great concern.  Antibiotics cannot kill viral pathogens. | Explain how antibiotics treat only bacterial diseases and how this has saved lives.  Describe the problems associated with antibiotic resistance. See 4.6.3.4  Explain the difficulty in developing drugs that kill viruses without damaging body tissues. | 2 | Describe the importance of antibiotics and the impact of antibiotic resistance. Explain how this has impacted on cleaning practices in Britain’s hospitals. Research MRSA and C. difficile infections and treatment.  Suggest what patients, doctors and scientists should do to ensure we will have effective antibiotics in the future.  Discussion starter – imagine the world we would live in if antibiotics stopped working. | Understand how scientific methods and applications develop over time. Evaluate personal, social and economic implications of antibiotics. | [BBC search on Antibiotic resistance](http://www.bbc.co.uk/search?q=antibiotic%20resistance) |
| 4.3.1.8  4.3.1.9 | Painkillers  Painkillers and other medicines are used to treat the symptoms of disease but do not kill pathogens.  Alexander Fleming discovered penicillin from the Penicillium mould. | Give examples of painkillers and other medicines used to treat symptoms.  Interpret data about painkillers and other medicines.  Describe Fleming’s discovery and explain its importance. | 1 | Samples of medicine packaging to stimulate discussion.  Role play: Pharmacist/patient giving recommendation based on symptoms (cards prepared or students’ own ideas).  Brainstorm symptoms of diseases and medicines used to relieve symptoms and treat disease; names of some antibiotics.  Watch BBC video clip about Fleming.  Research work of Fleming and/ or Florey and Chain and discuss the impact of their work on society**.**  Interpret data about antibiotics, painkillers and other medicines.  Draw a timeline to show how treatment of disease has changed over the years. | Understand how scientific methods and applications develop over time. Evaluate personal, social and economic implications of drugs.  Interpret data about antibiotics, painkillers and other medicines.  Use secondary evidence from text books, the internet and other sources to draw a timeline. | Samples of medicine packaging.  Cards of common symptoms.  BBC Bitesize – [Modern medicine Classroom Resources](http://www.bbc.co.uk/education/topics/zsfsgk7/resources/1)  BBC Bitesize – [Fleming and the discovery of penicillin](http://www.bbc.co.uk/education/clips/zxt6n39)  [BBC search on Medicine through time](http://www.bbc.co.uk/search?q=Medicine%20through%20time)  BBC Four series – [Pain, Pus and Poison: The Search for Modern Medicines](http://www.bbc.co.uk/programmes/p01f51s5) |
| 4.3.1.9 | Discovery and development of drugs  Traditionally drugs were extracted from plants and microorganisms.  Most new drugs are synthesised by chemists; the starting point may still be a chemical extracted from a plant.  New drugs are tested for toxicity, efficacy and dose.  Preclinical testing in the lab, then clinical trials involving healthy volunteers and then patients.  In a double blind trial, some patients are given a placebo; neither the doctors nor the patients know who has received a placebo and who has received the drug. | State which drugs come from plants and microorganisms.  Explain why drugs need to be tested before they can be prescribed.  Describe the main steps in the development and testing of a new drug.  Give reasons for the different stages in drug testing.  Explain the terms placebo and double-blind trial. | 1 | Discuss drug safety and how drugs are tested today.  Find information from ABPI and BBC websites.  Use cards/cut-outs to sequence the stages in drug testing and trialling and explain the purpose of each stage.  Create flow diagram of stages in process.  Answer past questions about drug testing. | Evaluate methods used in the development of a new drug.  Use a model to explain the stages in the development of a drug. | ABPI – Resources for Schools - [Developing medicines](http://www.abpischools.org.uk/page/modules/infectiousdiseases_medicines/medicines4.cfm?coSiteNavigation_allTopic=1)  BBC Bitesize – [Drugs and the human body](http://www.bbc.co.uk/education/guides/zpn9q6f/revision/2)  AQA resources: [PowerPoint B1.3 Use and abuse of drugs](http://filestore.aqa.org.uk/subjects/gcsescienceassessment/B1-3-USE-AND-ABUSE-OF-DRUGS.PPT) |