



## Course Outline

### Science Year 9

*Inspiring excellence, empowering global minds*

### Overview

The Science Syllabus at GEMS Wesgreen International Secondary School aims to support students to develop their ability to explore the world, to reason and solve problems through application of knowledge and transferable skills. Throughout the year we cover and extend objectives as the focus is on providing a foundation for understanding the world, the ability to reason scientifically, an appreciation of the beauty and power of science, and a sense of enjoyment and curiosity about the subject.

### Learning Outcomes

The sciences at Wesgreen is taught in ways that ensure that the students have the knowledge to enable them to develop curiosity about the natural world, insight into working scientifically, and appreciation of the relevance of science to their everyday lives, so that they develop:

- scientific knowledge and conceptual understanding in the areas of biology, chemistry, and physics
- understanding of the nature, processes, and methods of science through scientific enquiry, which helps them to answer scientific questions on the world around them
- learning of how to apply observational, practical, and enquiry-based skills to the world around them
- their ability to evaluate claims based on science through critical analysis of methods, evidence and conclusions, both qualitative and quantitative.

Scientific enquiry is set out separately but must always be taught through, and be clearly related to, the Pearson Edexcel International Award in Lower Secondary Science learning objectives.

## Chapter Overviews

### Term 1

#### Chapter 1 – 9A – Genetics and Evolution

**Approximate length: 10 lessons**

In this chapter the students look at different types of variations, factors that lead to variation, mathematical calculations to relate variations to probability, link DNA and genes to extinction of species and the phenomenon of natural selection.

Specific Objectives Covered:

- Explain how environmental variations can cause problems with classification.
- Explain how sexual reproduction leads to inherited variation.
- Explain what probability is.
- Calculate probability and display them in different forms.
- Outline how structure of DNA was discovered.
- Describe the relationship between chromosomes, DNA, genes, genetic information, and nuclei.
- Explain how organisms become endangered or extinct.
- Explain how animals get adapted to the environment.
- Explain ways of preserving biodiversity.
- Recall that individuals in a population vary genetically.
- Explain how natural selection works on the variations.

#### Chapter 2 – 9D – Biology STEM Project

**Approximate length: 4 lessons**

In this chapter the students will learn about the skill to present their ideas through scientific writing.

Specific Objectives Covered:

- Draw out a plan for scientific writing.
- Explain my thoughts, findings, and research work through scientific writing.
- Use references in my scientific writing.
- Write a scientific report on using the given information.

#### Chapter 3 – 9I – Forces and Motion

**Approximate length: 10 lessons**

In this chapter the students will recall what is force and motion. Use formulae to calculate speed, distance, and time. They will also analyse and plot graphs for different kinds of motion.

Specific National Curriculum Objectives Covered:

- Recall names of different forces.
- Explain effects of balanced and unbalanced forces.

- Explain why moving objects have a top speed.
- Recall ways in which energy can be stored and transferred.
- Recall laws of energy conservation.
- State the meaning of efficiency.
- Describe the meaning of speed and mean speed.
- Use the formula relating to speed, distance and time.
- Represent simple journeys on a distance-time graph.
- Draw and interpret distance-time graph.
- Calculate the gradient of a line graph.
- Draw and interpret speed-time graph.
- Describe how a simple lever can multiply forces or distances.
- Identify load, effort, and pivot on a diagram of a lever.
- Describe the factors that affect the size of a moment.
- Describe how simple machines can magnify forces.

#### Chapter 4 – 9E – Making materials

Approximate length: 10 lessons

In this chapter the students will learn about materials like ceramics, polymers and composite materials and their uses. They will understand the chemistry behind these materials and link it to reactions and recycling.

##### Specific National Curriculum Objectives Covered:

- Name some ceramics and their uses.
- Explain why certain ceramics have particular uses.
- Explain how the properties of ceramics depend on their structure.
- Name some examples and uses of polymers.
- Explain some properties of ceramics.
- Describe how polymers are made.
- Describe advantages and disadvantages of peer review.
- Explain composite materials, giving examples.
- Explain what happens in thermal decomposition, and exothermic and endothermic reactions.
- Explain how making and using materials can cause problems.
- Explain advantages of recycling.

**Term 2****Chapter 5 – 9B – Plant growth****Approximate length: 8 lessons**

In this chapter the students will learn about plants, the need of photosynthesis, different adaptations in plants, factors that affect photosynthesis, effects of pests and pesticides on plant growth.

Specific National Curriculum Objectives Covered:

- Explain what happens when plants photosynthesize and respire.
- Explain how the rate of photosynthesis can be affected.
- Describe how leaves, roots and stems are adapted for their functions.
- Explain how substances enter and leave the plants.
- Explain how and what plants make different substances.
- Describe how pests and human population alter the food supply.
- Explain ways in which farmers boost food production.
- Use models, for example food webs and carbon cycle to explain changes in an ecosystem.
- Explain how and what plants make different substances.
- Describe how pests and human population alter the food supply.
- Explain ways in which farmers boost food production.
- Use models, for example food webs and carbon cycle to explain changes in an ecosystem.
- Identify bias.
- Explain whether something is valid.

**Chapter 6 – 9F – Reactivity****Approximate length: 10 lessons**

In this chapter the students will define a reaction, a reactant, and a product. They will also compare physical and chemical reactions. They will investigate the production of oxygen gas during a chemical reaction. They will analyze and give examples of displacement reactions.

Specific National Curriculum Objectives Covered:

- State hazards associated with demolition.
- Identify and explain the differences between physical changes and chemical reactions.
- Use particle theory to explain gas pressure and how it can be changed.
- Describe the reactions of metals with water and dilute acids and air.
- Describe the structure of an atom.
- Describe the test for oxygen.
- Explain how combustion process can be speeded up.
- Explain why some reactions need a supply of energy.
- Express a number as a percentage of another.
- Calculate percentage.
- Explain what happens in a displacement reaction.
- Predict whether a displacement reaction will occur.

- Explain why the method used to extract a metal is related to cost and the metal's reactivity.

**Chapter 7 – 9L – Physics STEM Project****Approximate length: 8 lessons**

In this chapter the students will understand the importance of presenting their ideas to an audience via different modes – like oral and written presentations. They will learn the skill to collaborate and ask questions. They will also learn the skill to create an advertisement to sell their scientific idea.

Specific National Curriculum Objectives Covered:

- Explain the importance of a confident speaker in a presentation.
- Distribute duties among the group members for project work.
- Collect information to answer a question.
- Create a scientific writing piece for an online newspaper.
- Present my results/findings to reach a conclusion.
- Evaluate the information or data collected.
- Create a scientific writing script for an advertisement.

**Chapter 8 – 9G – Transition to further study – Chemistry****Approximate length: 7 lessons**

In this chapter the students will learn the diversity of topics which will help them link their learning easily to year 10. They will understand compounds, mixtures and elements, ionic bond formation in compounds, properties of ionic compounds, topics related to weather and rate of reaction.

Specific National Curriculum Objectives Covered:

- Identify reaction.
- Identify the elements in a chemical formula of a compound.
- Explain how two ions are formed.
- Describe metallic and ionic bonding.
- Explain how metals and ionic compounds can conduct electricity.
- Describe ways to modify weather.
- Discuss the advantages and disadvantages of controlling or modifying weather.
- Interpret and sketch reaction profiles.
- Explain why changes are described as being exothermic or endothermic.
- Describe how rates of reactions change.
- Write balanced symbol equations with state symbols.
- Recognise and use numbers and units with indices.
- Convert numbers to and from standard form.
- Represent reversible reactions using balanced symbol equations.
- Explain how a dynamic equilibrium is formed in reversible reactions.

**Term 3****Chapter 9 – 9K – Transition to further study – Physics****Approximate length: 5 lessons**

In this chapter the students will learn the diversity of topics which will help them link their learning easily to year 10. They learn the skill to ask questions for performing an investigation. They will use the formula of energies to calculate latent heat, potential energy, and kinetic energy. The students will also learn the skill to plot and interpret a graph.

Specific National Curriculum Objectives Covered:

- Decide scientific questions for an investigation.
- Describe how temperature differences can cause convection currents.
- State the meanings of latent heat and specific heat.
- Use the formula for a gravitational potential energy.
- Model force fields using diagrams and interpret them.
- Describe some examples of cause and effect in science.
- Describe the difference between correlation and cause.
- Identify linear and proportional relationships from graphs.
- Use the formula for a straight line to help interpret graphs.
- Use gradients to interpret distance-time and speed-time graphs.
- Explain the difference between physical and abstract models.
- Carry out research related to Physics.

**Chapter 10 – 9C – Transition to further study – Biology****Approximate length: 7 lessons**

In this chapter the students will learn the diversity of topics which will help them link their learning easily to year 10. The students will learn about life cycle, life expectancy, microorganisms affecting immunity, working of nervous system, coordination by the hormones, using statistical skills to estimate population size of a species in an area, topics related to osmosis.

Specific National Curriculum Objectives Covered:

- Explain the factors that have led to a change in life expectancy.
- Give examples of different kinds of diseases and describe how they are caused.
- Describe the ways in which white blood cells destroy the microorganisms in the body and explain how this can lead to immunity.
- Describe the importance of veterinary doctors to treat animals.
- Describe how the nervous system works.
- Describe how the hormones affect the body.
- Explain how large amounts of human hormones can be produced quickly using genetically modified bacteria.
- Calculate median, quartiles and interquartile range of a simple dataset.
- Interpret the use of quartiles in comparing variation in a large continuous dataset.

- Identify suitable apparatus for measuring distribution and abundance.
- Use data from abundance investigations to estimate population size.
- Give examples of how surface area: volume ratio affects organisms.
- Describe how osmosis happens.
- Explain how infectious diseases affect organisms.

**Chapter 11 – 9H- STEM Project related to Chemistry****Approximate length: 5 lessons**

In this chapter the students will carry out research to solve a given world problem. They will collect information about the topic and then present their argument as an advertisement or editorial report. They will also learn to plan an investigation.

Specific National Curriculum Objectives Covered:

- Identify the important elements of an advert.
- Research and solve a problem.
- Collect information about a given topic.
- Research and write a balanced editorial showing both sides of an argument.
- Plan an investigation to find out how different variables affect the amount of copper produced during the electrolysis of copper sulphate solution.
- Create a card/advert to promote a brand for catalytic converter.

**Chapter 12 – 9H- Electricity****Approximate length: 10 lessons**

In this chapter the students will learn the basic concepts of electricity and carry out investigations to understand the relation between current, magnetic field and resistance. They will also use mathematical skills to calculate voltage, current and resistance. They will learn to convert their numerical answers to scientific notation or to standard form.

Specific National Curriculum Objectives Covered:

- Recall the basic principles of electricity.
- State what is meant by a force field.
- Describe the shape of a magnetic field.
- Recall the factors that affect the strength of gravity.
- Calculate weight of a mass.
- Explain why an insulating material can be given a charge by rubbing.
- Describe how electrically charged objects affect each other.
- Describe an electric field.
- Explain how switches can be used to control different parts of a circuit.
- Recall how current behaves in series and parallel circuits.
- Describe how voltage behaves in series and parallel circuits.
- Describe the possible career development related to the study of electricity.
- Describe some factors that affect resistance.

- Use the formula relating voltage, current and resistance.
- Round off numbers to a given number of decimal places.
- Round off numbers to a given number of significant figures.
- Describe an electromagnet and its magnetic field.
- Describe how the strength of an electromagnet can be changed.
- Describe some applications of electromagnets.
- Describe the risks associated with space flights.

**Textbooks Exploring Science – 9 (Pearson)**

### Assessment

**Formative:** Throughout the chapters, the students will complete end of chapter assessments, quizzes and problem-solving activities which will allow the teacher to assess the students' progress and inform their planning.

**Summative:** At the end of each term, we will complete internal assessments which will be based on certain chapters. Students will also complete standardized tests such as the GL. This allows us to measure the students' attainment throughout the term and year.