



Course Outline

Science Year 8

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 are taught in ways that ensure that the students have the knowledge to enable them develop curiosity about the natural world, insight into working scientifically, and appreciation for 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
- observational, practical and enquiry-based skills and how they can be employed in the world around them
- their ability to evaluate scientific claims 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 – 8A – Food and nutrition

Approximate length: 11 lessons

In this chapter the students look at content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed, calculations of energy requirements in a healthy daily diet, the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases, the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) and the importance of bacteria in the human digestive system.

Specific Curriculum Objectives Covered:

- Recall the nutrients we need in our diet.
- Interpret nutrition information labels.
- Recall tests used to identify some substances.
- Recall good sources of different nutrients.
- Describe how factors change the amount of energy we need.
- Describe what each nutrient does to the body.
- Describe the benefits of a balanced diet.
- Explain the causes and effects of some different types of malnutrition.
- Recall parts of the digestive system.
- Explain why enzymes and bacteria are useful for digestion.
- Calculate areas of rectangles and cuboids.
- Explain the importance of surface area in the science, including surface area: volume ratios.
- Explain how diffusion enables absorption by the small intestine.
- Explain how the small intestine is adapted to its function.

Chapter 2 – 8E – Combustion**Approximate length: 9 lessons**

In this chapter the students will learn how to test for certain gases, understand how pollution may be caused by combustion and know the environmental problems caused by air pollution and ways of reducing them.

Specific Curriculum Objectives Covered:

- Describe conservation of mass and use chemical equations to represent it
- Describe the complete and incomplete combustion reactions of hydrogen and hydrocarbon.
- Describe tests for hydrogen, carbon dioxide and water.
- Describe oxidation reactions of metals and non-metals.
- Explain changes in mass seen in oxidation reactions.
- Use the fire triangle to explain how to control a fire.
- Identify hazard symbols for substances likely to cause fire.
- Identify control variables in an experiment and describe how to control them.
- Describe pollutants that are formed by burning fuels.
- Explain how these pollutants cause problems and how their effects can be reduced.
- Describe the greenhouse effect and how it is caused.
- Explain how human activity may be causing global warming.
- Explain how we can reduce carbon footprint.
- Explain how the pollution from the cars be reduced.

Chapter 3 – 8I – Fluids**Approximate length: 9 lessons**

In this chapter, the students will learn to explain the properties of different states of matter in terms of particle arrangement, movement and energy, interconversions between the states, and compare the density of regular and irregular objects and understand how forces could affect motion.

Specific Curriculum Objectives Covered:

- Describe properties of different states of matter.
- Explain properties in terms of the particle model.
- Explain why materials expand and contract when the temperature changes.
- State what is meant by density and recall its units.
- Describe how to measure the volume of irregular objects.
- Use the formula relating to mass, volume, and density.
- Recall that a substance does not change temperature while it is in a changing state.
- Describe what happens to particles during changes of state.
- Describe the ways in which water and ice are different from other liquids and solids.
- Describe how gas pressure can be increased.
- Describe how pressure changes in fluids with depth or height
- Explain some effects of pressure in different situations using the particle model.
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- State what is meant by upthrust.
- Explain why some objects float.
- Recall the factors that affect the amount of upthrust.
- Use ideas about the density in my explanation.
- Describe ways in which drag forces can be increased or reduced.
- Describe the causes of drag forces.
- Describe how drag changes with speed.
- Describe the skills needed to operate airplanes.

Chapter 4 – 8B – Plants**Approximate length: 11 lessons**

In this chapter, the students will learn about types of plant reproduction and how they occur.

Specific Curriculum Objectives Covered:

- Interpret scientific organisms' names.
- Describe how organisms are classified.
- Describe the structure of a plant and the function of each part within a flowering plant
- Write the word and balanced symbol equation for photosynthesis
- Describe the conditions required for photosynthesis
- Recall examples of reproduction in plants.
- Explain the characteristics of offspring produced by the types of reproduction.

- Explain how plants ensure cross-pollination.
- Describe how pollination leads to fertilization.
- Describe the formation of seeds and fruits.
- Explain how the structures of flowers and pollen allow pollination by animals and wind.
- Explain the functions of seeds and fruits.
- Describe what happens in germination.
- Explain why seeds and plants need certain resources.
- Explain the importance of biodiversity.
- Describe different methods of maintaining biodiversity

Chapter 5 – 8L - Earth and space**Approximate length: 7 lessons**

In this chapter the students will compare solar system models and use the tilt in the earth's axis to explain seasons. They will learn about how gravity affects objects in space and what factors affect it. They will also use mathematical skills to calculate percentages and convert fractions to decimals.

Specific Curriculum Objectives Covered:

- Compare different models of the solar system and describe methods of investigating the planets
- Use the tilt of the Earth's axis to explain the changes in the seasons
- Use a model to explain the pattern of light and dark at the Earth's poles
- Calculate weight and know the difference between mass and weight
- Describe the factors that affect the strength of gravity
- Describe how gravity affects objects in space
- Describe stars, galaxies and constellations
- Describe the milky way
- Explain what a light year is

Term 2**Chapter 6 – 8F – Periodic table****Approximate length: 8 lessons**

In this chapter the students will learn the names and chemical symbols of some common elements, understand how to identify an element as a metal or non-metal, know the physical properties of metals, identify trends in the periodic table and make predictions using this information.

Specific Curriculum Objectives Covered:

- Describe Dalton's atomic theory.
- Describe elements using physical properties.
- Write and identify the chemical symbols for elements.
- Explain the difference between physical and chemical changes and properties.
- Use atomic theory to explain what happens during the chemical reactions.

- Write and interpret chemical formulae.
- Use the periodic table to find the elements with similar properties.
- Describe some typical properties of alkali metals, halogens and noble gases.
- Describe how modern periodic table is arranged.
- Explain melting, freezing and boiling points and use them to predict the state of a substance.
- Describe and identify trends in physical properties within the periodic table.
- Identify metals and non-metals by their properties and position in their periodic table.
- Describe the reactions of some elements with water and oxygen.
- Identify trends and make predictions about chemical properties using the periodic table.

Chapter 7 – 8J – Light

Approximate length: 10 lessons

In this chapter the students will understand the use of ray diagram and the terms incident, reflected and refracted ray as well as the angles of reflection and refraction. They will learn how an image is formed in a plane mirror and know what refraction is.

Specific Curriculum Objectives Covered:

- Compare light and sound waves.
- Describe what happens to light when it hits different surfaces.
- Describe how to demonstrate that light travels in straight lines.
- Explain why agreed conventions are used in ray diagrams.
- Use the correct names for rays reaching and leaving a mirror and the angles between them and the normal.
- Use ray tracing to investigate mirrors.
- Describe how mirrors and rough surfaces reflect light.
- Describe how an image is formed in a mirror using ray diagram.
- Describe how light changes direction when travelling through different mediums
- Draw ray diagrams to represent refraction
- Recall some uses of lenses.
- Use a model to explain how lenses work.
- Recall the parts of camera and eyes and state their functions.
- Describe some ways in which energy transferred by light leads to chemical or electrical effects.
- Describe how ophthalmologists work.
- Describe how to make a spectrum.
- Explain why colored objects appear colored.

Chapter 8 – 8C – Breathing and Respiration**Approximate length: 8 lessons**

In this chapter the students will understand what the respiratory system does and what respiration is. They will also learn to describe gaseous exchange in living organisms.

Specific Curriculum Objectives Covered:

- Recall what happens in aerobic respiration.
- Recall functions of the organs in the gas exchange system.
- Explain how structure of the lungs allows efficient gas exchange.
- Recall why means and ranges are used.
- Calculate means and ranges.
- Describe how gas exchange occurs in different organisms.
- Recall what happens in aerobic respiration.
- Describe the effects of anaerobic respiration during and after hard exercise.
- Describe how substances reach respiring cells from the blood and how waste products are returned to the blood.
- Describe the causes and explain the effects of reduced oxygen supply on the blood.
- Describe effects of exercise on breathing and heartbeat rates.
- Explain how data can be used to identify the cause of a disease.
- Recall how to detect aerobic respiration.

Chapter 9 – 8G – Metals and their uses**Approximate length: 9 lessons**

In this chapter the students will learn about what metals are and how they can be protected. They will also gain some investigative skills analyzing and improving the quality of data.

Specific Curriculum Objectives Covered:

- Describe some common properties and uses of metals.
- Write word equations for the reactions of metals and non-metals.
- Explain what alloys are and why they are used.
- Identify pure substances by their melting points and boiling points.
- Explain how scientists discover new alloys.
- Use models to explain the properties of alloys.
- Describe what a catalyst is and some uses of catalyst.
- Describe, draw and recognize arrangement of particles.
- Identify products and reactants using symbol equation.
- Describe the reactions of metals with water.
- Place metals in order of their reactivity.
- Write word and symbol equations for reactions.
- Explain what is meant by accurate data.
- Identify data that is not reliable, repeatable or reproducible.

- Explain how to improve the quality of data collected during an investigation.
- Describe the reactions of metals with acids.
- Place metals in order of reactivity.
- Describe what happens during corrosion and rusting.
- Explain how metals can be protected from corrosion.

Chapter 10 – 8H- Rocks

Approximate length: 7 lessons

In this chapter the students will about the structure of the earth and the rocks found in it. They will explain how these rocks for and how geologists use the scientific method

Specific Curriculum Objectives Covered:

- Describe the structure of the Earth
- Describe how igneous and metamorphic rocks are formed
- Explain how the size of crystals is evidence for the speed of cooling
- Describe how sedimentary rocks form
- Describe the texture of some sedimentary rocks
- Use the rock cycle model to link the three types of rock
- Describe how weathering can break up rocks
- Describe how weathered rocks are eroded
- Describe how metals are obtained and some advantages of recycling metals

Term 3

Chapter 11 – 8K – Energy transfers

Approximate length: 7 lessons

In this chapter the students will understand that energy can be transferred between stores but no energy is created or lost and ways by which energy can be transferred. They will also learn to interpret Sankey diagrams and explain the environmental impact of energy usage.

Specific Curriculum Objectives Covered:

- Explain how internal energy and temperature are different
- Identify direction in which energy will be transferred.
- Explain what happens to the particles when a liquid evaporates.
- Describe how energy is transferred by radiation, conduction and convection.
- Use particle model to explain energy transfers in matter.
- Recall ways of reducing energy transfer.
- State the meaning of accuracy and precision.
- Explain how to avoid random and systematic errors.
- Describe what power and efficiency mean.

- Calculate power
- Calculate efficiencies.
- Interpret Sankey diagrams.
- Explain how power companies charge for the energy used.
- Describe what a payback time tells.
- Work out payback times.

Chapter 12 – 8D – Unicellular organisms

Approximate length: 7 lessons

In this chapter the students will learn to distinguish between different kingdoms by identifying features and examples of each. They will learn about bacteria: their features, how they reproduce and examples of useful bacteria. They will also learn about decomposers in an ecosystem and model other recycling in said ecosystem using the carbon cycle.

Specific Curriculum Objectives Covered:

- Use cell features to identify members of different kingdoms.
- Explain differences between members of unicellular and multicellular organisms.
- Label the structure of viruses and describe how they reproduce
- Explain why there is no virus kingdom and explain why they are described as non-living
- Describe the ways in which yeast respire.
- Explain the use of yeast in baking.
- Describe how yeast reproduce and the factors that limit this.
- Explain why anaerobic bacteria are used to make yogurt and cheese.
- Describe the functions of the parts of a bacterial cell.
- Describe how a bacteria reproduces.
- Describe the functions of the common parts Protista cells.
- Describe how algae makes their own food and explain the importance of this.
- Explain the importance of decomposers.
- Model the recycling of carbon in an ecosystem using the carbon cycle.

Textbooks Exploring Science – 8 (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: Students will be assessed on their understanding of each chapter with end of topic assessments. 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.