

# **Yew Chung International School**

## **YCIS Science Curriculum Framework**

### **YCIS SCIENCE GUIDING STATEMENTS**

#### **Purpose and Rationale**

The purpose of studying science at YCIS is to inspire a life-long appreciation of science, and to foster the growth of an inquiring mind, whilst stimulating curiosity and developing critical thinking skills. Our students incorporate the use of technology, mathematics, and language as tools to develop scientific understanding. They have the confidence to ask questions, find solutions and then actively apply their scientific knowledge to everyday life.

An understanding of the implications of science and its uses will allow our students to be socially and ethically responsible citizens of the world. Our students will have the knowledge, skills and understandings to contribute to the advancement of human civilization and perpetuate the environment and our planet.

#### **Belief Statements**

We believe students learn Science best when they...

- Are motivated and engaged in the learning process.
- Are empowered and challenged to reach their full potential.
- Make science relevant to their own lives by applying scientific principles to personal, local, and global real world issues.
- Are given the opportunity to learn in many ways, including whole group instruction, small group collaborations, independent inquiry, project based activities and hands-on experiences that reinforce scientific principles.
- Use age-appropriate technology to facilitate the learning process.
- Use the proper scientific language to synthesise material and to communicate it to others.
- Use their knowledge of science to improve the lives of all living things and to care for the Earth.
- Are aware of the changing nature of science through the study of global history and international current events.
- Are taught and assessed through differentiated means for knowledge and skills gained.
- Are given opportunities to learn through multiple intelligences and learning styles.
- Integrate their learning with other subject areas and disciplines.

## **Yew Chung International School**

### **Overarching Learning Expectations**

Upon graduating from YCIS, our students will be equipped to...

- Engage in opportunities for scientific study, critical thinking and creativity within a global context.
- Demonstrate an in-depth body of knowledge, methods and techniques that characterise science and technology.
- Analyse, evaluate and synthesise scientific information for the purpose of solving problems.
- Apply and integrate technology, mathematics, communication and other interdisciplinary skills in the study of science.
- Develop an appreciation of the contributions of scientists, and maintain an awareness of the possibilities and limitations associated with science and scientists.
- Understand the relationships between scientific disciplines and the overarching nature of science.
- Apply and integrate the nature of science to personal, local, and global real world issues that promote awareness and stewardship of the environment, our planet, and all living things.
- Demonstrate an awareness of the moral, ethical, social, economic and environmental implications of using science and technology to guide actions.
- Exhibit open-mindedness, celebrate diversity, and respect the beliefs and values of all people with a sense of social responsibility and compassion.
- Demonstrate an awareness of the need for and the value of effective collaboration and communication during scientific activities.
- Exhibit experimental and investigative scientific skills

## Yew Chung International School

### YCIS SCIENCE CURRICULUM FRAMEWORK

#### YCIS PRIMARY SCIENCE

##### Years 1-6

The YCIS Science Curriculum Framework for Primary is based on the frameworks of the National Curriculum in England, with an emphasis on integrating social sciences with other curricular areas. Additionally, the YCIS Science Learning Standards are aligned with the YCIS Philosophy and Objectives and the needs of our local and international students.

English is the medium of instruction in all YCIS schools, and successful learning is reliant on the ability to access, understand and utilise the English language. Therefore, it is acknowledged that, because English is not the mother tongue for many of our students, learning will be impacted until English proficiency is gained. The terminology used in the YCIS curriculum is consistent with the National Curriculum in England; however, other terminologies are acknowledged based on student needs and backgrounds.

The YCIS Science Curriculum Framework emphasises the importance of developing a global view and becoming solution and action focused. Students learn to act ethically and responsibly and to contribute to community development and sustainability.

#### ESSENTIAL TOPICS, SKILLS, AND CONTENT

Year 1	Year 2	Year 3
<b>I. Working Scientifically</b>	<b>I. Working Scientifically</b>	<b>I. Working Scientifically</b>
<b>II. Plants</b> Identify/name/describe basic structure of plants/trees.	<b>II. Living Things &amp; their Habitats</b> Introduction to food chain and habitats.	<b>II. Plants</b> Observe/describe how plants grow. Describe function of the different parts of plant.

<p><b>III. Animals, including Humans</b> Identify/name/describe common animals; including parts of human body.</p>	<p><b>III. Animals, including Humans</b> Basic needs of animals to survive; life cycle of animals; importance of exercise and nutrition for humans.</p>	<p><b>III. Animals, including Humans</b> Skeletons/muscles of humans and animals; Nutrition from food.</p>
<p><b>IV. Everyday Materials</b> Explore, name, discuss and raise and answer questions about everyday materials.</p>	<p><b>IV. Uses of Everyday Materials</b> Linking properties of materials to their uses; discover how some solid materials can be reshaped in different ways; introduction to recycling.</p>	<p><b>IV. Rocks</b> Compare/group rocks by appearance and properties; uses of rocks; link rocks to geological formations.</p>
<p><b>V. Seasonal Changes</b> Observe and talk about changes in the weather and the seasons</p>	<p><b>V. Light</b> Reflection of light; shadows; lights sources</p>	<p><b>V. Forces and Magnets</b> Magnets and its properties; uses of magnets; attraction &amp; repulsion</p>
<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>
<p><b>I. Working Scientifically</b></p>	<p><b>I. Working Scientifically</b></p>	<p><b>I. Working Scientifically</b></p>
<p><b>II. Living Things &amp; their Habitats</b> Classification keys; local environments and how changes affect living things; endangered/extinct species; construction of food chains; use key terms such as producers, predators and prey.</p>	<p><b>II. Living Things &amp; their Habitats/Plants</b> Compare life cycles of different creatures/humans; reproduction of plants/pollination and animals.</p>	<p><b>II. Living Things &amp; their Habitats</b> Classification of plants, micro-organisms and animals; interdependence (could be combined with evolution and inheritance).</p>
<p><b>III. Animals, including Humans</b> Digestive systems of humans, teeth &amp; their function.</p>	<p><b>III. Animals, including Humans</b> Human circulatory system; impact of diet, exercise, drug, lifestyle on body; nutrient and water transportation within animals/humans.</p>	<p><b>III. Evolution and Inheritance</b> Fossils providing information about living organisms from the past; adaptation to suit environment; sustaining our planet.</p>

<p><b>IV. States of Matter</b></p> <p>Identification of different states; changes of state with temperature; water cycle; water conservation.</p>	<p><b>IV. Forces</b></p> <p>Gravity; air &amp; water resistance; friction; levers, pulleys and gears.</p>	<p><b>IV. Properties &amp; Changes in Materials</b></p> <p>Dissolving; separation of materials; reversible/irreversible changes; effects on climate.</p>
<p><b>V. Sound</b></p> <p>How sound is made; sound waves; pitch &amp; volume.</p>	<p><b>V. Earth and Space</b></p> <p>Movement of Earth and Moon; explanation of day, night and seasons.</p>	<p><b>V. Light</b></p> <p>Travels in straight lines, leading to shadow shapes; travels from source to eyes; Objects reflect light to our eye making them visible, observe and explain refraction.</p>
<p><b>VI. Electricity</b></p> <p>Simple circuits; switches; identification of conductors and indicators.</p>		<p><b>VI. Electricity</b></p> <p>Adapting circuits to make bulbs brighter, buzzers louder; use recognisable symbols when representing circuits in a diagram; renewable/non-renewable sources of energy.</p>

YCIS Learning Standards  
Science  
Year 1

The following essential skills, knowledge, concepts, values, and enduring understandings are interwoven throughout the study of Science in Year 1.

**I. WORKING SCIENTIFICALLY**

Students will:

**S1.W1** Ask simple questions and recognising that they can be answered in different ways.

**S1.W2** Observe closely, using simple equipment.

**S1.W3** Perform simple tests.

**S1.W4** Identify and classify.

**S1.W5** Use observations and ideas to suggest answers to questions.

**S1.W6** Gather and record data to help in answering questions.

**S1.W7** Apply scientific knowledge to the real world.

**S1.W8** Develop skills for collaborative working.

**Guidance**

Students in Year 1 explore the world around them and raise their own questions. They experience different types of scientific enquiries, including practical activities, and begin to recognise ways in which they might answer scientific questions. They use simple features to compare objects, materials and living things and, with help, decide how to sort and group them, observe changes over time, and with guidance begin to notice patterns and relationships. Students ask questions and use simple secondary sources to find answers. They use simple measurements and equipment (for example, hand lenses, egg timers) to gather data, carry out simple tests, record simple data, and talk about what they find and **how** they found it. With help, they record and communicate findings in a range of ways and begin using simple scientific language.

Opportunities for working scientifically are provided across Years 1 and 2, but not all skills are addressed in every area of study.

## **II. PLANTS**

Students will:

**S1.P1** Identify a variety of common plants in the local environment.

**S1.P2** Identify and describe the basic structure of a variety of common flowering plants, including trees; and understand that plants come from seeds.

### **Guidance**

Students use the local environment throughout the year to explore and answer questions about plants growing in their habitat. Where possible, they observe the growth of flowers and vegetables that they have planted.

Students become familiar with flowers and characteristics of deciduous and evergreen trees, and plant structures (including leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem).

Students work scientifically by: observing closely using a magnifying glass and comparing and contrasting familiar plants; describing how they were able to identify and group plants, and drawing diagrams of the parts of different plants including trees. Students keep records of how plants have changed over time, for example leaves falling off trees and buds opening; comparing and contrasting what they have discovered about different plants.

## **III. ANIMALS, INCLUDING HUMANS**

Students will

**S1.A1** Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.

**S1.A2** Identify and name a variety of common animals that are carnivores, herbivores and omnivores.

**S1.A3** Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)

**S1.A4** Identify, name, draw and label the basic parts of the human body; say which part is associated with each sense.

### **Guidance**

Students use the local environment throughout the year to explore and answer questions about animals in their habitat. They will learn how to take care of animals taken from their local environment and the need to return them safely after study. Students become familiar with the common names of some fish, amphibians, reptiles, birds and mammals, including those kept as pets.

Students have opportunities to learn the names of the main body parts (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth) through games, actions, songs and rhymes.

Students work scientifically by: using observations to compare and contrast animals at first hand or through videos and photographs, describing how they identify and group them; grouping animals according to what they eat; and using their senses to

compare different textures, sounds and smells.

#### **IV. EVERYDAY MATERIALS**

Students will:

**S1.M1** Distinguish between an object and the material from which it is made.

**S1.M2** Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.

**S1.M3** Describe the simple physical properties of a variety of everyday materials.

**S1.M4** Compare and group together a variety of everyday materials on the basis of their simple physical properties, including sorting materials for recycling.

#### **Guidance**

Students will explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. Students explore and experiment with a wide variety of materials, not only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil.

Students work scientifically by: performing simple tests to explore questions, for example: 'What is the best material for an umbrella? ...for lining a dog basket? ...for curtains? ...for a bookshelf? ...for a gymnast's leotard?'

#### **V. SEASONAL CHANGES**

Students will:

**S1.S1** Identify different types of seasons (e.g.: four seasons, wet/dry seasons), including those personal to them.

**S1.S2** Observe changes across the seasons and how these affect the lives of people in the local area and on the global level.

**S1.S3** Observe and describe weather associated with the seasons.

#### **Guidance**

Students will observe and talk about changes in the weather and the seasons. Students talk about concepts such as how day length varies and changes of humidity as appropriate to local conditions.

Note: Students are warned that it is not safe to look directly at the Sun, even when wearing dark glasses.

Students work scientifically by: making tables and charts about the weather; and making displays of what happens in the world around them, including day length with seasonal changes.

Links are made with everyday materials, for example finding connections between seasons and clothing needed.



YCIS Learning Standards  
Science  
Year 2

The following essential skills, knowledge, concepts, values, and enduring understandings are interwoven throughout the study of Science in Year 2.

**I. WORKING SCIENTIFICALLY**

Students will:

**S2.W1** Ask simple questions and recognising that they can be answered in different ways.

**S2.W2** Observe closely, using simple equipment.

**S2.W3** Perform simple tests.

**S2.W4** Identify and classify.

**S2.W5** Use observations and ideas to suggest answers to questions.

**S2.W6** Gather and record data to help in answering questions.

**S2.W7** Apply scientific knowledge to the real world.

**S2.W8** Develop skills for collaborative working.

**Guidance**

Students in Year 2 explore the world around them and raise their own questions. They experience different types of scientific enquiries, including practical activities, and begin to recognise ways in which they might answer scientific questions. Students use simple features to compare objects, materials and living things; and with help decide how to sort and group them and observe changes over time. With guidance, they begin to notice patterns and relationships. Students ask questions and use simple secondary sources to find answers. They use simple measurements and equipment (for example, hand lenses, egg timers) to gather data, carry out simple tests, record simple data, and talk about what they have discovered and how. With help, they record and communicate their findings in a range of ways and begin to use simple scientific language.

Opportunities for working scientifically are provided across Years 1 and 2 to meet expectations by the end of Year 2. Students are not expected to cover each aspect for every area of study.

## **II. LIVING THINGS AND THEIR HABITAT**

Students will:

**S2.H1** Identify that most living things live in habitats to which they are suited.

**S2.H2** Describe how different habitats provide for the basic needs of different kinds of animals and plants.

**S2.H3** Describe how animals and plants depend on each other.

**S2.H4** Identify and name a variety of plants and animals in their habitats, including microhabitats found locally and comparing them to those found globally.

**S2.H5** Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food, comparing animals from different locales.

**S2.H6** Describe how to protect endangered animals and habitats.

### **Guidance**

Students are introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. They begin to ask and answer questions that help them become familiar with the life processes common to all living things. Students are introduced to the terms 'habitat' (a natural environment or home of a variety of plants and animals) and 'micro-habitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). They raise and answer questions about the local environment that help them identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals. Students compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in a woodland, in the ocean, in the rainforest.

Students work scientifically by: sorting and classifying according to whether things are living, dead or were never alive, recording their findings by using charts. They describe how they decided where to place things by exploring questions, for example: 'Is a flame alive? Is a deciduous tree dead in winter?' They talk about ways of answering questions, and construct a simple food chain that includes humans (e.g. grass, cow, human). They describe the conditions in different habitats and micro-habitats (under log, on stony path, under bushes) and find out how the conditions affect the number and type(s) of plants and animals that live there.

### **III. ANIMALS, INCLUDING HUMANS**

Students will:

**S2.A1** Recognise that animals, including humans, have offspring which grow into adults

**S2.A2** Recognise and compare the external body parts of humans and other animals

**S2.A3** Recognise similarities and differences between self and others and the need to treat all living creatures with respect and sensitivity.

**S2.A4** Identify and describe the basic needs of animals, including humans, for survival (water, food and air)

**S2.A5** Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene, and to know how to make simple choices to improve their health and well-being.

**S2.A6** Recognise the five senses that enable humans and other animals to be aware of the world around them.

#### **Guidance:**

Students will be introduced to the basic needs of animals for survival, as well as the importance of exercise and nutrition for humans. They are also introduced to the processes of reproduction and growth in animals. The focus at this stage is on questions that help students to recognise growth; however, they are not be expected to understand how reproduction occurs.

### **IV. USES OF EVERYDAY MATERIALS**

Students will:

**S2.M1** Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.

**S2.M2** Demonstrate how the shapes of solid objects can be changed by squashing, bending, twisting and stretching.

**S2.M3** Identify recyclable materials.

#### **Guidance**

Students will identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for matches, floors, and telegraph poles) or different materials are used for the same thing (spoons can be made from plastic, wood, metal, but not normally from glass). They learn about the properties of materials that make them suitable or unsuitable for particular purposes, and are encouraged to think about unusual and creative uses for everyday materials. Students learn about people who have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam.

In identifying recyclable materials, students take responsibility for their own rubbish.

Students work scientifically by: comparing the uses of everyday materials in and around the school with materials found in other

places (at home, the journey to school, on visits, and in stories, rhymes and songs); observing closely, identifying and classifying the uses of different materials, and recording their observations.

## **V. LIGHT**

Students will:

**S2.L1** Recognise that light is essential in order to see things, and that dark is the absence of light.

**S2.L2** Identify that light is reflected from surfaces.

**S2.L3** Recognise that light from the sun can be dangerous and that there are ways to protect one's eyes.

**S2.L4** Recognise that shadows are formed when a source of light is blocked by a solid object.

**S2.L5** Find patterns in the way the size of shadows change.

**S2.L6** Recognise that energy can be harnessed from the sun as a renewable energy source.

### **Guidance**

Students will explore what happens when light reflects off a mirror or other reflective surface, playing mirror games to answer questions about how light behaves. Students learn about why it is important to protect their eyes from bright lights. They look for and measure shadows, and discover how shadows formed and what causes shadows to change.

*Note:* Students should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.

Students work scientifically by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.

YCIS Learning Standards  
Science  
Year 3

The following essential skills, knowledge, concepts, values, and enduring understandings are interwoven throughout the study of Science in Year 3.

**I. WORKING SCIENTIFICALLY**

Students will:

**S3.W1** Ask relevant questions and use different types of scientific enquiries to answer them.

**S3.W2** Set up simple practical enquiries, comparative and fair tests.

**S3.W3** Make systematic and careful observations and take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.

**S3.W4** Gather, record, classify, and present data in a variety of ways to answer questions.

**S3.W5** Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.

**S3.W6** Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

**S3.W7** Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

**S3.W8** Apply scientific knowledge and skills to daily life and problems.

**S3.W9** Identify differences, similarities or changes related to simple scientific ideas and processes.

**S3.W10** Use straightforward scientific evidence to answer question or to support findings.

**S3.W11** Work collaboratively

**Guidance**

Students in Year 3 are given a range of scientific experiences to enable them to raise their own questions about the world around them. They start to make their own decisions about the most appropriate types of scientific enquiries they might use to answer questions; recognise when a simple fair test is necessary, and help decide how to set it up. Students talk about criteria for grouping, sorting and classifying; and they use simple keys. Students begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them. They help make decisions about what observations to make, how

long to make them for and the type of simple equipment that might be used.

Students learn how to use new equipment, such as data loggers, appropriately. They collect data from their own observations and measurements, using notes, simple tables and standard units, and help to make decisions about how to record and analyse this data. With help, students look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. With support, they identify new questions arising from the data, making predictions for new values within or beyond the data collected, and find ways of improving what they have already done. They also recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations. Students use relevant scientific language to discuss their ideas and communicate findings in ways that are appropriate for different audiences.

Opportunities for working scientifically shall be provided across Years 3 and 4 to meet YCIS Learning Standards by the end of Year 4. Students are not expected to cover each aspect for every area of study.

## **II. PLANTS**

Students will:

**S3.P1** Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

**S3.P2** Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant

**S3.P3** Investigate the way in which water is transported within plants

**S3.P4** Explain the important role plants play in the environment

**S3.P5** Observe and describe how seeds and bulbs grow into mature plants (from y2)

**S3.P6** Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (from y2)

**S3.P7** Care for plants and describe their importance to the environment (e.g. That plants give us oxygen). (from y2)

### **Guidance**

Students are introduced to the relationship between structure and function: the idea that every part has a job to do. They explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition, and flowers for reproduction.

Note: Students are introduced to the idea that plants make their own food, but at this stage they do not need to understand how this happens.

Students work scientifically by: comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertiliser; discovering how seeds are formed by observing different stages of plant life cycles over a period of time. They can observe how water is transported in plants, for example by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.

### **III. ANIMALS, INCLUDING HUMANS**

Students will:

**S3.A1** Recognise that animals cannot make their own food.

**S3.A2** Identify that animals, including humans, need the right types and amounts of food, and that they get nutrition from what they eat

**S3.A3** Identify healthy lifestyle choices, including diet and exercise; apply these to everyday life; and justify the choice.

**S3.A4** Identify that humans and some other animals have skeletons and muscles for support, protection and movement.

#### **Guidance**

Students continue to learn about the importance of nutrition and are introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.

Students explore issues that relate to food production and consumption (e.g. world hunger, obesity, equal distribution of resources).

Students work scientifically by: identifying and grouping animals with and without skeletons, observing and comparing their movements; exploring ideas about what would happen if humans did not have skeletons. They compare and contrast the diets of different animals (including their pets), and decide ways of grouping them according to what they eat. They research different food groups and how these keep us healthy, designing meals based on what they discover.

### **IV. ROCKS**

Students will:

**S3.R1** Compare and group different kinds of rocks on the basis of their appearance, formation, and simple physical properties.

**S3.R2** Describe in simple terms how fossils are formed when living things are trapped within rock.

**S3.R3** Recognise that soils are made from rocks and organic matter.

**S3.R4** Describe how humans use rocks.

#### **Guidance**

Linked with work in Geography, students explore different kinds of rocks and soils, including those in the local environment.

Students work scientifically by: observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time. They use a hand lens or microscope to identify and classify rocks according to whether they have grains or crystals, and whether they contain fossils. Students research and discuss the different kinds of living things whose

fossils are found in sedimentary rock, and explore how fossils are formed. Students explore different soils and identify similarities and differences, and investigate what happens when rocks are rubbed together, or what changes occur when rocks are in water. Students raise and answer questions about the way soils are formed.

When students study how humans make use of rock, they explore how obtaining these materials affect the environment and/or communities (e.g. the impact of mining on local and global environments and communities).

## **V. FORCES AND MAGNETS**

Students will:

**S3.F1** Compare how things move on different surfaces.

**S3.F2** Identify that some forces need contact between two objects, but magnetic forces can act at a distance.

**S3.F3** Observe how magnets attract or repel each other and attract some materials and not others.

**S3.F4** Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.

**S3.F5** Describe magnets as having two poles.

**S3.F6** Predict whether two magnets will attract or repel each other, depending on which poles are facing.

**S3.F7** Explore the everyday and/or innovative uses of different magnets.

### **Guidance**

Students observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). They explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe).

Students work scientifically by: comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces, gathering and recording data to find answers their questions. Students explore the strengths of different magnets and find a fair way to compare, sorting materials into those that are magnetic and those that are not, and looking for patterns in the way that magnets behave in relation to each other. They identify the effects of magnets, for example, the strength of a magnet, which pole faces another, how properties make magnets useful in everyday items, creative uses for different magnets.



YCIS Learning Standards  
Science  
Year 4

The following essential skills, knowledge, concepts, values, and enduring understandings are interwoven throughout the study of Science in Year 4.

**I. WORKING SCIENTIFICALLY**

Students will:

**S4.W1** Ask relevant questions and use different types of scientific enquiries to answer them.

**S4.W2** Set up simple practical enquiries, comparative and fair tests.

**S4.W3** Make systematic and careful observations and take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.

**S4.W4** Gather, record, classify, and present data in a variety of ways to help answer questions.

**S4.W5** Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.

**S4.W6** Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

**S4.W7** Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

**S4.W8** Apply scientific knowledge and skills to daily life and problems.

**S4.W9** Identify differences, similarities or changes related to simple scientific ideas and processes.

**S4.W10** Use straightforward scientific evidence to answer question or to support findings.

**S4.W11** Work collaboratively

**Guidance**

Students in Year 4 are given a range of scientific experiences to enable them to raise their own questions about the world around them. They start to make their own decisions about the most appropriate types of scientific enquiries they might use to answer questions; recognise when a simple fair test is necessary, and help decide how to set it up. Students talk about criteria for grouping, sorting and classifying; and they use simple keys. Students begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them. They help make decisions about what observations to make, how

long to make them for and the type of simple equipment that might be used.

Students learn how to use new equipment, such as data loggers, appropriately. They collect data from their own observations and measurements, using notes, simple tables and standard units, and help to make decisions about how to record and analyse this data. With help, students look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. With support, they identify new questions arising from the data, making predictions for new values within or beyond the data collected, and find ways of improving what they have already done. They also recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations. Students use relevant scientific language to discuss their ideas and communicate findings in ways that are appropriate for different audiences.

Opportunities for working scientifically shall be provided across Years 3 and 4 to meet YCIS Learning Standards by the end of Year 4. Students are not expected to cover each aspect for every area of study.

## **II. LIVING THINGS AND THEIR HABITAT**

Students will:

**S4.H1** Recognise that living things can be grouped in a variety of ways

**S4.H2** Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment

**S4.H3** Recognise that environments can change (naturally or by human intervention) and that this can sometimes have positive and negative impact on living things

**S4.H4** Identify endangered and extinct species and discuss the causes and implications of this

**S4.H5** Explore human beings' responsibility towards animals and living things in the environment

**S5.H6** Construct and interpret a variety of food chains, identifying producers, predators and prey (from Y4 animals including humans)

### **Guidance**

Students use the local environment throughout the year to raise and answer questions that help to identify and study plants and animals in their habitat. They identify how the habitat changes throughout the year, and explore possible ways of grouping a wide selection of living things that include animals, flowering plants and non-flowering plants. Students begin to put vertebrate animals into groups such as fish, amphibians, reptiles, birds, and mammals; and invertebrates into categories of snails and slugs, worms, spiders, and insects.

Students are encouraged to identify various charities that support environmental causes.

Note: Plants can be grouped into categories such as flowering plants (including grasses) and non-flowering plants, such as ferns and mosses.

Students explore examples of human impact (both positive and negative) on environments, for example, the positive effects of nature reserves, ecologically planned parks, or garden ponds; and the negative effects of population and development, litter or deforestation.

Students work scientifically by: using and making simple guides or keys to explore and identify local plants and animals; making a guide about local living things; raising and answering questions based on observations and discoveries about animals they have researched.

### **III. ANIMALS, INCLUDING HUMANS**

Students will:

**S4.A1** Describe the simple functions of the basic parts of the digestive system in humans

**S4.A2** Identify the different types of teeth in humans and their simple functions

**S4.A3** Design and explain a healthy regimen of diet, exercise and dental care

#### **Guidance**

Students are introduced to the main body parts associated with the digestive system, for example, mouth, tongue, teeth, oesophagus, stomach and small and large intestine. They explore questions that help them understand the special functions of each.

Students work scientifically by: comparing the teeth of carnivores and herbivores; suggesting reasons for differences; finding out what damages teeth and how to look after them. They draw conclusions and discuss ideas about the digestive system and compare with models or images.

Students compare how people stay healthy in different locales and/or cultures, including their own local circumstances.

### **IV. STATES OF MATTER**

Students will:

**S4.M1** Compare and group materials together according to whether they are solids, liquids or gases.

**S4.M2** Identify that some materials change state when they are heated or cooled.

**S4.M3** Measure or research the temperature at which materials change state in degrees Celsius (°C).

**S4.M4** Identify the part played by evaporation and condensation in the water cycle; associate the rate of evaporation with temperature.

#### **Guidance**

Students explore a variety of everyday materials and develop simple descriptions of the states of matter (e.g. solids hold their shape; liquids form a pool; gases escape from an unsealed container). Students observe water as a solid, a liquid and a gas, and note

the changes to water when it is heated or cooled.

Note: Teachers should avoid using materials where heating is associated with chemical change, for example, through baking or burning.

Students identify ways in which solids, liquids and gases can be pollutants and alter the environment, with specific local references. They investigate the importance of water conservation and means of saving water. Students recognise the importance of water conservation and means of saving water.

Students work scientifically by: grouping and classifying a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, cream (for example, making food such as chocolate crispy cakes and ice-cream for a party). They research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. They observe and record evaporation over a period of time, for example, a puddle in the playground or the clothes drying on a line; and investigate the effect of temperature on clothes drying or snowmen melting.

## **V. SOUND**

Students will:

**S4.S1** Identify how sounds are made, associating some of them with something vibrating

**S4.S2** Recognise that vibrations from sounds travel through a medium to the ear

**S4.S3** Find patterns between the pitch of a sound and features of the object that produced it

**S4.S4** Find patterns between the volume of a sound and the strength of the vibrations that produced it

**S4.S5** Recognise that sounds get fainter as the distance from the sound source increases.

### **Guidance**

Students explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and discover how the pitch and volume of sounds can be changed in a variety of ways.

Students work scientifically by: finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. They make things, such as earmuffs, from a variety of different materials to investigate which provides the best insulation against sound. Students are encouraged to make and play their own instruments by using what they discover about pitch and volume.

This unit could link with Music, sounds and music from other cultures, or learning about noise pollution.

## **VI. ELECTRICITY**

Students will:

**S4.E1** Identify common appliances that run on electricity.

**S4.E2** Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.

**S4.E3** Identify whether or not a lamp will light in a simple series circuit based on whether or not the lamp is part of a complete loop with a battery.

**S4.E4** Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.

**S4.E5** Recognise some common conductors and insulators, and associate metals with being good conductors.

**S4.E6** Identify renewable and non-renewable energy sources.

### **Guidance**

Students learn to construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches; using their circuits to create simple devices. Students draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage (introduced in Year 6).

Note: Students may use the terms current and voltage, but these should not be introduced or defined formally at this stage. Students must learn about precautions for working safely with electricity.

Students work scientifically by: observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that different materials can or cannot be used to connect across a gap in a circuit.

In Year 6, students will compare and contrast renewable and non-renewable energy sources.

YCIS Learning Standards

Science

Year 5

The following essential skills, knowledge, concepts, values, and enduring understandings are interwoven throughout the study of Science in Year 5.

**I. WORKING SCIENTIFICALLY**

Students will:

**S5.W1** Plan different types of scientific enquiries to answer questions, including recognising and controlling variables as necessary.

**S5.W2** Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings as appropriate.

**S5.W3** Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

**S5.W4** Use test results to make predictions to set up further comparative and fair tests.

**S5.W6** Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.

**S5.W7** Identify scientific evidence that has been used to support or refute ideas or arguments.

**S5.W8** Apply scientific knowledge and skills to daily life.

**S5.W9** Work collaboratively.

**Guidance**

Students in Years 5 use science experiences to: explore ideas and raise different kinds of questions; select and plan the most appropriate types of scientific enquiries to answer scientific questions; recognise when and how to set up comparative and fair tests; and explain which variables need to be controlled and why. They use and develop keys and other information records to identify, classify and describe living things and materials; and identify patterns that might be found in the natural environment. They make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them. Students choose the most appropriate equipment to make measurements and explain how to use it accurately. They decide how to record data from a choice of familiar approaches; look for different causal relationships in their data; and identify evidence that refutes or supports their ideas. Students use their results to identify when further tests and observations might be needed; recognise which secondary sources will be most useful to research ideas; and begin to separate opinion from fact. They use relevant scientific language and illustrations to discuss, communicate, and justify their scientific ideas; and research how

scientific ideas have developed over time. The science experiences in Year 5 include investigative projects.

## **II. LIVING THINGS AND THEIR HABITAT**

Students will:

**S5.H1** Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.

**S5.H2** Describe the life process of reproduction in some plants and animals.

**S5.H3** Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

**S5.H4** Describe the changes as humans develop to old age.

### **Guidance**

Students in Year 5 study and raise questions about the local environment throughout the year. They observe life-cycle changes in a variety of living things, for example, plants in a vegetable garden or flower border, and animals in the local environment. They learn about the work of naturalists and animal behaviourists such as David Attenborough and Jane Goodall.

Students learn about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals. Students identify perspectives of different cultures towards age, and associated responsibilities that accompany different ages. They look for patterns in the structure of fruits that relate to how the seeds are dispersed.

Students work scientifically by: observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas, and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences. Students are encouraged to grow new plants from different parts of a parent plant, for example, seeds, stem and root cuttings, tubers, bulbs. They observe changes in an animal over a period of time (for example, the hatching and rearing of chicks if appropriate), comparing how different animals reproduce and grow.

## **III. ANIMALS, INCLUDING HUMANS**

Students will:

**S5.A1** Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood

**S5.A2** Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function

**S5.A3** Describe the ways in which nutrients and water are transported within animals, including humans. (from Year 6)

### **Guidance**

Students build on their learning from Years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive

system) to explore and answer questions that help them understand how the circulatory system enables the body to function. Students learn how to keep their bodies healthy and how their bodies might be damaged, and how some drugs and other substances can be harmful to the human body.

Students work scientifically by: experimenting with the effects of exercise on heart rate, breathing, etc. They investigate how exercise and diet affects health.

Students explore the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health. They study sustainability of organic foods, grain fed cattle, chickens & antibiotics, associated benefits and costs.

#### **IV. EARTH AND SPACE**

Students will:

**S5.E1** Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.

**S5.E2** Describe the movement of the moon relative to the earth.

**S5.E3** Describe the Sun, Earth and Moon as approximately spherical bodies.

**S5.E4** Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.

**S5.E5** Explain why we have different seasons in reference to the tilt of the earth and its movement around the Sun.

#### **Guidance**

Students are introduced to a model of the Sun and Earth that enables them to explain day and night. They learn that the Sun is a star at the centre of our solar system, and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). Students learn that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).

Note: Students should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.

Students learn about how the moon causes tides. They discover the way that ideas about the solar system have developed; and understand how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus. Students relate this to the time in China compared to the time in their home country, including understanding of jet lag. Students learn about space exploration, including Chinese space exploration and collaborative projects.

Students work scientifically. Methods include comparing the time of day at different places on the Earth through internet links and direct communication; creating simple models of the solar system; constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day.



## **V. FORCES**

Students will:

**S5.F1** Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object

**S5.F2** Identify the effects of air resistance, water resistance and friction, that act between moving surfaces

**S5.F2** Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

### **Guidance:**

Students explore falling objects and raise questions about the effects of air resistance; and they explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. Students experience forces that make things begin to move, get faster or slow down. They explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Students explore the effects of levers, pulleys and simple machines on movement. Students research how scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

Students work scientifically by: exploring falling paper cones or cup-cake cases; designing and making a variety of parachutes; and carrying out fair tests to determine which designs are the most effective. They explore resistance in water by making and testing boats of different shapes; and they design and make products that use levers, pulleys, gears and/or springs and explore their effects.

YCIS Learning Standards  
Science  
Year 6

The following essential skills, knowledge, concepts, values, and enduring understandings are interwoven throughout the study of Science in Year 6.

**I. WORKING SCIENTIFICALLY**

Students will:

- S6.W1** Plan different types of scientific enquiries to answer questions, including recognising and controlling variables as necessary.
- S6.W2** Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings as appropriate.
- S6.W3** Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
- S6.W4** Use test results to make predictions to set up further comparative and fair tests.
- S6.W6** Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.
- S6.W7** Identify scientific evidence that has been used to support or refute ideas or arguments.
- S6.W8** Apply scientific knowledge and skills to daily life.
- S6.W9** Work collaboratively.

**Guidance**

Students in Year 6 use science experiences to: explore ideas and raise different kinds of questions; select and plan the most appropriate types of scientific enquiries to answer scientific questions; recognise when and how to set up comparative and fair tests; and explain which variables need to be controlled and why. They use and develop keys and other information records to identify, classify and describe living things and materials; and identify patterns that might be found in the natural environment.

Students make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them. Students choose the most appropriate equipment to make measurements and explain how to use it accurately. They decide how to record data from a choice of familiar approaches; look for different causal relationships in their data; and identify evidence that refutes or supports their ideas. Students use their results to identify when further tests and

observations might be needed; recognise which secondary sources will be most useful to research ideas; and begin to separate opinion from fact. They use relevant scientific language and illustrations to discuss, communicate, and justify their scientific ideas; and research how scientific ideas have developed over time. The science experiences in Year 6 include investigative projects.

## **II. LIVING THINGS AND THEIR HABITATS**

Students will:

**S6.H1** Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals.

**S6.H2** Give reasons for classifying plants and animals based on specific characteristics.

**S6.H3** Identify how living creatures are interdependent.

### **Guidance**

Students build on their learning about grouping living things by looking at the classification system in more detail. They are introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. Students focus on the local impact of viruses (e.g. swine/bird flu, HFMD etc.). Through direct observations where possible, students classify animals into commonly found invertebrates such as insects, spiders, snails, worms; and vertebrates such as fish, amphibians, reptiles, birds and mammals. They discuss reasons why living things are placed in one group and not another.

Students learn about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.

Students work scientifically by: using classification systems and keys to identify some animals and plants in the immediate environment. They research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system.

## **III. PROPERTIES AND CHANGES IN MATERIALS**

Students will:

**S6.M1** Compare and group everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.

**S6.M2** Identify that some materials dissolve in liquid to form a solution, and describe how to recover a substance from a solution.

**S6.M3** Use knowledge of solids, liquids and gases to decide how mixtures might be separated, e.g. filtering, sieving and evaporating.

**S6.M4** Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.

**S6.M5** Demonstrate that dissolving, mixing and changes of state are reversible changes.

**S6.M6** Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, e.g. changes associated with burning and the action of acid on bicarbonate of soda.

**S6.M7** Identify effects on the climate/environment from changing materials (e.g coal burning, acid rain, non-biodegradable plastics).

### **Guidance**

Students build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in Year 3 and about electricity in Year 4. Students explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.

Students also explore changes that are difficult to reverse, for example, burning, rusting and other reactions such as vinegar with bicarbonate of soda. They learn about chemists who created new materials, such as Spencer Silver who invented the glue for sticky notes, or Ruth Benerito who invented wrinkle-free cotton.

Students are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors produce a brighter bulb in a circuit than others, and that some materials feel hotter than others when placed against a heat source. Safety guidelines must be taught and followed when burning materials.

## **IV. EVOLUTION AND INHERITANCE**

Students will:

**S6.EV1** Recognise that living things have changed over time, and that fossils provide information about living things that inhabited the Earth millions of years ago.

**S6.EV2** Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.

**S6.EV3** Identify how all living things are adapted to suit their environment in different ways, and that adaptation may lead to evolution.

### **Guidance**

Building on what they learned about fossils in the topic on rocks in Year 3, students discover more about how living things on earth have changed over time. They are introduced to the idea that characteristics are passed from parents to offspring, for instance by considering different breeds of dogs, and what happens when, for example, Labradors are crossed with Poodles. They learn that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Students research the work of palaeontologists such as Mary Anning, and how Charles Darwin and Alfred Wallace developed their ideas on evolution.

With regards to sustainability, students learn about pollution and long-term effects on the local environment and lifestyles. They recognise ways in which our planet can be sustained for future generations, and ways in which all living things can continue to grow and thrive.

Note: At this stage, students are not expected to understand genes and chromosomes.

Students work scientifically by: observing and raising questions about local animals and how they are adapted to their environment; comparing how some living things are adapted to survive in extreme conditions, e.g. cactuses, penguins and camels. They analyse the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.

## **V. LIGHT**

Students will:

**S6.L1** Recognise that light appears to travel in straight lines.

**S6.L2** Use the concept that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.

**S6.L3** Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.

**S6.L4** Use the concept that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

**S6.L5** Investigate the effects of light travelling through different materials, including transparency and opacity, and refraction.

### **Guidance**

Students build on their study of light in Year 2, exploring the way that light behaves, including light sources, reflection and shadows. They talk about what happens and make predictions.

Students work scientifically by: deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. They investigate the relationship between light sources, objects and shadows by using shadow puppets. They investigate the effects of light travelling through different materials by using prisms and by looking a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters.

## **VI. ELECTRICITY**

Students will:

**S6.E1** Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.

**S6.E2** Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.

**S6.E3** Use recognised symbols when representing a simple circuit in a diagram.

**S6.E4** Compare and contrast renewable and non-renewable sources of energy.

### **Guidance**

Building on their study of electricity in Year 4, students construct simple series circuits, to help them answer questions about what happens when they try different components, e.g. switches, bulbs, buzzers and motors. They learn how to represent a simple circuit in a diagram using recognised symbols.

Note: Students are expected to learn only about series circuits, not parallel circuits. Necessary precautions for working safely with electricity must be taught and followed.

Students work scientifically by: systematically identifying the effect of changing one component at a time in a circuit; designing and making a set of traffic lights, a burglar alarm, or some other useful circuit.

**Yew Chung International School**  
**YCIS SCIENCE CURRICULUM FRAMEWORK**

YCIS LOWER SECONDARY SCIENCE YEARS 7-8-9		
SCIENCE LEARNING DOMAINS: Years 7-8-9		
<p>I. <b>WORKING SCIENTIFICALLY</b></p> <p>II. <b>BIOLOGY</b></p> <p>III. <b>CHEMISTRY</b></p> <p>IV. <b>PHYSICS</b></p>		
YEAR 7	YEAR 8	YEAR 9
ESSENTIAL TOPICS AND CONTENT		
<p><b>Biology:</b></p> <ul style="list-style-type: none"> <li>• Structure and function of living organisms: Cells and organization, the skeletal and muscular systems</li> <li>• Interactions and interdependencies: Relationships in an ecosystem</li> <li>• Health and well-being</li> </ul> <p><b>Chemistry:</b></p> <ul style="list-style-type: none"> <li>• The particulate nature of matter: Particle model, energy in matter</li> <li>• Acids and alkalines</li> <li>• Earth and atmosphere</li> </ul> <p><b>Physics:</b></p>	<p><b>Biology:</b></p> <ul style="list-style-type: none"> <li>• Structure and function of living organisms: Nutrition and digestion, reproduction</li> <li>• Material cycles and energy: Photosynthesis</li> </ul> <p><b>Chemistry:</b></p> <ul style="list-style-type: none"> <li>• Pure and impure substances</li> <li>• The Periodic Table</li> <li>• Rates of reaction</li> </ul> <p><b>Physics:</b></p> <ul style="list-style-type: none"> <li>• Motion and forces: Describing motion</li> </ul>	<p><b>Biology:</b></p> <ul style="list-style-type: none"> <li>• Structure and function of living organisms: Gas exchange systems</li> <li>• Material cycles and energy: Cellular respiration</li> <li>• Inheritance, chromosomes, DNA and genes</li> </ul> <p><b>Chemistry:</b></p> <ul style="list-style-type: none"> <li>• Chemical reactions</li> <li>• Atoms, elements and compounds</li> <li>• Materials (and reactivity series)</li> </ul> <p><b>Physics</b></p> <ul style="list-style-type: none"> <li>• Electricity and magnetism: Magnetism, static electricity, electricity</li> </ul>

<ul style="list-style-type: none"> <li>• Matter: Physical changes, particle model, energy in matter</li> <li>• Motion and Forces: Forces and balanced forces</li> <li>• Energy: Energy resources and power</li> </ul>	<ul style="list-style-type: none"> <li>• Observed waves, sound waves, energy and waves, light waves</li> <li>• Space physics</li> </ul>	<ul style="list-style-type: none"> <li>• Energy: Calculation of fuel uses and costs in the domestic context, energy changes and transfers, changes in systems</li> <li>• Motion and forces: Pressure in fluids</li> </ul>
<p><b>METHODS OF ASSESSMENT:</b></p>		
<ul style="list-style-type: none"> <li>• Labs and fieldwork</li> <li>• Written assignments</li> <li>• Homework tasks</li> <li>• Quizzes and tests</li> <li>• Semester exams</li> <li>• Projects and presentations</li> <li>• Classroom activities and group work</li> <li>• Peer and self assessments</li> <li>• Common assessments across year level Science classes</li> </ul>		
<p><b>DIFFERENTIATION STRATEGIES:</b></p>		
<ul style="list-style-type: none"> <li>• Varied teaching strategies, checking for understanding, reteaching</li> <li>• Varied and multiple assessments for students with differing learning styles and levels of language proficiency to demonstrate understanding and learning</li> <li>• EAL/Learning Support in the classroom by EAL/Learning Support teachers</li> <li>• EAL strategies and/or oral assessments for students requiring language support</li> <li>• Extra time given on timed assessments for students with learning difficulties, as determined by Learning Support specialists</li> <li>• Project work that takes advantage of assigning students to work with peers of diverse ability levels</li> <li>• Activities that promote oral presentation skills and/or cross-curricular topics for students who may excel in other curricular areas</li> <li>• Assignments that promote written, oral and/or creative communication to demonstrate understanding</li> </ul>		



**RESOURCES AND TEXTS: YEARS 7-8-9**

- *Activate: 11-14: Activate Biology* Student Book
- *Activate: 11-14: Activate Chemistry* Student Book
- *Activate: 11-14: Activate Physics* Student Book
- *Complete Biology for Cambridge Secondary 1* Student Book
- *Complete Chemistry for Cambridge Secondary 1* Student Book
- *Complete Physics for Cambridge Secondary 1* Student Book
- *Exploring Science 7* + CD-rom (worksheets) ISBN-978-1-4058-9246-9
- *Exploring Science 8* + CD-rom (worksheets) ISBN- 978-1-4058-9543-9
- *Exploring Science 9* + CD-rom (worksheets) ISBN 978-1-4058-9551-4

## YCIS Learning Standards SCIENCE YEAR 7

The following essential skills, knowledge, concepts, values, and enduring understandings are organized according to the **Y7-8-9 Science Learning Domains**, and are interwoven throughout the **Year 7 Science Programme**.

### I. WORKING SCIENTIFICALLY

**Students will:**

#### SCIENTIFIC ATTITUDES

**S7.W1** Demonstrate objectivity and concern for accuracy, precision, repeatability and reproducibility.

**S7.W2** Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review.

**S7.W3** Evaluate risks.

#### EXPERIMENTAL SKILLS AND INVESTIGATIONS

**S7.W5** Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience.

**S7.W5** Make predictions using scientific knowledge and understanding.

**S7.W6** Select, plan and carry out the most appropriate types of scientific enquiries to test predictions.

**S7.W7** Identify independent, dependent and control variables, where appropriate.

**S7.W8** Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety.

**S7.W9** Make and record observations and measurements using a range of methods for different investigations.

**S7.W10** Evaluate the reliability of methods and suggest possible improvements.

**S7.W11** Apply sampling techniques.

#### ANALYSIS AND EVALUATION

**S7.W12** Apply mathematical concepts and calculate results.

**S7.W13** Present observations and data using appropriate methods, including tables and graphs.

**S7.W14** Interpret observations and data by identifying patterns and using observations, measurements and data to draw conclusions.

**S7.W15** Present reasoned explanations by explaining data in relation to predictions and hypotheses.

**S7.W16** Evaluate data, showing awareness of potential sources of random and systematic error.

**S7.W17** Identify further questions arising from results.

#### **MEASUREMENT**

**S7.W18** Understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature.

**S7.W19** Use and derive simple equations and carry out appropriate calculations.

**S7.W20** Conduct basic data analysis using simple statistical techniques.

## **II. BIOLOGY**

**Students will:**

### **STRUCTURE AND FUNCTION OF LIVING ORGANISMS**

**Cells and organisation:**

**S7.B1** Identify cells as the fundamental unit of living organisms.

**S7.B2** Demonstrate how to observe, interpret and record cell structure using a light microscope.

**S7.B3** Identify the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplast.

**S7.B4** Recognize the similarities and differences between plant and animal cells.

**S7.B5** Know the role of diffusion in the movement of materials in and between cells.

**S7.B6** Identify the structural adaptations of some unicellular organisms.

**S7.B7** Recognize the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms.

**The skeletal and muscular systems:**

**S7.B8** Identify the structure and functions of the human skeleton, to include support, protection, movement and making blood cells.

**S7.B9** Demonstrate understanding of biomechanics as the interaction between skeleton and muscles, including the measurement of force exerted by different muscles.

**S7.B10** Know the function of muscles and examples of antagonistic muscles.

### **INTERACTIONS AND INTERDEPENDENCE**

**Relationships in an ecosystem:**

**S7.B11** Demonstrate understanding of the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops.

**S7.B12** Know the importance of plant reproduction through insect pollination in human food security.

**S7.B13** Identify how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

**Health and Well-being:**

**S7.B14** Demonstrate understanding of the effects of recreational drugs and substance abuse on behaviour, health and life processes.

**S7.B15** Identify the interdependence between the environment and physical health, and acquire skills to care for the environment.

**S7.B16** Demonstrate the ability to practice health-enhancing behaviours and reduce health risks.

**III. CHEMISTRY**

**Students will:**

**THE PARTICULATE NATURE OF MATTER** (Links with Physics: Matter)

**S7.C1** Identify the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure.

**S7.C2** Identify changes of state in terms of the particle model.

**S7.C3** Demonstrate the conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving.

**S7.C4** Identify similarities and differences, including density differences, between solids, liquids and gases.

**S7.C5** Demonstrate understanding of the Brownian motion in gases.

**S7.C6** Know that diffusion in liquids and gases is driven by differences in concentration.

**S7.C7** Recognize the differences between chemical and physical changes.

**Particle model:**

**S7.C8** Identify differences in arrangements, in motion and in closeness of particles.

**S7.C9** Explain changes of state, shape and density, the anomaly of ice-water transition.

**S7.C10** Identify atoms and molecules as particles.

**Energy in matter:**

**S7.C11** Identify changes with temperature in motion and spacing of particles.

**S7.C12** Know that internal energy is stored in materials.

**ACIDS AND ALKALINES**

**S7.C13** Define acids and alkalis in terms of neutralisation reactions.

**S7.C14** Use the pH scale for measuring acidity/alkalinity; and indicators.

**EARTH AND ATMOSPHERE**

**S7.C15** Know the composition of the Earth.

**S7.C16** Know the structure of the Earth.

**S7.C17** Demonstrate understanding of the rock cycle and the formation of igneous, sedimentary and metamorphic rocks.

**S7.C18** Describe the Earth as a source of limited resources and the efficacy of recycling.

**S7.C19** Demonstrate understanding of the carbon cycle.

**S7.C20** Know the composition of the atmosphere.

**S7.C21** Describe the production of carbon dioxide by human activity and the impact on climate.

**IV. PHYSICS**

**Students will:**

**MATTER** (Links with Chemistry: The Particulate Nature of Matter, see S7.C1 to S7.C11)

**MOTION AND FORCES**

**Forces and balanced forces:**

**S7.P1** Demonstrate forces as pushes or pulls, arising from the interaction between two objects.

**S7.P2** Use force arrows in diagrams to add forces in one dimension, balanced and unbalanced forces.

**S7.P3** Demonstrate that forces are needed to cause objects to stop or start moving (qualitative only).

**S7.P4** Demonstrate that forces are needed to cause objects to change speed or direction of motion (qualitative only).

**S7.P5** Recognize that change in motion depends on the direction of the force and the size of the object.

**S7.P6** Identify opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface.

**S7.P7** Identify a moment as the turning effect of a force.

**S7.P8** Identify forces associated with deforming objects: stretching and squashing – springs.

**S7.P9** Identify forces associated with rubbing and friction between surfaces.

**S8.P10** Identify forces associated with pushing things out of the way; resistance to motion of air and water.

**S7.P11** Identify forces measured in newtons and measurements of stretch or compression as force is changed.

**S7.P12** Identify force-extension linear relation; and Hooke's Law as a special case.

**S7.P13** Demonstrate understanding of work done and that energy changes on deformation.

**S7.P14** Recognize non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity.

### **ENERGY**

#### **Energy resources and power:**

**S7.P15** Describe the difference between a renewable and a non-renewable energy resource.

**S7.P16** Describe how electricity is generated in a power station.

**S7.P17** Explain the difference between energy and power.

**S7.P18** Describe the link between power, fuel use, and the cost of using domestic appliances.

## YCIS Learning Standards SCIENCE YEAR 8

The following essential skills, knowledge, concepts, values, and enduring understandings are organized according to the **Y7-8-9 Science Learning Domains**, and are interwoven throughout the **Lower Secondary Science Programme**.

### I. WORKING SCIENTIFICALLY

**Students will:**

#### SCIENTIFIC ATTITUDES

**S8.W1** Demonstrate objectivity and concern for accuracy, precision, repeatability and reproducibility.

**S8.W2** Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review.

**S8.W3** Evaluate risks.

#### EXPERIMENTAL SKILLS AND INVESTIGATIONS

**S8.W5** Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience.

**S9.W5** Make predictions using scientific knowledge and understanding.

**S8.W6** Select, plan and carry out the most appropriate types of scientific enquiries to test predictions.

**S8.W7** Identify independent, dependent and control variables, where appropriate.

**S8.W8** Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety.

**S8.W9** Make and record observations and measurements using a range of methods for different investigations.

**S8.W10** Evaluate the reliability of methods and suggest possible improvements.

**S8.W11** Apply sampling techniques.

#### ANALYSIS AND EVALUATION

**S8.W12** Apply mathematical concepts and calculate results.

**S8.W13** Present observations and data using appropriate methods, including tables and graphs.

**S8.W14** Interpret observations and data by identifying patterns and using observations, measurements and data to draw conclusions.

**S8.W15** Present reasoned explanations by explaining data in relation to predictions and hypotheses.

**S8.W16** Evaluate data, showing awareness of potential sources of random and systematic error.

**S8.W17** Identify further questions arising from results.

### **MEASUREMENT**

**S8.W18** Understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature.

**S8.W19** Use and derive simple equations and carry out appropriate calculations.

**S8.W20** Conduct basic data analysis using simple statistical techniques.

## **II. BIOLOGY**

**Students will:**

### **STRUCTURE AND FUNCTION OF LIVING ORGANISMS**

#### **Nutrition and digestion:**

**S8.B1** Explain the content of a healthy human diet.

**S8.B2** Demonstrate understanding of why carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water are all needed in a healthy diet.

**S8.B3** Conduct calculations of energy requirements in a healthy daily diet.

**S8.B4** Demonstrate understanding of the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases.

**S8.B5** Identify the tissues and organs of the human digestive system, including adaptations to function.

**S8.B6** Demonstrate how the digestive system digests food (enzymes simply as biological catalysts)

**S8.B7** Recognize the importance of bacteria in the human digestive system.

**S8.B8** Know that plants make carbohydrates in their leaves through photosynthesis.

**S8.B9** Know that plants gain mineral nutrients and water from the soil via their roots.

#### **Reproduction:**

**S8.B10** Demonstrate understanding of reproduction in humans (mammals).

**S8.B11** Recognize the structure and function of the male and female reproductive systems.

**S8.B12** Demonstrate understanding of the menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth.

**S8.B13** Recognize the effect of maternal lifestyle on the foetus through the placenta.

**S8.B14** Demonstrate understanding of reproduction in plants.



**S8.B15** Identify the structure of a flower.

**S8.B16** Identify wind and insect pollination, fertilisation, seed and fruit formation and dispersal.

**S8.B17** Conduct quantitative investigation of some dispersal mechanisms.

### **MATERIAL CYCLES AND ENERGY**

#### **Photosynthesis:**

**S8.B18** Demonstrate understanding of the reactants in, and products of, photosynthesis, and a word summary for photosynthesis.

**S8.B19** Recognize that almost all life on Earth is dependent on the ability of photosynthetic organisms, such as plants and algae.

**S8.B20** Demonstrate how photosynthetic organisms use sunlight in photosynthesis to build organic molecules that are an essential energy store for maintaining levels of oxygen and carbon dioxide in the atmosphere.

**S8.B21** Recognize the adaptations of leaves for photosynthesis.

### **III. CHEMISTRY**

#### **Students will:**

#### **PURE AND IMPURE SUBSTANCES**

**S8.C1** Demonstrate understanding of the concept of a pure substance.

**S8.C2** Recognize mixtures, including the dissolving of mixtures.

**S8.C3** Demonstrate understanding of diffusion in terms of the particle model.

**S8.C4** Identify simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography.

**S8.C5** Identify pure substances.

#### **THE PERIODIC TABLE**

**S8.C6** Identify the varying physical and chemical properties of different elements.

**S8.C7** Demonstrate understanding of the principles underpinning the Mendeleev Periodic Table.

**S8.C8** Recognize the Periodic Table: periods and groups; metals and non-metals.

**S8.C9** Demonstrate how patterns in reactions can be predicted with reference to the Periodic Table.

**S8.C10** Demonstrate understanding of the properties of metals and non-metals.

**S8.C11** Identify the chemical properties of metal and non-metal oxides with respect to acidity.

#### **RATES OF REACTION**

**S8.C12** Explain the effect of concentration, particle size and temperature on the speeds of reaction.

**S8.C13** Know what catalysts do.

**S8.C14** Recognize the application of the above factors in dangerous situations.

#### **IV. PHYSICS**

**Students will:**

##### **MOTION AND FORCES**

**Describing motion:**

**S8.P1** Calculate speed and identify the quantitative relationship between average speed, distance and time. (speed = distance ÷ time)

**S8.P2** Illustrate the representation of a journey on a distance-time graph.

**S8.P3** Identify relative motion: trains and cars passing one another.

##### **WAVES**

**Observed waves:**

**S8.P1** Identify waves on water as undulations that travel through water with transverse motion.

**S8.P2** Demonstrate understanding that waves can be reflected, and add or cancel – superposition.

**Sound waves:**

**S8.P3** Identify frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound.

**S8.P4** Demonstrate understanding that sound needs a medium to travel.

**S8.P5** Know the speed of sound in air, in water, in solids.

**S8.P6** Demonstrate understanding of sound as produced by vibrations of objects.

**S8.P7** Recognize that sound in a loud speaker is detected by its effect on the microphone diaphragm and the eardrum.

**S8.P8** Demonstrate understanding that sound waves are longitudinal.

**S8.P9** Identify the auditory range of humans and animals.

**Energy and waves:**

**S8.P10** Recognize that pressure waves transfer energy; and are used for cleaning and physiotherapy by ultra-sound.

**S8.P11** Recognize that waves transfer information for conversion to electrical signals by microphone.

**Light waves:**

**S8.P12** Identify the similarities and differences between light waves and waves in matter.

**S8.P13** Recognise that light waves travel through a vacuum.

**S8.P14** Know the speed of light.

**S8.P15** Demonstrate understanding of the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface.

**SPACE PHYSICS**

**S8.P16** Identify gravity force, weight = mass x gravitational field strength ( $g$ ), on Earth  $g=10$  N/kg.

**S8.P17** Recognise that gravity forces are different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only).

**S8.P18** Identify our Sun as a star, other stars in our galaxy, and other galaxies.

**S8.P19** Identify the seasons and the Earth's tilt, day length at different times of year, and in different hemispheres.

**S8.P20** Know the light year as a unit of astronomical distance.

**YCIS Learning Standards  
SCIENCE YEAR 9**

The following essential skills, knowledge, concepts, values, and enduring understandings are organized according to the **Lower Secondary Science Learning Domains**, and are interwoven throughout the **Year 9 Science Programme**.

**I. WORKING SCIENTIFICALLY**

**Students will:**

**SCIENTIFIC ATTITUDES**

**S9.W1** Demonstrate objectivity and concern for accuracy, precision, repeatability and reproducibility.

**S9.W2** Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review.

**S9.W3** Evaluate risks.

**EXPERIMENTAL SKILLS AND INVESTIGATIONS**

**S9.W5** Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience.

**S9.W5** Make predictions using scientific knowledge and understanding.

**S9.W6** Select, plan and carry out the most appropriate types of scientific enquiries to test predictions.

**S9.W7** Identify independent, dependent and control variables, where appropriate.

**S9.W8** Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety.

**S9.W9** Make and record observations and measurements using a range of methods for different investigations.

**S9.W10** Evaluate the reliability of methods and suggest possible improvements.

**S9.W11** Apply sampling techniques.

**ANALYSIS AND EVALUATION**

**S9.W12** Apply mathematical concepts and calculate results.

**S9.W13** Present observations and data using appropriate methods, including tables and graphs.

**S9.W14** Interpret observations and data by identifying patterns and using observations, measurements and data to draw conclusions.

**S9.W15** Present reasoned explanations by explaining data in relation to predictions and hypotheses.

**S9.W16** Evaluate data, showing awareness of potential sources of random and systematic error.

**S9.W17** Identify further questions arising from results.

#### **MEASUREMENT**

**S9.W18** Understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature.

**S9.W19** Use and derive simple equations and carry out appropriate calculations.

**S9.W20** Conduct basic data analysis using simple statistical techniques.

## **II. BIOLOGY**

**Students will:**

### **STRUCTURE AND FUNCTION OF LIVING ORGANISMS**

#### **Gas exchange systems:**

**S9.B1** Identify the structure and functions of the gas exchange system in humans, including adaptations to function.

**S9.B2** Demonstrate understanding of the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases.

**S9.B3** Conduct simple measurements of lung volume.

**S9.B4** Identify the impact of exercise, asthma and smoking on the human gas exchange system

**S9.B5** Know the role of leaf stomata in gas exchange in plants.

### **MATERIAL CYCLES AND ENERGY**

#### **Cellular respiration:**

**S9.B6** Demonstrate understanding of aerobic and anaerobic respiration in living organisms.

**S9.B7** Know that the breakdown of organic molecules enables all other chemical processes necessary for life.

**S9.B8** Produce a word summary for aerobic respiration

**S9.B9** Identify the process of anaerobic respiration in humans and microorganisms, to include fermentation.

**S9.B10** Produce a word summary for anaerobic respiration.

**S9.B11** Know the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism.

**INHERITANCE, CHROMOSOMES, DNA AND GENES**

**S9.B12** Demonstrate understanding of heredity as the process by which genetic information is transmitted from one generation to the next.

**S9.B13** Identify a simple model of chromosomes, genes and DNA in heredity.

**S9.B14** Identify the contributions of Watson, Crick, Wilkins and Franklin in the development of the DNA model.

**S9.B15** Identify differences between species.

**S9.B16** Identify the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation.

**S9.B17** Identify the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection.

**S9.B18** Demonstrate understanding that changes in the 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.

**S9.B19** Recognise the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

**III. CHEMISTRY**

**Students will:**

**CHEMICAL REACTIONS**

**S9.C1** Identify chemical reactions as the rearrangement of atoms.

**S9.C2** Represent chemical reactions using formulae and using equations.

**S9.C3** Demonstrate understanding of combustion, thermal decomposition, oxidation and displacement reactions.

**S9.C4** Identify reactions of acids with metals to produce a salt plus hydrogen.

**S9.C5** Identify reactions of acids with alkalis to produce a salt plus water.

**ATOMS, ELEMENTS, AND COMPOUNDS**

**S9.C6** Identify the simple (Dalton) atomic model.

**S9.C7** Know the differences between atoms, elements and compounds.

**S9.C8** Identify chemical symbols and formulae for elements and compounds.

**S9.C9** Know that the conservation of mass changes of state and chemical reactions.

**MATERIALS AND RELATIVITY SERIES**

**S9.C10** Know the order of metals and carbon in the reactivity series

**S9.C11** Identify the use of carbon in obtaining metals from metal oxides

**S9.C12** Know the properties of ceramics, polymers and composites (qualitative).

**IV. PHYSICS**

**Students will:**

**ELECTRICITY AND MAGNETISM**

**Magnetism:**

**S9.P1** Demonstrate understanding of magnetic poles, attraction and repulsion.

**S9.P2** Illustrate magnetic fields by plotting with compass, representation by field lines.

**S9.P3** Demonstrate understanding of the Earth's magnetism, compass and navigation.

**S9.P4** Know the principles of the magnetic effect of a current, electromagnets, and D.C. motors.

**Static electricity and magnetism:**

**S9.P5** Identify the separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects.

**S9.P6** Know the idea of electric field, forces acting across the space between objects not in contact.

**S9.P7** Demonstrate understanding of electric current, measured in amperes, circuits, series and parallel circuits.

**S9.P8** Understand that currents add where branches meet and current as flow of charge.

**S9.P9** Identify potential difference, measured in volts, battery and bulb ratings.

**S9.P10** Identify resistance, measured in ohms, as the ratio of potential difference (p.d.) to current.

**S9.P11** Identify differences in resistance between conducting and insulating components (quantitative).

**ENERGY**

**Calculation of fuel uses and costs in the domestic context:**

**S9.P12** Compare energy values of different foods (from labels) (kJ).

**S9.P13** Compare power ratings of appliances in watts (W, kW).

**S9.P14** Compare amounts of energy transferred (J, kJ, kW hour).

**S9.P15** Demonstrate understanding of domestic fuel bills, fuel use and costs.

**S9.P16** Identify fuels and energy resources.

**Energy changes and transfers:**

**S9.P17** Demonstrate understanding that simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged.

**S9.P18** Demonstrate understanding of heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation.

**S9.P19** Recognise that transfers of energy tend to reduce the temperature difference: use of insulators.

**S9.P20** Recognise other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels.

**Changes in systems:**

**S9.P21** Demonstrate understanding of energy as a quantity that can be quantified and calculated.

**S9.P22** Know that total energy has the same value before and after a change.

**S9.P23** Compare the starting with the final conditions of a system.

**S9.P24** Describe increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, elastic distortions and chemical compositions.

**S9.P25** Use physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.

**MOTION AND FORCES**

**Pressure in fluids:**

**S9.P26** Recognizes that atmospheric pressure decreases with increase of height, as weight of air above decreases with height.

**S9.P27** Recognizes pressure in liquids, increasing with depth; upthrust effects, floating and sinking.

**S9.P28** Recognizes that pressure is measured by ratio of force over area – acting normal to any surface.