Providence English Pvt. School
مدرسة العناية الانجليزية الخاصة

# Science (Year 9)

## Thinking and Working Scientifically

### Models and representations

9TWSm.01 Understand that models and analogies reflect current scientific evidence and understanding and can change.
9TWSm.02 Describe some important models, including analogies, and discuss their strengths and limitations.
9TWSm.03 Use symbols and formulae to represent scientific ideas.

### Scientific enquiry: purpose and planning

9TWSp.01 Suggest a testable hypothesis based on scientific understanding.
9TWSp.02 Describe examples where scientists' unexpected results from enquiries have led to improved scientific understanding.
9TWSp.03 Make predictions of likely outcomes for a scientific enquiry based on scientific knowledge and understanding.
9TWSp.04 Plan a range of investigations of different types to obtain appropriate evidence when testing hypotheses.
9TWSp.05 Make risk assessments for practical work to identify and control risks.

### Carrying out scientific enquiry

9TWSc.01 Sort, group and classify phenomena, objects, materials and organisms through testing, observation, using secondary information, and making and using keys.
9TWSc.02 Decide what equipment is required to carry out an investigation or experiment and use it appropriately.
9TWSc.03 Decide when to increase the range of observations and measurements, and increase the extent of repetition, to give sufficiently reliable data.
9TWSc.04 Take appropriately accurate and precise measurements, explaining why accuracy and precision are important.
9TWSc.05 Carry out practical work safely, supported by risk assessments where appropriate.
9TWSc.06 Make an informed decision whether to use evidence from first-hand experience or secondary sources.
9TWSc.07 Collect, record and summarise sufficient observations and measurements, in an appropriate form.

### Scientific enquiry: analysis, evaluation and conclusions

9TWSa.01 Evaluate the strength of the evidence collected and how it supports, or refutes, the prediction.
9TWSa.02 Describe trends and patterns in results, identifying any anomalous results and suggesting why results are anomalous.
9TWSa.03 Make conclusions by interpreting results, explain the limitations of the conclusions and describe how the conclusions can be further investigated.
9TWSa.04 Evaluate experiments and investigations, including those by others, and suggest improvements, explaining any proposed changes.
9TWSa.05 Present and interpret results, and predict results between the data points collected.

## Biology

### Structure and function

9Bs.01 Describe the pathway of water and mineral salts from the roots to the leaves in flowering plants, including absorption in root hair cells, transport through xylem and transpiration from the surface of leaves.
9Bs.02 Describe the structure of the human excretory (renal) system and its function (limited to kidneys filtering blood to remove urea, which is excreted in urine).
9Bs.03 Know that chromosomes contain genes, made of DNA, and that genes contribute to the determination of an organism's characteristics.

### Life processes

9Bp.01 Describe the fusion of gametes to produce a fertilised egg with a new combination of DNA.
9Bp.02 Describe the inheritance of sex in humans in terms of XX and XY chromosomes.
9Bp.03 Describe variation within a species and relate this to genetic differences between individuals.
9Bp.04 Describe the scientific theory of natural selection and how it relates to genetic changes over time.
9Bp.05 Know that plants require minerals to maintain healthy growth and life processes (limited to magnesium to make chlorophyll and nitrates to make protein).
9Bp.06 Know that photosynthesis occurs in chloroplasts and is the process by which plants make carbohydrates, using the energy from light.
9Bp.07 Know and use the summary word equation for photosynthesis (carbon dioxide + water -> glucose + oxygen, in the presence of light and chlorophyll).
9Bp.08 Discuss how fetal development is affected by the health of the mother, including the effect of diet, smoking and drugs.

### Ecosystems

9Be.01 Describe what could happen to the population of a species, including extinction, when there is an environmental change.

## Chemistry

### Materials and their structure

9Cm.01 Understand that the structure of the Periodic Table is related to the atomic structure of the elements and the Periodic Table can be used to predict an element's structure and properties.
9Cm.02 Understand that a molecule is formed when two or more atoms join together chemically, through a covalent bond.
9Cm.03 Describe a covalent bond as a bond made when a pair of electrons is shared by two atoms (limited to single bonds).
9Cm.04 Describe an ion as an atom which has gained at least one electron to be negatively charged or lost at least one electron to be positively charged.
9Cm.05 Describe an ionic bond as an attraction between a positively charged ion and a negatively charged ion.

### Properties of materials

9Cp.01 Understand that the groups within the Periodic Table have trends in physical and chemical properties, using group 1 as an example.
9Cp.02 Describe how the density of a substance relates to its mass in a defined volume.
9Cp.03 Calculate and compare densities of solids, liquids and gases.
9Cp.04 Know that elements and compounds exist in structures (simple or giant), and this influences their physical properties.

### Changes to materials

9Cc.01 Use word equations and symbol equations to describe reactions (balancing symbol equations is not required).
9Cc.02 Identify examples of displacement reactions and predict products (limited to reactions involving calcium, magnesium, zinc, iron, copper, gold and silver salts).
9Cc.03 Describe how to prepare some common salts by the reactions of metals with acids, and metal carbonates with acids, and purify them, using filtration, evaporation and crystallisation.
9Cc.04 Describe the effects of concentration, surface area and temperature on the rate of reaction, and explain them using the particle model.
9Cc.05 Understand that in chemical reactions mass and energy are conserved.

## Physics

### Forces and energy

9Pf.01 Use density to explain why objects float or sink in water.
9Pf.02 Describe the difference between heat and temperature.
9Pf.03 Know that energy is conserved, meaning it cannot be created or destroyed.
9Pf.04 Know that thermal energy will always transfer from hotter regions or objects to colder ones, and this is known as heat dissipation.
9Pf.05 Describe thermal transfer by the processes of conduction, convection and radiation.
9Pf.06 Explain cooling by evaporation.

### Light and sound

9Ps.01 Draw and interpret waveforms, and recognise the link between loudness and amplitude, pitch and frequency.
9Ps.02 Use waveforms to show how sound waves interact to reinforce or cancel each other.

### Electricity and magnetism

9Pe.01 Describe how current divides in parallel circuits.
9Pe.02 Know how to measure current and voltage in series and parallel circuits, and describe the effect of adding cells and lamps.
9Pe.03 Calculate resistance (resistance = voltage / current) and describe how resistance affects current.
9Pe.04 Use diagrams and conventional symbols to represent, make and compare circuits that include cells, switches, resistors (fixed and variable), ammeters, voltmeters, lamps and buzzers.

## Earth and Space

### Planet Earth

9ESp.01 Explain the movement of tectonic plates in terms of convection currents.
9ESp.02 Explain why the jigsaw appearance of continental coasts, location of volcanoes and earthquakes, fossil record and alignment of magnetic materials in the Earth's crust are all evidence for tectonic plates.

### Cycles on Earth

9ESc.01 Describe the carbon cycle (limited to photosynthesis, respiration, feeding, decomposition and combustion).
9ESc.02 Describe the historical and predicted future impacts of climate change, including sea level change, flooding, drought and extreme weather events.

### Earth in space

9ESs.01 Describe the consequences of asteroid collision with the Earth, including climate change and mass extinctions.
9ESs.02 Describe the evidence for the collision theory for the formation of the Moon.
9ESs.03 Know that nebulae are clouds of dust and gas, and can act as stellar nurseries.

## Science in Context

9SIC.01 Discuss how scientific knowledge is developed through collective understanding and scrutiny over time.
9SIC.02 Describe how science is applied across societies and industries, and in research.

9SIC.03 Evaluate issues which involve and/or require scientific understanding.
9SIC.04 Describe how people develop and use scientific understanding as individuals and through collaboration, e.g. through peer-review.
9SIC.05 Discuss how the uses of science can have a global environmental impact.