SCIENCES

With inquiry at the core, the MYP sciences framework aims to guide students to independently and collaboratively investigate issues through research, observation and experimentation. The MYP sciences curriculum must explore the connections between science and everyday life. As they investigate real examples of science applications, students will discover the tensions and dependencies between science and morality, ethics, culture, economics, politics, and the environment. Scientific inquiry also fosters critical and creative thinking about research and design, as well as the identification of assumptions and alternative explanations. Students should learn to appreciate and respect the ideas of others, gain good ethical-reasoning skills and further develop their sense of responsibility as members of local and global communities. Learning science involves more than simply learning technical terminology. The MYP considers all teachers to be language teachers and, thus, MYP sciences should enable students to access, use and communicate scientific knowledge correctly and confidently in oral, written and visual modes. *(MYP Sciences Guide, 2025)*

Throughout the MYP science courses students should have regular exposure to the mathematical skills developed in MYP mathematics and used by scientists. By the end of the MYP science courses, students should be able to:

The aims of MYP sciences are to encourage and enable students to:

- understand and appreciate science and its implications
- consider science as a human endeavour with benefits and limitations
- cultivate analytical, inquiring and flexible minds that pose questions, solve problems, construct explanations and judge arguments
- develop skills to design and perform investigations, evaluate evidence and reach conclusions
- build an awareness of the need to effectively collaborate and communicate
- apply language skills and knowledge in a variety of real-life contexts
- develop sensitivity towards the living and non-living environments
- reflect on learning experiences and make informed choices.

Grade Level	Sciences Themes			
	Experiment Cycle	**Life Science**	**Chemical Science**	**Physical Science**
Grade 7	• Inquire and design scientific investigations • Process and evaluate results of scientific investigation	• Food and Nutrition • Biological molecules • Relationships in the Ecosystem • Characteristics of living organisms • Organisms and their environment		• Physical quantities and measurement techniques • Mass and Force • Effects of forces • Density
Grade 8	• Inquire and design scientific investigations • Process and evaluate results of scientific investigation	• Cell Structure • Movement into and out of cells	• Atoms, elements and compounds • Atomic Structure • The Periodic Table • States of matter	• Speed and Motion • Energy, work and power • Basics of Electricity • Energy resources
Grade 9	• Inquire and design scientific investigations • Process and evaluate results of scientific investigation	• Human influences on ecosystems • Plant Biology • Plant nutrition • Transport in plants	• Chemical compounds • Ions and ionic bonds • Simple molecules and covalent bonds	• Waves (Light and Sound) • General properties of waves • Electromagnetic spectrum • Reflection of light • Refraction of light
Grade 10	• Inquire and design scientific investigations • Process and evaluate results of scientific investigation	• Human Body Systems • Evolution (life cycles, natural selection; cell division, mitosis, meiosis; reproduction; biodiversity; inheritance and variation, DNA and genetics)	• Chemical Reactions • Exothermic and endothermic reactions • Physical and chemical changes • Rate of reaction • Redox Reaction • The characteristic properties of acids and bases • Reactivity series • Corrosion and extraction of metals	• Astrophysics (the solar system, planets and satellites, the Big Bang theory) • Thermal Physics • Kinetic particle model of matter • Thermal properties and temperature • Transfer of thermal energy

Sciences KUD Articulation

Grade 7 (MYP 2)		
Know What essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?

• what science principle is
• scientific attitude
• scientific method
• the four key areas of the experimental cycle
• key terminologies:
  ○ Theory
  ○ Hypothesis
  ○ Evidence
  ○ fair test
  ○ Experiment
  ○ Conclusion
  ○ Observation
  ○ Method / Procedure
  ○ Variables (independent, dependent, controlled)
• name and use of basic laboratory equipment and devices
• work of some famous scientists and their contribution to the society
	• to make discoveries, scientists do make observations, ask questions, share ideas and data, and learn what's already been discovered
	• patterns and evidence help in analysing and interpreting data to arrive at a conclusion
	• different scientific inventions and innovations may have advantages and disadvantages which can impact us and the way we live.
		• structure information using the experimental cycle as they communicate the results of an investigation
		• collect, record (using tables and graphs), process, verify and interpret data from an experiment to draw reasonable conclusions and generalizations

• different food sources • nutrients needed in the human diet • main parts of the digestive system and alimentary canal and their function • rate world's food production and food waste	• how vitamins and minerals are beneficial to the human body • how the problems regarding food production and security, malnutrition, and world hunger are impacted by the country's economy	• test of different food samples using Benedict's solution, Iodine solution, Biuret solution, and ethanol to check their macro nutritional content (carbohydrates, proteins, and fats) • inquire and evaluate current practices and solutions used to end world hunger and to achieve food security and improved nutrition • write an essay explaining their idea of "Which nutrient is more important than the other?"
• what an ecosystem is • the biotic and abiotic factors in an ecosystem • producers, consumers, and decomposers • food chain and food web • different trophic levels • symbiotic relationships between organisms • what is the conservation status of a group of organisms • how human actions are impacting the environment • the consequences of human impacts on the environment	• the relationships between biotic and abiotic factors and between organisms in an ecosystem. • the importance of maintaining the balance within an ecosystem. • various issues and concerns regarding human impacts on the environment and its consequences.	• draw a simple food chain using the information provided to demonstrate the main trophic levels • analyze a food web using pre-existing data, labelling all trophic levels, producers, consumers, and decomposers • summarize the cause, consequence, and possible solutions to the problems related to human impacts on the environment
• physical quantities, numerical measurements, and SI units • difference between mass and weight • units of measurement for mass and weight • tools to measure mass and weight • what force is • types of force • effects of force • three Laws of Motion • the terms: stress, strain, compression, tension, bending, torsion, and shear • what sustainable infrastructure is • different types of bridge design	• weight is a type of force that is due to the effect of gravitational pull • geometric shapes affect the stability and strength (amount of force it can hold) of a structure • infrastructure development may have impacted various aspects of society	• use the formula $W = m \times g$ and $F = m \times a$ to solve familiar and unfamiliar problems related to weight • make a scale model of the bridge

Grade 8 (MYP 3)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
• speed and average speed • acceleration • deceleration is negative acceleration • speed and acceleration equations • units of measurement for speed and acceleration • distance-time graph • that the gradient (slope) of a distance-time graph is speed • speed-time graph • that the gradient (slope) of a speed-time graph is acceleration	• how movements can be measured and quantified to provide accurate descriptions • how movement can be interpreted using motion graphs • how changes in society have impacted the way humans develop their capacity to move	• use speed and acceleration equations to answer problems about motion set in familiar and unfamiliar situations • interpret the distance-time graph and speed-time graph to describe movement qualitatively and quantitatively

• cells are the smallest unit of life
• cell theory
• classification of cells as eukaryotic or prokaryotic, each having distinct properties
• different cell structures and organelles with specialized functions including
  ○ nucleus
  ○ nuclear membrane
  ○ nucleolus
  ○ centrioles
  ○ cell membrane
  ○ cell wall
  ○ chloroplast
  ○ vacuole
  ○ mitochondria
  ○ cytoplasm
  ○ golgi apparatus
  ○ endoplasmic reticulum
  ○ ribosomes
• osmosis and diffusion
• cellular respiration
	• that all living organisms are composed of cells.
	• how microscopy has contributed to our knowledge of living things.
	• plant, animal and bacteria cells have similarities and differences in terms of structure and function.
	• cells may be specialized for specific functions (for example, leaf cell, root hair cell, sperm cell, red blood cell).
	• that many organisms are unicellular (for example, bacteria, yeast, algae). In these unicellular organisms, one cell must carry out all of the basic functions of life.
	• the cell membrane regulates the flow of substances into and out of the cell.
	• the surface area of the cell limits the amount of substances that can flow into and out of the cell.
	• the transport of substances into and out of cells during diffusion and osmosis is based on a concentration gradient.
	• models help us to understand complex biological structures.
		• identify and label cell structures.
		• compare and contrast cell types
		• classify cells based on observations.
		• explain cell theory
		• analyze the role of organelles
		• demonstrate understanding of diffusion and osmosis
		• explain cellular respiration
		• model cellular structures
		• interpret microscope data
		• investigate specialized cells.
		• evaluate the impact of microscopy on biology
		• discuss surface area and cell function

• atoms, elements, molecules, and compounds • the structure of the atom as a central nucleus containing neutrons and protons, surrounded by electrons in shells • atomic number and mass number • proton number / atomic number as the number of protons in the nucleus of an atom • mass number / nucleon number as the total number of protons and neutrons in the nucleus of an atom • the electronic configuration of the first 20 elements • periodic table of elements • Group VIII noble gases have a full outer shell • the number of outer-shell electrons is equal to the group number in Groups I to VII • the number of occupied electron shells is equal to the period number • metals, non-metals, and metalloids • neutral atoms, ions, and isotopes • thermal conductor, electrical conductor, thermal insulator, electrical insulator • molecule, compound, and mixture • kinetic molecular theory • matter and its phases (states) • properties of solids, liquids and gases	• atoms can be arranged into groups that have similar properties • different element has different chemical properties • elements can join together in chemical reactions to form many different chemical compounds and these compounds can be mixed together in a variety of ways • a chemical formula is a notation using chemical symbols to describe the atoms that make up a molecule • the arrangements of the atoms and molecules determine the properties of solids, liquids, and gases • matter changes it states through that process of melting, freezing, vaporisation, condensation, and sublimation • objects floats if they are less dense than their surroundings and they sink if their density is greater	• calculate the mass of a molecule • use the periodic table of elements • interpret and use symbols for atoms • use the different physical techniques (filtration, evaporation, distillation) to separate mixtures of chemicals • use different techniques to separate mixtures • measure the mass and volume of the material and calculate its density • recognize which materials conduct electricity
• what electricity is • different circuit components • how to represent an electrical circuit using a schematic diagram • electrical quantities such as current (I), potential difference (p.d.), electromotive force (e.m.f.), voltage (V), and resistance (R)	• electricity may be obtained from chemical energy stored in fuel; water, including the energy stored in waves, in tides, and in the water behind hydroelectric dams; geothermal resources; nuclear fission; heat and light from the Sun (solar cells and panels); and wind energy. • each method of obtaining electricity from	• sketch and explain the current-voltage characteristic of an ohmic resistor and a filament lamp. • use quantitatively the proportionality between resistance and length, and the inverse proportionality between resistance and cross-sectional area of a wire. • draw and interpret circuit diagrams

Grade 8 (MYP 3)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
• Ohm's Law • electrical hazards such as damaged insulation, overheating of cables, and damp conditions	various means has advantages and disadvantages in terms of renewability, cost, reliability, scale, and environmental impact. • the current at every point in a series circuit is the same while for a parallel circuit, the current from the source is larger than the current in each branch. • the sum of the p.d.s across the components in a series circuit is equal to the total p.d. across the supply while the current from the source is the sum of the currents in the separate branches of a parallel circuit.	containing sources, switches, resistors (fixed and variable), lamps, ammeters, voltmeters and fuses(Symbols for other common circuit components will be provided in questions.) • calculate the combined resistance of two or more resistors in series • calculate the combined resistance of two resistors in parallel

Grade 9 (MYP 4)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
• formation of ions • formation of ionic bonds • properties of ionic compounds • formation of covalent bonds • giant covalent structures of graphite and diamond • properties of simple molecular compounds • formation of metallic bonds • properties of metals	• that an ionic bond is a strong electrostatic attraction between oppositely charged ions • that covalent bond is formed when a pair of electrons is shared between two atoms leading to noble gas electronic configurations • that metallic bonding as the electrostatic attraction between the positive ions in a giant metallic lattice and a 'sea' of delocalised electrons	• describe the formation of positive ions, known as cations, and negative ions, knownas anions • describe the formation of ionic bonds between elements from Group I and Group VII, including the use of dot-and-cross diagrams • describe the formation of ionic bonds between ions of metallic and non-metallic elements, including the use of dot-and-cross diagrams • use dot-and-cross diagrams to show the electronic configurations in these molecules: H_2, Cl_2, H_2O, CH_4, NH_3, HCl, CH_3OH, C_2H_4, O_2, CO_2 and N_2
• ecosystem as a unit containing the community of organisms and their environment, interacting together • biodiversity as the number of different species that live in an area • climate change, habitat destruction, hunting, overharvesting, pollution, eutrophication, and introduced species • the reasons for habitat destruction, including (a) increased area for housing, crop plant production and livestock production, (b) extraction of natural resources, (c) freshwater and marine pollution • environmental value system • key conservation organizations (e.g., WWF, IUCN) and legislation • conservation methods like protected areas, reforestation, and species rehabilitation programs • the difference between mitigation and adaptation	• the undesirable effects of deforestation as an example of habitat destruction, reducing biodiversity, extinction, loss of soil, flooding and increase of carbon dioxide in the atmosphere. • why organisms become endangered or extinct. • how endangered species can be conserved through (a) monitoring and protecting species and habitats, (b) education, (c) captive breeding programmes, and (d) seed banks • the ecological consequences of global warming • that there are international efforts and conferences to address mitigation and adaptation strategies for climate change	• **interpret** graphs showing carbon dioxide concentration • **evaluate** contrasting viewpoints on the issue of climate change • **discuss** mitigation and adaptation strategies to deal with the impacts of climate change • **evaluate** the effectiveness of international climate change talks • **analyze** case studies on habitat destruction and conservation efforts to identify successful strategies and areas for improvement • **conduct** research on local conservation projects or habitat restoration initiatives • **develop** and **propose** action plans for habitat conservation, considering factors like feasibility and community impact • **advocate** for conservation by creating awareness materials (e.g., presentations, posters, or social media campaigns)
• speed, frequency, wavelength and amplitude of a wave • compressions and rarefactions in a sound wave • the reflection of sound may produce an echo • reflection and refraction of light • the formation of an optical image by a plane mirror and its characteristics • internal and total internal reflection	• waves can be distinguished as transverse and longitudinal waves • sound is produced by vibrating sources. • the approximate range of audible frequencies for a healthy human ear is 20Hz to 20000Hz • a medium is needed to transmit sound waves. • sound travels faster in liquids than gases and faster in solids than in liquids.	• recall and use the equation $v = f \lambda$ • demonstrate understanding that waves transfer energy without transferring matter • describe and interpret an experiment to determine the speed of sound in air, including calculation • relate the loudness and pitch of sound waves to amplitude and frequency • recall and use the law: angle of incidence i

Grade 9 (MYP 4)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
• what is meant by the critical angle • the action of optical fibres particularly in medicine and communications technology • the action of a thin converging lens on a beam of light • the difference between a real image and a virtual image • the function of each part of the eye: • cornea - refracts light • iris - controls how much light enters the pupil • lens - focuses light onto the retina • retina - contains light receptors, some sensitive to light of different colours • optic nerve - carries impulses to the brain	• reflection is the bouncing back of light when it strikes a smooth surface while refraction is the bending of light rays when it travels from one medium to another. • refraction can cause optical illusions as the light waves appear to come from a different position than their actual source. • refraction is caused by a change in speed as a wave moves from one medium to another. • when light travels from one medium to another, its wavelength changes but not the frequency. • the eye captures images similar to the way the camera does and the anatomy of the camera bears many similarities to a biological eyeball, including the lens-like cornea and the film-like retina. • the development of optical fibre has been a key enabler for technology development and is used in a variety of applications such as communication and healthcare.	= angle of reflection r recognising these angles are measured to the normal • perform simple constructions, measurements and calculations for reflection by plane mirrors • interpret and describe an experimental demonstration of the refraction of light • recall and use the equation for refractive index • draw ray diagrams for the formation of a real image by a single lens • describe the nature of an image using the terms enlarged/same size /diminished and upright/ inverted
• parts of a plant • the word equation and balanced equation photosynthesis • that chlorophyll is a green pigment that is found in chloroplasts • leaf structure of a dicotyledonous plant: chloroplasts, cuticle, guard cells and stomata, upper and lower epidermis, palisade mesophyll, spongy mesophyll, air spaces, vascular bundles, xylem and phloem • that most leaves have a large surface area and are thin, and explain how these features are adaptations for photosynthesis • the functions of xylem and phloem	• chlorophyll transfers energy from light into energy in chemicals, for the synthesis of carbohydrates. • the large surface area of root hairs increases the uptake of water and mineral ions	• investigate the need for chlorophyll, light and carbon dioxide for photosynthesis • describe the effects of varying light intensity, carbon dioxide concentration and temperature on the rate of photosynthesis • outline the pathway taken by water through root, stem and leaf as: root hair cells, root cortex cells, xylem, mesophyll cells

Grade 10 (MYP 5)		
Know What other essential *knowledge information* is needed for this unit?	**Understand** What other *understanding* will students gain from learning the knowledge information of this unit?	**Do** What skills do students further need to develop in deepening the learning of the *knowledge information* and their *understanding*?
• level of organisation in the human body • 11 human body systems and their function • different parts and organs of the respiratory system, circulatory system, digestive system, nervous system, endocrine system, and reproductive system • common diseases associated with an organ system, their causes and prevention	• each organ system has its own role and function but also works interdependently with other organ systems to ensure and maintain balance in human body • a well-functioning organ system leads to a healthy body and good well-being which could impact one's physical, psychological, and social development	• design, perform, and report an investigation about the effect of a physical activity on heart and breathing rates
• Big Bang Theory • Geocentric and heliocentric theory of the universe • Astronomical units and measurements (light-years and parsec) • Star and its life cycle • Stellar parallax • The Solar System and planets • Celestial and stellar bodies • Kepler's Laws	• why the heliocentric theory was unpopular at first. • the vastness of the universe and its scale in terms of celestial bodies and systems. • how humans have observed and studied celestial patterns throughout history to gain insights into the universe. • the significance of patterns in celestial motions, such as the apparent motion of stars across the night sky. • how models and theories are developed based on the study of celestial patterns to describe the history and evolution of the universe.	• analyze and interpret celestial patterns and astronomical data • calculate relevant astronomical measurements such as the speed of light, • create simple models and diagrams illustrating the relative positions and motions of celestial bodies in our solar system using Kepler's laws, • develop a conceptual model that explains the scale and big history of the universe based on the patterns observed in celestial bodies and their systems, and • engage in discussions or presentations about the significance of celestial patterns in our understanding of the universe's history and evolution.

<table>
<tr><th colspan="3">Grade 10 (MYP 5)</th></tr>
<tr><th>Know

What other essential knowledge information is needed for this unit?</th><th>Understand

What other understanding will students gain from learning the knowledge information of this unit?</th><th>Do

What skills do students further need to develop in deepening the learning of the knowledge information and their understanding?</th></tr>
<tr><td>• changes in the state of matter in terms of kinetic particle theory, including the interpretation of heating and cooling curves
• degrees Celcius and Kelvin as units for temperature measurement
• melting and boiling in terms of energy input without a change in temperature
• the difference between boiling and evaporation
• factors affecting the rate of evaporation
• condensation and solidification
• specific heat capacity
• specific latent heat of fusion and vaporisation
• heat curves
• Gas Laws
• thermal expansion
• thermal processes of conduction, convection, and radiation</td><td>• how the kinetic molecular model of matter is used to describe the properties of solids, liquids, and gases
• the relationship between the motion of particles and temperature, including the idea that there is the lowest possible temperature (−273°C), known as absolute zero, where the particles have the least kinetic energy
• the cooling effect of evaporation
• how the pressure of a gas and the temperature of a gas, liquid or solid can be described in terms of the motion of its particles
• how the pressure of a gas can be described in terms of the motion of its molecules and their colliding with the walls creating a force
• the effect on the pressure of a gas in terms of molecules when there is
• a change of temperature at constant volume
• a change of volume at constant temperature
• that an increase in an object's temperature is related to an increase in the average kinetic energies of all the particles in the object.
• the everyday applications and consequences of thermal expansion
• the complex applications and consequences of conduction, convection and radiation</td><td>• analyse heat curves
• convert temperatures between kelvin and degrees Celsius;
• use the equation pV = constant
• use the equation $c = Q/m\Delta T$</td></tr>
<tr><td>• exothermic and endothermic reactions
• identify physical and chemical changes, and understand the differences between them
• rate of reaction
• collision theory
• reduction-oxidation reaction
• how redox reactions are used in the chemical industry with specific examples
• reactivity series of metals
• displacement method
• balancing of chemical equations</td><td>• that an exothermic reaction transfers thermal energy to the surroundings leading to an increase in the temperature of the surroundings
• that an endothermic reaction takes in thermal energy from the surroundings leading to a decrease in the temperature of the surroundings
• an overview of the chemical industry, its key processes, technologies, and products.
• the concept of fairness in the context of chemical resource utilization</td><td>• explain the effect on the rate of reaction of:
  ○ (a) changing the concentration of solutions
  ○ (b) changing the pressure of gases
  ○ (c) changing the surface area of solids
  ○ (d) changing the temperature
  ○ (e) adding or removing a catalyst using collision theory
• interpret data, including graphs, from rate of reaction experiments
• analyze the impact of globalization on the chemical industry, from production to consumption of chemical resources.</td></tr>
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