MARINA INTERNATIONAL SCHOOL

SCIENCE SCHEME OF WORK

FORM 3 - TERM 1

WEEK	TOPIC	TOPIC DETAILS
1.1	FORCES AND MOTION	• Explain that pressure is caused by the action of a force on an area. • Determine the densities of solids, liquids, and gases.
2.1	FORCES AND MOTION	• Explain pressures in gases and liquids (quantitative only).
3.1	FORCES AND MOTION	• Know that forces can cause objects to turn on a pivot. • Understand the principle of moments.
4.1	ELECTRICITY	• Describe electrostatics. • Describe the concept of charge, including digital sensors
5.1	ELECRICITY	• Interpret and draw simple series and parallel circuits. • Differentiate between series and parallel circuits. • Do simple calculations on parallel circuits.
6.1	ELECTRICITY	• Model and explain how common types of components, including cells (batteries), affect currents.
7.1	ELECTRICITY	• Explain how current divides in parallel circuits.
8.1	ELECTRICITY	• Measure current using ammeters and voltage using voltmeters, including digital meters.
9.1	ENERGY	• Use knowledge of energy sources including fossil fuels and renewable energy sources to consider the world's energy needs, including research from secondary sources.

WEEK	TOPIC	TOPIC DETAILS
10.1	ENERGY	• Identify and explain the thermal (heat) energy transfer processes of # conduction #convection #radiation
11.1	ENERGY	• Explain cooling by evaporation

SCIENCE SCHEME OF WORK

FORM 3 - TERM 2

WEEK	TOPIC	TOPIC DETAILS
1.1	MATERIAL PROPERTIES	Describe the structure of an atom and learn about the methods and discoveries of Rutherford ●Compare the structures of the first twenty elements of the periodic table ●Compare trends in groups and periods ●Talk about the contribution of scientists
2.1	MATERIAL CHANGES	Explore and explain the idea of endothermic and exothermic reactions
3.1	MATERIAL CHANGES	Describe the reactivity of metals with oxygen, water and dilute acids
4.1	MATERIAL CHANGES	Explain how to prepare some salts by reaction of metals and metal carbonates, and be able to write word equations for these reactions
5.1	MATERIAL CHANGES	●Explain the effects of concentration, particle size, temperature and catalysts on the rate of a reaction
6.1	PLANTS	Define and describe photosynthesis •Use the word equation of photosynthesis •explain the importance and deficiency of nitrates and magnesium in plants
6.2	PLANTS	Understand the importance of water to plant growth for: # support # transport # cooling # photosynthesis
7.1	PLANTS	Understand sexual reproduction in flowering plants # pollination # fertilization and seed formation # seed and fruit dispersal

WEEK	TOPIC	TOPIC DETAILS
8.1	LIVING THINGS IN THEIR ENVIRONMENT	Explain the adaptations of the following plants: # spruce trees in the arctic # strangles figs in a rainforest # weeds in a crop # adaptations for living things in water
9.1	LIVING THINGS IN THEIR ENVIRONMENT	• Explain the adaptations of the following animals: # Arabian Oryx in the desert # Sealions in the sea # Earthworms in the soil # Behavioural adaptations of wood lice
10.1	LIVING THINGS IN THEIR ENVIRONMENT	• Explain food chains, food web and energy flow • Explain the role of decomposers in food chains
11.1	LIVING THINGS IN THEIR ENVIRONMENT	Describe factors that can affect the size of population, such as # food # predators #disease •Describe and investigate some effects of human influences on the environment •Explain the effects of destruction of the following habitats: #Wetlands # Rainforests #Coral reefs
11.2	LIVING THINGS IN THEIR ENVIRONMENT	•Protecting the environment # preserving wetlands # Preserving the ozone layer # Reducing carbon dioxide emissions
12.1	VARIATION AND CLASSIFICATION	•Use and construct keys to identify plants and animals •Understand that organisms inherit characteristics from their parents through genetic material that is carried in cell nuclei
12.2	VARIATION AND CLASSIFICATION	•Understand that organisms inherit characteristics from their parents through genetic material that is carried in cell nuclei • Discuss the work of Charles Darwin in developing the scientific theory of natural selection

SCIENCE SCHEME OF WORK

FORM 3 - TERM 3

WEEK	TOPIC	TOPIC DETAILS
1.1	CHEMISTRY-THE PARTICULATE NATURE OF MATTER	1. State the distinguishing properties of solids, liquids and gases 2. Describe the structure of solids, liquids and gases in terms of particle separation, arrangement and types of motion 3. Describe changes of state in terms of melting, boiling, evaporation, freezing, condensation and sublimation 4. Explain changes of state in terms of the kinetic theory 5. Describe qualitatively the pressure and temperature of a gas in terms of the motion of its particles
1.2	BIOLOGY-Characteristics of living organisms	•• Define the terms: – movement as an action by an organism or part of an organism causing a change of position or place – respiration as the chemical reactions in cells that break down nutrient molecules and release energy for metabolism – sensitivity as the ability to detect or sense stimuli in the internal or external environment and to make appropriate responses – growth as a permanent increase in size and dry mass by an increase in cell number or cell size or both – excretion as removal from organisms of the waste products of metabolism (chemical reactions in cells including respiration), toxic materials, and substances in excess of requirements – nutrition as taking in of materials for energy, growth and development; plants require light, carbon dioxide, water and ions; animals need organic compounds and ions and usually need water
1.3	PHYSICS-Measurement	☐ Use and describe the use of rules and measuring cylinders to find a length or a volume. ☐ Use and describe the use of clocks and devices, both analogue and digital, for measuring an interval of time. ☐ Obtain an average value for a small distance and for a short interval of time by measuring multiples (including the period of a pendulum). ☐ Understand that a micrometer screw gauge is used to measure very small distances.

WEEK	TOPIC	TOPIC DETAILS
1.4	COMBINED SCIENCE- Characteristics of living organisms	☐ Describe the characteristics of living organisms by defining the terms: • Movement as an action by an organism causing a change of position or place. • respiration as the chemical reactions in cells that break down nutrient molecules and release energy • sensitivity as the ability to detect and respond to changes in the environment • growth as a permanent increase in size • reproduction as the processes that make more of the same kind of organism • excretion as removal from organisms of toxic materials and substances in excess of requirements • nutrition as taking in of materials for energy, growth and development
2.1	CHEMISTRY -THE PARTICULATE NATURE OF MATTER continue	6. Describe and explain Brownian motion in terms of random molecular bombardment 7. State evidence for Brownian motion 8. Show an understanding of the random motion of particles in a suspension (sometimes known as Brownian motion) as evidence for the kinetic particle (atoms, molecules or ions) model of matter 9. Describe and explain diffusion 10. Describe and explain dependence of rate of diffusion on molecular mass
2.2	BIOLOGY- Concept and use of a classification system	•• Explain that classification systems aim to reflect evolutionary relationships •• Explain that classification is traditionally based on studies of morphology and anatomy •• Explain that the sequences of bases in DNA and of amino acids in proteins are used as a more accurate means of classification •• Explain that organisms which share a more recent ancestor (are more closely related) have base sequences in DNA that are more similar than those that share only a distant ancestor
2.3	PHYSICS-Scalers and vectors	☐ Understand that vectors have a magnitude and direction ☐ Demonstrate an understanding of the difference between scalars and vectors and give common examples ☐ Determine graphically the resultant of two vectors

WEEK	TOPIC	TOPIC DETAILS
2.4	COMBINED SCIENCE-Cells and Cell structure	☐ State that living organisms are made of cells ☐ Describe and compare the structure of a plant cell with an animal cell, as seen under a light microscope, limited to cell wall, nucleus, cytoplasm, chloroplasts, vacuoles and location of the cell membrane ☐ State the functions of the structures seen under the light microscope in the plant cell and in the animal cell ☐ Relate the structure of the following(specialized cells) to their functions: –– ciliated cells – movement of mucus in the trachea and bronchi –– root hair cells – absorption –– palisade mesophyll cells – photosynthesis –– red blood cells – transport of oxygen –– sperm and egg cells – reproduction ☐ Calculate magnification and size of biological specimens using millimetres as units
3.1	CHEMISTRY-Measurement & Criteria of purity	1. Name appropriate apparatus for the measurement of time, temperature, mass and volume, including burettes, pipettes and measuring cylinders 2. Demonstrate knowledge and understanding of paper chromatography 3. Interpret simple chromatograms 4. Identify substances and assess their purity from melting point and boiling point information 5. Understand the importance of purity in substances in everyday life, e.g. foodstuffs and drugs 6. Interpret simple chromatograms, including the use of Rf values 7. Outline how chromatography techniques can be applied to colourless substances by exposing chromatograms to substances called locating agents. (Knowledge of specific locating agents is not required.)
3.2	BIOLOGY- Features of organisms - Dichotomous keys	•• List the features in the cells of all living organisms, limited to ribosomes for protein synthesis and enzymes involved in respiration •• List the main features used to place all organisms into one of the five kingdoms: Animal, Plant, Fungus, Prokaryote, Protoctist •• List the main features used to place organisms into groups within the plant kingdom, limited to ferns and flowering plants (dicotyledons and monocotyledons) •• List the features of viruses, limited to protein coat and genetic material •• Construct and use simple dichotomous keys based on easily identifiable features

WEEK	TOPIC	TOPIC DETAILS
3.3	PHYSICS-Mass and wight	☐ Show familiarity with the idea of the mass of a body ☐ State that weight is a gravitational force ☐ Distinguish between mass and weight ☐ Recall and use the equation W = mg ☐ Demonstrate understanding that weights (and hence masses) may be compared using a balance. ☐ Demonstrate an understanding that mass is a property that 'resists' change in motion. ☐ Describe, and use the concept of, weight as the effect of a gravitational field on a mass.
3.4	COMBINED SCIENCE-The particulate nature of matter, Experimental techniques, measurement & Method of purification	1. State the distinguishing properties of solids, liquids and gases 2. Describe the structure of solids, liquids and gases in terms of particle separation, arrangement and types of motion 3. Describe the changes of state in terms of melting, boiling, freezing,evaporation, and condensation 4. Explain changes of state in terms of particle theory and the energy changes involved 5. Describe qualitatively the pressure and temperature of a gas in terms of the motion of its particles 6. Name and suggest appropriate apparatus for the measurement of time, temperature, mass and volume, including burettes, pipettes and measuring cylinders 7. Criteria of purity 8. Interpret simple chromatograms 9. Interpret simple chromatograms, including the use of Rf values 10. Describe and explain methods of separation and purification by the use of a suitable solvent, filtration, crystallisation, distillation, fractional distillation and paper chromatography 11. Suggest suitable separation and purification techniques, given information about the substances involved
4.1	CHEMISTRY-Methods of purification	1. Describe and explain methods of purification by the use of a suitable solvent, filtration, crystallisation and distillation (including use of a fractionating column). (Refer to the fractional distillation of petroleum in section 14.2 and products of fermentation in section 14.6.) 2. Suggest suitable purification techniques, given information about the substances involved

WEEK	TOPIC	TOPIC DETAILS
4.2	BIOLOGY- Cell structure and organisation	•• Describe and compare the structure of a plant cell with an animal cell, as seen under a light microscope, limited to cell wall, nucleus, cytoplasm, chloroplasts, vacuoles and location of the cell membrane •• State the functions of the structures seen under the light microscope in the plant cell and in the animal cell •• State that the cytoplasm of all cells contains structures, limited to ribosomes on rough endoplasmic reticulum and vesicles •• State that almost all cells, except prokaryotes, have mitochondria and rough endoplasmic reticulum •• Identify mitochondria and rough endoplasmic reticulum in diagrams and images of cells •• State that aerobic respiration occurs in mitochondria •• State that cells with high rates of metabolism require large numbers of mitochondria to provide sufficient energy
4.3	PHYSICS-Energy	☐ Identify changes in kinetic, gravitational potential, chemical, elastic (strain), nuclear and internal energy that have occurred as a result of an event or process ☐ Recognise that energy is transferred during events and processes, including examples of transfer by forces (mechanical working), by electrical currents (electrical working), by heating and by waves ☐ Apply the principle of conservation of energy to simple examples ☐ Recall and use the expressions kinetic energy = ½mv 2 and change in gravitational potential energy = mgΔh ☐ Apply the principle of conservation of energy to examples involving multiple stages ☐ Explain that in any event or process the energy tends to become more spread out among the ☐ objects and surroundings (dissipated

WEEK	TOPIC	TOPIC DETAILS
4.4	COMBINED SCIENCE- Motion & Mass and weight	Use and describe the use of rules and measuring cylinders to find a length or a volume Use and describe the use of clocks and devices, both analogue and digital, for measuring an interval of time Obtain an average value for a small distance and for a short interval of time by measuring multiples (including the period of a pendulum) Define speed and calculate average speed from =(total distance)/(total time) Plot and interpret a speed-time graph and a distance-time graph Recognise from the shape of a speed-time graph when a body is: –– at rest –– moving with constant speed –– moving with changing speed Calculate the area under a speed-time graph to work out the distance travelled for motion with constant acceleration Calculate acceleration from the gradient of a speed-time graph Recognise linear motion for which the acceleration is constant and calculate the acceleration Recognise motion for which the acceleration is not constant Demonstrate understanding that acceleration and deceleration are related to changing speed including qualitative analysis of the gradient of a speed-time graph 1. Distinguish between mass and weight 2. Know that the Earth is the source of a gravitational field 3. Describe, and use the concept of, weight as the effect of a gravitational field on a mass 4. Recognise that g is the gravitational force on unit mass and is measured in N / kg 5. Recall and use the equation W = mg
5.1	CHEMISTRY-ATOM, MOLECULES AND IONS	1. State the relative charges and approximate relative masses of protons, neutrons and electrons 2. Define proton number (atomic number) as the number of protons in the nucleus of an atom 3. Define nucleon number (mass number) as the total number of protons and neutrons in the nucleus of an atom 4. Use proton number and the simple structure of atoms to explain the basis of the Periodic Table with special reference to the elements of proton number 1 to 20 5. Define isotopes as atoms of the same element which have the same proton number but a different nucleon number 6. State the two types of isotopes as being radioactive and non radioactive 7. Understand that isotopes have the same properties because they have the same number of electrons in their outer shell 8. State one medical and one industrial use of radioactive isotopes

WEEK	TOPIC	TOPIC DETAILS
5.2	BIOLOGY-Levels of organization - Size of specimens	•• Relate the structure of the following to their functions: – ciliated cells – movement of mucus in the trachea and bronchi – root hair cells – absorption – xylem vessels – conduction and support – palisade mesophyll cells – photosynthesis – nerve cells – conduction of impulses – red blood cells – transport of oxygen – sperm and egg cells – reproduction •• Define tissue as a group of cells with similar structures, working together to perform a shared function •• Define organ as a structure made up of a group of tissues, working together to perform specific functions •• Define organ system as a group of organs with related functions, working together to perform body functions •• State examples of tissues, organs and organ systems from sections 6 to 16 •• Identify the different levels of organisation in drawings, diagrams and images of familiar material •• Calculate magnification and size of biological specimens using millimetres and micrometres as units
5.3	PHYSICS-Energy resources	☐ Describe how electricity or other useful forms of energy may be obtained from: ☐ Chemical energy stored in fuel water, including the energy stored in waves, in tides, and in water behind hydroelectric dams ☐ Geothermal resources ☐ Nuclear fission heat and light from the Sun (solar cells and panels) ☐ wind ☐ Give advantages and disadvantages of each method in terms of renewability, cost, reliability, scale and environmental impact ☐ Show a qualitative understanding of efficiency ☐ Understand that the Sun is the source of energy for all our energy resources except geothermal, nuclear and tidal ☐ Show an understanding that energy is released by nuclear fusion in the Sun ☐ Recall and use the equations: efficiency = useful energy output energy input × 100% efficiency = useful power output ☐ power input × 100%

WEEK	TOPIC	TOPIC DETAILS
5.4	COMBINED SCIENCE- Movement in and out of cells	1. Define diffusion as the net movement of particles from a region of their higher concentration to a region of their lower concentration down a concentration gradient, as a result of their random movement 2. State that substances move into and out of cells by diffusion through the cell membrane 3. State that water diffuses through partially permeable membranes by osmosis 4. Define osmosis as the net movement of water molecules from a region of higher water potential (dilute solution) to a region of lower water potential (concentrated solution), through a partially permeable membrane 5. State that water moves in and out of cells by osmosis through the cell membrane 6. Investigate and describe the effects on plant tissues of immersing them in solutions of different concentrations
6.1	CHEMISTRY-MOLECULES, IONS AND ELECTRON ARRANGEMENT	1. Describe the formation of ions by electron loss or gain 2. State that cations are positive and anions are negative 3. Give examples of polyatomic and monoatomic ion 4. Define molecule 5. Explain what polyatomic and diatomic molecules are given examples 6. Describe the build-up of electrons in 'shells' and understand the significance of the noble gas electronic structures and of the outer shell electrons. (The ideas of the distribution of electrons in s and p orbitals and in d block elements are not required.) 7. Define element, compound and mixtures 8. Describe the differences between elements, mixtures and compounds, and between metals and non-metals 9. Describe an alloy, such as brass, as a mixture of a metal with other elements
6.2	BIOLOGY- Movement in and out of cells - Diffusion	•• Define diffusion as the net movement of particles from a region of their higher concentration to a region of their lower concentration down a concentration gradient, as a result of their random movement •• Describe the importance of diffusion of gases and solutes •• State that substances move into and out of cells by diffusion through the cell membrane •• State that the energy for diffusion comes from the kinetic energy of random movement of molecules and ions •• Investigate the factors that influence diffusion, limited to surface area, temperature, concentration gradients and distance

WEEK	TOPIC	TOPIC DETAILS
6.3	PHYSICS-Work and Power	☐ Demonstrate understanding that work done = energy transferred ☐ Relate (without calculation) work done to the magnitude of a force and the distance moved in the direction of the force ☐ Recall and use W = Fd = ΔE ☐ Relate (without calculation) power to work done and time taken, using appropriate examples ☐ Recall and use the equation P = ΔE / t in simple ☐ systems
6.4	COMBINED SCIENCE-Atoms, elements, compounds, Physical and chemical changes	1. Demonstrate understanding of the terms atom, molecule and ion 2. Identify physical and chemical changes, and understand the differences between them 3. Describe the differences between elements, mixtures and compounds, and between metals and non-metals 4. Define the terms solvent, solute, solution and Concentration 5. Describe the structure of an atom in terms of a central nucleus, containing protons and neutrons, and 'shells' of electrons 6. Describe the build-up of electrons in 'shells' and understand the significance of the noble gas electronic structures and of the outer shell electrons (The ideas of the distribution of electrons in s and p orbitals and in d block elements are not required) 7. State the charges and approximate relative masses of protons, neutrons and electrons 8. Define and use proton number (atomic number) as the number of protons in the nucleus of an atom 9. Define and use nucleon number (mass number) as the total number of protons and neutrons in the nucleus of an atom Use proton number and the simple structure of atoms to explain the basis of the Periodic Table, with special reference to the elements of proton numbers 1 to 20