Course Overviews MYP Science, UWC Thailand 2020-2021

All units taught in grades 6 to 10 are continuously being developed and improved to best meet the needs of the students at UWCT. Therefore, the following overview is only a reflection of current plans for the course. Some changes to these course overviews may occur as a result of planning done throughout the academic year.

Grade	Unit Number and Title	Key and Related Concepts	Global Context	Statement of Inquiry	Inquiry Questions	Approaches To learning skills taught / learnt / developed in this unit	Content (topics / knowledge/ subject specific skills)
6	Unit 1: What do Scientists do?	Relationships Evidence	Identities and relationships	To be a scientist means to gather evidence about similarity and difference in nature to understand how things are related.	**Factual**: How do Scientists behave? How is a laboratory different? What is an experiment? **Conceptual:** How do scientists use evidence? What kinds of relationships can be investigated? **Debatable:** Can Science tell us everything we need to know?	Research (information literacy). Thinking (critical thinking).	- identify similarities and differences between a science laboratory and other MYP classrooms - suggest and follow laboratory safety rules - identify famous scientists - describe what a scientist is - identify and suggest dependent, independent, and controlled variables - outline the scientific method - design an experiment based on a research question of their own choosing, prompted by classroom observations.
6	Unit 2: What Changes? (Chemistry)	Change Form, Transformation	Fairness and development	Science enables us to change the form of matter into useful materials that can make the world a better place.	**Factual**: What are the 3 states (forms) of matter? What are the changes of state called? **Conceptual:** How do particles change as they are transformed between the 3 states (forms) of matter and separated from each other? **Debatable:** What are the implications of using the lifestraw to transform matter, with reference to fair or equal access to water?	Communication (communication skills) Self management (organisation skills) *Under review*	- Students will identify and outline the 3 states of matter, namely solids, liquids and gases including inter-particle forces, particle arrangement and particle motion. - Students will state the properties of solids liquids and gases and outline how this relates to particles. - Students will identify and describe changes of state including what happens to inter-particle forces, particle arrangement and particle motion. - Students will outline what a mixture is. - Students will outline what a solution is. - Students will define key words associated with solutions: solvent, solute, dissolve, saturated, soluble and insoluble - Students will describe different ways in which mixtures can be separated and carry out separations - Students will differentiate between melting and dissolving. - Students will design and make a water filter - Students will investigate a factor affecting the effectiveness of water filters made in class, and analyse and evaluate the results - state whether current global access to clean drinking water is fair or equal - discuss whether the lifestraw is a successful solution to the problem of widening the availability of clean drinking water.
6	Unit 3 How do living things work? (Biology)	Relationships Form Function	Fairness and development	By understanding the relationship between the necessities of life and the specialized form and function of living things, we can develop processes that can enhance fairness.	**Factual:** What are the characteristics of living things? What are living things made of? What are the specialized forms and functions of cells? How do organ transplants work? **Conceptual:** How can form enhance function? How can we use our understanding of needs, forms, and functions of living things to make ethical decisions and actions? **Debatable:** Are viruses alive?	Thinking skills: transfer Research: information literacy	Students will: - outline the structure of a cell, including the function of organelles - view cells under a microscope and describe this process - compare plant cells and animal cells - outline the characteristics of living things (MRS GREN) - outline how the form of specialised cells is adapted to their function. - state the relationship between cells, tissues, organs and systems - students will outline photosynthesis and why it is needed for life - students will outline respiration and why it is needed for life - students will outline the 5 kingdoms - consider whether viruses and yeast are alive or not
6	Unit 4 What makes change happen (Physics)	Change Energy	Globalisation and Sustainability	Through controlling energy we can make changes happen that have an impact on the sustainability of our lives.	**Factual:** What types of energy are there? How can energy be changed? **Conceptual:** What does sustainability mean? Why is energy never created or destroyed? What's the difference between an energy transfer and an energy transformation? **Debatable:** What would be the best future energy source for Phuket?	Communication Critical thinking Research	Students will: Identify the different types of energy and give examples. Outline simple energy transfers and transformations and give examples. Investigate simple energy changes. Outline conduction, convection, radiation and insulation State how insulation is used to make sustainable homes Investigating how controlling the heat energy transfer through insulation can impact the sustainability of our buildings. Define fuels Define the terms renewable and nonrenewable Outline how energy is transferred from the sun to different renewable and nonrenewable energy sources (fossil fuels, wind, water, geothermal and biomass) Outline the energy transfers that occur when when we use the different energy sources ((fossil fuels, wind, water, geothermal, biomass and nuclear) Analyse efficiency using Sankey diagrams

							Outline advantages and disadvantages of different energy sources, include suitability for different areas Consider the meaning of the term 'sustainability' in relation to different UN sustainability goals (not just the context of environmentalism) Analyse and evaluate the best future energy source for Phuket
6	Unit 5: How can we study the living world?	Systems Balance Interaction	Scientific and Technical Innovation (models)	Scientists have developed models and tools to understand and maintain the interactions that keep ecosystems in balance.	**Factual:** What are ecosystems and how can they be studied? **Conceptual:** What do scientists do to understand ecosystems and what makes them healthy? How do scientific innovations and daily decisions help keep ecosystems healthy? **Debatable:**To what extent can we and should we rely on scientific innovations to manipulate ecosystems for human gain?	Communication (organise and depict information logically). Social (collaborating with others)	Students will: - Define: ecosystem, habitat, population, biodiversity, innovation, quadrat, transect, ecologist, mesocosm, species -outline different types of habitats/biomes and some adaptations of the plants and animals that live there - Recall what plants and animals need to survive and different ways in which they compete for these resources - outline and investigate different methods for how we study and model the living world (including transects, quadrats, magpots) - use a scientific model (quadrat transect) to investigate how the distribution of grass changes as you move further from a tree and explain this in terms of the interactions between organisms in a system. - describe interactions between organisms in an ecosystem using food chains and food webs to model this - describe the interdependence of organisms in an ecosystem (and how changing number of predators or prey affects this balance), including use of an online modelling tool - interpret and use the scientific model of graphing to show interdependence in an ecosystem - analyse the case of the cats in Borneo by drawing a food web and population graph - evaluate this innovation (the use of cats in Borneo) - describe factors that make an ecosystem balanced - identify factors making an ecosystem unbalanced. Example: invasive species, eutrophication, acid rain, overfishing/hunting, flooding, presence of different pollutants - Research and evaluate an innovation aimed at managing balance in an ecosystem

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7	Unit 1: Body Systems	Systems Related concepts: Form Function	*identities and relationships*	. Physical health is dependent upon the form and functions of different body systems.	**Factual:** What are the structures and functions of our digestive, circulatory and respiratory systems? **Conceptual:** How does the form of our small intestine, heart and alveoli help to make their functions more efficient? What is the relationship between different body systems? **Debatable:** Which is the most important body system for health?	Communication (communication skills) Use a variety of organizers for academic writing tasks Research (information literacy skills) Access information to be informed and inform others	- Students will describe the structure and function of the digestive system - Students will describe the role of enzymes in aiding the function of the digestive system, including the importance of the specific form of enzymes. - Students will outline the role and structure of carbohydrates, fat and protein - Students will describe how the form of the small intestine, is adapted to its function. -- Students will describe the structure and function of the respiratory system, including gas exchange and breathing - Students will describe how the form of the small intestine is adapted to its function. - Students will describe the structure and function of the circulatory system, including the heart, double loop, vessels and red blood cells - Students will outline how the form of the heart is adapted to its function. - Students will identify how the form of the heart can increase the chance of heart attack and cardiac arrest - Students will describe the process of a heart attack and cardiac arrest - Students will explain how the major body systems and their functions interact to support respiration (digestive, respiratory, circulatory) - Students will discuss which body system is the most important for health - Students will investigate and describe the impact of exercise on heart rate - Students will collect (in PE), organize, transform and present data on how exercise changes their heart rate - Students will interpret their data on how exercise affects their heart rate and describe results using correct scientific reasoning about the form and function of the circulatory - Students will discuss the validity of their hypothesis based on the outcome of their scientific investigation into how exercise affects heart rate - students will discuss the validity of the method based on the outcome of a scientific investigation into how exercise affects heart rate - students will describe improvements or extensions to the method that would benefit their scientific investigation into how exercise affects heart rate.

							- Students will use the knowledge gained in their heart rate and exercise investigation to suggest how exercise impacts the long to medium term form and function of their heart to help prevent heart disease. - Students will be able to use flow charts, mind maps and t-charts to communicate or plan information.
7	Unit 2: Electricity and Magnetism -Physics	Relationships Energy	*scientific and technical innovation*	The relationship between electrical energy and magnetism has led to useful inventions.	**Factual**: What is electricity? What is a magnetic field? **Conceptual**: What is the relationship between electricity and magnetism? How does energy move through a circuit? **Debatable**: To what extent are hydroelectric dams a good thing?	Research Thinking	- Students will describe the effects of a magnet and define a magnetic field - Students will recall the difference between insulating and conducting materials with examples. - Students will state that electrical current is a flow of charged particles, measured in amperes - Students will state that electrical voltage is the difference in the potential energy of electrons between 2 points in a circuit, measured in volts. - Students will describe how static electricity forms from the transfer of electrons - Students will state that “electrical energy” may mean energy stored in a battery or energy transmitted by electric currents. -Students will recall that electric, and magnetic forces between a pair of objects do not require that the objects be in contact. -Students will outline the differences between a parallel and series circuit. -Students will suggest how to wire a model of a house using parallel and series circuits. - Students will describe electromagnetism and design an investigation into the factors which affect it (criterion B) - Students will describe how energy is generated by a turbine and dynamo - Students will distinguish between renewable and non-renewable energy sources used to drive a turbine - Students will evaluate the use of hydroelectric dams (criterion D)
7	Unit 3: Urban Plant Growing - Environmental	Systems Balance Interactions	*globalization and sustainability*	Interactions between factors can help to create balance in ecosystems through the context of urban plant growing schemes.	**Factual:** What benefits do plants provide in an ecosystem? What do plants need to survive? What is the plant life cycle? **Conceptual:** What is the interaction between photosynthesis and respiration? How do the different stages in the plant life cycle help to create balance in the ecosystem? **Debatable:**Are urban plant growing schemes effective way of balancing the ecosystem?	Self management Communication	- Students will be able to outline the process of photosynthesis. - Students will be able to outline the process of respiration - Students will be able to outline how respiration and photosynthesis interact to create balance in our ecosystem (in oxygen/ carbon dioxide levels) - Students will be able to outline how respiration and photosynthesis interact to enable plant growth - Students will be able to outline how the leaf is adapted for photosynthesis - Students will identify what is needed for plant growth - Students will describe how limiting factors interact to affect plant growth - Students will design an investigation into a factor affecting the growth of a plant grown from food scraps in the context of growing food or decoration for an urban restaurant. - Students will identify the different stages of the plant life cycle (including pollination, fertilisation, seed dispersal, germination, and photosynthesis) and how interactions between factors or organisms at each stage help create balance in our ecosystem (what benefits do the plants provide for animals and/or the animals provide for plants at each stage? e.g. food, habitat, and carbon dioxide removal) - Students consider urban plant growing schemes in the context of them being sustainable solutions to some problems cause by globalisation (transport, global warming, reduced biodiversity) - Students will build a window farm and then be given a series of questions asking them to recall, state, outline or describe the scientific knowledge, apply this knowledge to familiar and unfamiliar problems, and analyse data related to their project.
7	Unit 4: Using Atoms for Change (Chemistry)	Change Consequences Form	Globalization and sustainability	Changing the form of atoms and molecules has consequences for our environment.	**Factual:** What is the structure of the atom? What are compounds? **Conceptual**: How do we release energy by changing the form of atoms? How does changing the form of atoms create new products? **Debatable:** Are the consequences of splitting atoms a blessing or a curse for our planet?	**Self management** (affective skills - keep a journal to record reflections) **Communication skills** Critical Thinking (TBD)	Content - Students will state what atoms are - Students will outline the history of the atom - Students will describe the structure (form) of the atom - Students will outline what elements are - Students will recall the names and symbols of key elements - Students will describe the parts of an atom using Bohr's model -Students will state thow the form of a nucleus is changed through nuclear fissure and the consequent release in energy - Students will discuss the consequences of nuclear power. - Students will discuss whether the use of nuclear power is justified (Criterion D) In the context of the combustion of hydrocarbon fuels: - Students will describe ‘combustion’, ‘fuel’ and the fire triangle -Students will recall major types and uses of hydrocarbon-fuels - Students will outline what fossil fuels are mostly made of (their form) and what a hydrocarbon is - Students will define ‘molecule’ and interpret molecular formula - Students will define the terms ‘reactants’ and ‘products’ and outline the relationship between them - Students will recall the molecular formula of water, carbon dioxide, carbon monoxide, oxygen and methane - Students will write word equations for the complete and incomplete combustion of alkanes and consider how their form is changed in this process - Students will write (unbalanced) symbol equations for the combustion of alkanes to demonstrate how their form changes in this process - Students will be able to explain why combustion of hydrocarbons causes their form to be changed to carbon dioxide or monoxide - Students will investigate how the oxygen supply given to a flame affects the energy given out via combustion and consider the impacts of clean burning for the environment (Criterion C)

							- Extension: students will balance simple equations Skills - Students will describe scientific pheomoen and process (the form of an atom or compound and how this form is changed during nuclear fission or combustion) -Students will evaluate the use of nuclear power stations. -Students will draw results tables and graphs pertaining to how the form of compounds is changed during combustion. They will use scientific conventions for this. -Students will analyse and interpret results tables and graphs pertaining to how the form of compounds is changed during combustion -Students will evaluate the validity of the method used to obtain the combustion data. -Students will use scientific equipment safely and appropriately.
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8	Unit 1. Disease and Epidemics	Change Patterns Interaction	Orientation in Space and Time	Interactions between different epidemiological factors change patterns in the frequency and distribution of diseases in space and time.	**Factual:** What ways can diseases spread? What factors can change (reduce, increase) the spread of disease? **Conceptual:** How do epidemiological factors (both at the microbial and environmental level, such as medicines, vaccines, living conditions) work to change (increase or reduce) the spread of disease? **Debatable:** To what extent has a treatment for a disease been successful in controlling its spread? You must look at patterns in the spread of the disease over time (maps and/or graphs) and consider how interactions between different epidemiological factors may affect these patterns.	**Self-management** (organisation skills - planning assignments and meeting deadlines). **Thinking Skills** (critical thinking - consider ideas from multiple perspectives)	- Students will identify and outline the features of the main types of pathogen (bacteria, viruses, protoctista, and fungi) -Students will give examples of diseases caused by each pathogen - Students will outline how bacteria, viruses, Protoctista, fungi and tapeworm can cause infectious disease. - Students will outline how infectious diseases are spread at the micro-level (direct contact, waterborne, foodborne, bodily fluids, animal-borne etc) - Students will suggest ways to prevent the spread of diseases at the micro-level - Students will describe the role of the immune system in the human body in defence against disease (to include the 1st, 2nd, and 3rd lines of defence) - Students will outline the use of vaccines - Students will outline the use of antibiotics, antifungal, antiseptics, anti-malarial and antiviral drugs in the prevention and treatment of disease - Students will identify what 'discuss' means (thinking skills) - Students will identify various time management strategies (self-management skills) - Students will recall, state, outline, and describe scientific knowledge relating to pathogens, the immune system, ways in which diseases spread, and epidemiological factors (such as medicines, vaccines, living conditions) can change the spread of disease - Students will analyse and interpret maps and data of infectious diseases, using scientific knowledge - students will describe the ways in which science is applied and used to address a specific problem or issue (HIV, then a disease of choice) - Students will use scientific language to describe the immune system, ways in which diseases spread, and epidemiological factors (such as medicines, vaccines, living conditions) can change the spread of disease (HIV, then a disease of choice). - Students will **describe** the distribution of a disease of choice, how a form of treatment or prevention works to solve problems associated with the disease (i.e. control its spread), and **discuss** whether it has been successful at stopping the spread of disease with reference to a UN sustainability goal.
8	Unit 2. Chemical Change	Change Interaction Form	Identities and Relationships	The identities of substances change because the reactions they have with other substances changes their form.	**Factual**: What are signs of a chemical change? What are examples of acids, bases and neutralisations? **Conceptual**:How do we neutralise acids or bases by changing the form of compounds? How do new products form in a chemical change vis the interaction of reactants? How do we represent this change through word and symbol equations? **Debatable:** Is the method you used to investigate change the form of the base via neutralisation valid?	**Self management** **Communication skills**	- Students will state what atoms, elements, and compounds are - Students will describe what happens in a chemical change. - Students will define the terms ‘reactants’ and ‘products’ and outline the relationship between them - Students will name simple compounds made when a metal bonds with a non-metal - Students will interpret chemical formula (how many atoms of each element are present) - Students will outline the principle of the conservation of mass - Students will write balanced symbol equations (formula given) - Students will state examples of acids and bases - Students will outline the pH scale. - Students will describe neutralisation reactions. - Students will use a biuret to deduce which acid is the most concentrated. - Students will predict the products of neutralisation reactions, given reactants (and vice versa) - Students will write word equations for neutralisation reactions - Students will write symbol equations for neutralisation reactions (formula given) - Students will plan, carry out, analyse and evaluate an investigation into a factor affecting a neutralisation reaction (criterion B and C).
8	Unit 3. Human impact on the	Relationships	Globalization and sustainability	The relationship between globalization and its	**Factual:** What are the consequences of global human action on water and the environment (state them)?	Communication	*Water*

	atmosphere and water.	Related concepts: Consequences and Environment		consequences on water and the atmosphere in our local and global environments	**Conceptual:** How and why does global human action affect atmospheric and water quality? How the activities relate to the consequences they bring? **Debatable:** Could an innovation of your choosing be successful in reducing the consequences of globalisation on our oceans (eg overfishing, plastic pollution, ocean acidification) ?	Self-mangement	- Students will describe various indicators of water quality (nitrate, phosphate, pH, dissolved oxygen, biochemical oxygen demand, temperature, turbidity) and how these can be used to assess human impact on the environment - Students deduce the relationship between human activities and their consequences by interpreting data about water quality indicators and maps - Students will collect and analyse data on how the water quality of a local stream changes as it moves through a more populated area and deduce the relationship between human activities and their consequences -Students will describe the relationship between global warming on process of ocean acidification and its effect on the coral environment -Students will describe the impact of rising sea water temperatures due to global warming and their impact on coral (coral bleaching) -Students will describe the environmental consequences of overuse of fertilizers developed to meet increasing global food demand on lakes and streams (eutrophication) *Atmosphere* - Students will describe the historical formation and function of the atmosphere. - Students will describe the relationship between the combustion of fossil fuels and deforestation on levels of CO_2 in the atmosphere. - Students will state how their different activities and lifestyle choices can be directly or indirectly linked to greenhouse gas production or deforestation, including choices around transport, diet, and electricity use. - Students will describe how CO_2 and other greenhouse gases cause teh consequence of global warming. - Students will identify causes of ozone depletion which are related to globalisation. - Students will describe the ozone cycle and how CFCs disrupt this, leading to the consequences of ozone depletion. - Students will be able to differentiate between global warming and ozone depletion. - Students will describe the consequences of ozone depletion and global warming. - Students will analyse data pertaining to ozone depletion and global warming.
8	Unit 4: Waves	Systems Movement and Energy	Scientific and Technical Innovation	Innovative systems harness wave energy and movement to create sounds and communication.	**Factual:** What models help to undertand energy transfer through waves? **Conceptual:** How can the properties of sound waves help to understand pitch, loudness, and speed of the waves? **Debatable:** From a mindful perspective, are smartphones harmful?	Research Thinking	*General wave properties* - Students will use a describe a simple model to represent energy transfer through waves (transverse and longitudinal) - Students will describe a wave using wavelength, frequency, amplitude, period, and speed - Students will calculate wave speed, frequency, and wavelength using $v = f \times \lambda$, including interpreting graphs. *Sound* - Students will describe how sound transfers energy as a wave of compressions created by objects vibrating -Students will describe how sound intensity in dB relates to energy transfer -Students will describe how pitch relates to the frequency of sound waves -Students will describe how loudness relates to the amplitude of sound waves - Student will interpret representations of sound waves on an oscilloscope to explain and quantify loudness and pitch -Students will explain how sound waves from musical instruments are caused by vibration and standing waves - Students will explain how to adjust the pitch of a string instrument with reference to string density, wavelength, and tension -Students will explain using ideas about sound waves, why different musical instruments sound different even when playing the same notes - Students will build a musical instrument and describe how it functions. *Phones* -Students will describe the electromagnetic spectrum - Students will investigate and describe the concepts of reflection, refraction and diffraction (including ray diagrams) -Students will describe how mobile phone use EM waves to send and receive signals -Students will describe factors that affect mobile phone signal (including 3/4G and wifi), including the concepts of diffraction and line of sight. -Students will evaluate the impacts of smartphone use on mental well being.

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9	Unit 1: Population Dynamics	System Pattern Evidence	orientation in space and time	Evidence shows patterns in the frequency or variability of a system over time.	**Factual:** What is a system? **Factual:** With the evidence collected, which statistical test should be used? **Conceptual:** How can the understanding of patterns in populations, help conservationists to protect species?	Communication Research	- Students will interpret data using measures of central tendency (mean, median, mode, range) - Students will apply various sampling techniques to collect data on population size - Students will explain how sample size impacts the sampling techniques - students will solve for central tendencies - Students will solve for standard deviation - Students will apply various statistical tests support their conclusions (t-test, chi-squared)

					Debatable: Can results be effectively analyzed without statistical analysis to show variability or patterns?		- Students will describe carrying capacity, and sigmoid growth curves - Students will describe factors that affect population size (predation, birth rate, death rate, disease) as well as the independent and dependent Factors - Graphing
9	2. Rates of Reaction	Change Interaction and Energy	Globalization and Sustainability	Changing the rate of a reaction through manipulating molecular interactions and/or available energy, benefits manufacturing processes.	**Factual:** What are catalysts and how do they speed up reactions by decreasing activation energy? **Conceptual:** How can the change in temperature, concentration, pressure, etc... affect the rate of reactions? **Conceptual:** How do bonds that elements create allow for particular reactions through the interactions of electrons? **Debatable:** Is speed of reaction always the best indicator for industrial progress?	Critical thinking skills Communication skills Research Skills: Information Literacy	- Students will suggest practical methods for determining the rate of a given reaction - Students will interpret rate of reaction graphs - Students will be able to recall that the molar concentration of a solution is determined by the amount of solute (in moles) and the volume of solution (in dm^3) - Students will describe the effect of changes in temperature, concentration, pressure, and surface area on rate of reaction - Students will explain the effects of changes in temperature, concentration and pressure in terms of frequency and energy of collision between particles - Students will explain the effects of changes in the size of the pieces of a reacting solid in terms of surface area to volume ratio - Students will suggest - Students will describe the characteristics of catalysts and their effect on rates of reaction - Students will describe the role of catalysts in reactions - Students will explain catalytic action in terms of activation energy, including energy diagrams - Students will recall that enzymes act as catalysts in biological systems. - Effect of changes of rate graphs - reward (exam type qs) - Students will be able to identify how many atoms of each type of element are present in a molecule. - Students will be able to calculate relative molecular mass - Students will describe the mole concept. - Students will be able to use the equations n=M/m, - Students will apply principles of stoichiometry to calculate reacting masses, concentrations, and volumes. Before lab: - Students will be able to determine the appropriate number of decimal places to read equipment to. - Students will quantify the uncertainty of particular measurements (absolute and percentage). - Students will be able to draw error bars based on the measurement uncertainty and/or max-min value. - **Extension**: Students will be able to propagate measurement uncertainties.
9	Unit 3: Reproductive Health and Homeostasis	Change Models Function	Identities and Relationships	**Models** help to **identify** how various relationships can **change function**s and result in **transitions** in the body.	**Factual:** How do the hormones in the menstrual cycle fluctuate to drive the female reproductive system? **Conceptual:** How can students make better informed choices from learning about their own biology? **Debatable:**Should research/change focus on the reason or the result?	Social: Collaboration skill Communication	- Students will recall the structure and function of the male and female reproductive systems - Students will explain physical and emotional changes during puberty - Students will explain the menstrual cycle including hormones - Students will explain how to become pregnant and discuss some artificial techniques used to help this process - Students will discuss various methods of birth control methods - Students will describe common STI's and how to prevent them - Students will discuss at least one current issue related to reproductive health (women's rights, access to prenatal care, gender bias, etc) - Students will define homeostasis and give examples relating to reproductive system Students will understand homeostatic mechanism for controlling body temperature and blood sugar (including hormones) and water balance -Osmosis diffusion - mitosis review - Meiosis
9	Unit 4: Circuits (Automated House Circuits)	Change Interaction Function	Scientific and Technical Innovation	Innovations in circuit functions have changed our interactions with our surroundings.	**Factual:** How do circuits function? **Conceptual:** How do changes in circuits affect measurement? **Debatable:** How will human interaction with circuits change as technology develops?	Creative thinking skills	Students will explain and algebraically manipulate the equation V=IR to describe electrical circuits - I can describe what the equation R=V/I defines regarding electrical circuits - I know what R stands for when discussing electrical circuits - I can describe what the equation I=V/R defines regarding electrical circuits - I know what I stands for when discussing electrical circuits - I can describe what the equation V=IR defines regarding electrical circuits - I know what V stands for when discussing electrical circuits Students will solve for V, I, and R in a circuit - I can use algebra to solve for a missing part of the equation if I have two of the three parts of the equation Students will explain what electrical current is, and how we measure it (including units) - I can describe what electrical current is - I can explain how electrical current works and factors that affect it - I can describe how we measure electrical current, including the proper tools

							- I can state the unit used to measure electrical current Students will explain what potential difference is, and how we measure it (including units) - I can describe what potential difference is - I can explain how potential difference works and factors that affect it - I can describe how we measure potential difference, including the proper tools - I can state the unit used to measure potential difference Students will explain what electrical resistance is, and how we measure it (including units) - I can describe what electrical resistance is - I can explain how electrical resistance works and factors that affect it - I can describe how we measure electrical resistance, including the proper tools - I can state the unit used to measure electrical resistance Students will present circuit diagrams including switches, power source, and resistors - I can outline the symbols used to represent the parts of a circuit in a circuit diagram (power cell, wire, resistor, switches, lights, etc) - I can outline a circuit by drawing a proper circuit diagram (not a picture) - I can explain a circuit by drawing a proper circuit diagram and labelling the appropriate resistances, currents, and potential differences at each component Students will solve for the amount of power transferred in any circuit device - I can define power - I can solve for the amount of power transferred in circuit device Students will apply their knowledge of circuits to create Arduino circuits - I can describe what an Arduino is - I can outline possible inputs for an Arduino - I can outline possible outputs for an Arduino - I can calculate the appropriate current needed for a given resistance in order to know how to wire an Arduino circuit - I can load the appropriate code onto an Arduino - I can create a working prototype of a circuit using a breadboard - I can explain my design using a circuit diagram and appropriate calculations
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10	1: Genetics	Change Form and Function	Identities and Relationships	Changes in DNA may alter the form and function of who we are.	**Factual:** Who were the scientists that have contributed to the modern understanding of DNA and to the ability to manipulate genes to create a change in phenotype? **Conceptual:** How does the structure and form of DNA allow the DNA to function as a template for replication RNA transcription? **Conceptual:** How can Punnett Squares help us determine the possible offspring genotypes and phenotypes? **Debatable:** Is the change of genes via genetic modification beneficial to feed a growing human population or are they a disaster waiting in happen?	Communication Social: Collaboration Thinking: Critical	Students will describe DNA as a polymer made up of two strands forming a double helix - Students will state that DNA is made from four types of nucleotides; each nucleotide consists of a common sugar and phosphate group with one of four different bases attached to the sugar - Students will describe the genome as the entire DNA of an organism - Students will explain that the genome interacts extensively with the environment to influence the development of the phenotype - Students will explain the following terms: chromosome, gene, variant, dominant, recessive, homozygous, heterozygous, genotype and phenotype - Students will discuss the potential importance for medicine of our increasing understanding of the human genome. - Students will recognise how the genome influences the development of an organism, to include a simple treatment of protein synthesis - Students will explain monogenic inheritance - Students will suggest the results of monogenic crosses - Students will state that most phenotypic features are the result of multifactorial rather than monogenic inheritance - Students will describe the work of Mendel in discovering the basis of genetics and recognise the difficulties of understanding inheritance before the mechanism was discovered. - Students will describe that most genetic variants have no effect on the phenotype, some variants contribute to the phenotype and, rarely, a single variant will control an aspect of the phenotype - Students will describe the impact of selective breeding on food plants and domesticated animals - Students will describe the main stages of the process of genetic engineering - Students will explain some of the possible benefits of using genetic engineering in modern agriculture and medicine - Students will discuss some of the practical and ethical issues of using genetic engineering in modern agriculture and medicine.some of the practical and ethical issues of using genetic engineering in modern agriculture and medicine.
10	2. Rates of Reaction	Change Interaction and Energy	Globalization and Sustainability	Changing the rate of a reaction through manipulating molecular interactions and/or available energy, benefits manufacturing processes.	**Factual:** What are catalysts and how do they speed up reactions by decreasing activation energy? **Conceptual:** How can the change in temperature, concentration, pressure, etc... affect the rate of reactions? **Conceptual:** How do bonds that elements create allow for particular reactions through the interactions of electrons?	Critical thinking skills Communication skills Research Skills: Information Literacy	- Students will suggest practical methods for determining the rate of a given reaction - Students will interpret rate of reaction graphs - Students will be able to recall that the molar concentration of a solution is determined by the amount of solute (in moles) and the volume of solution (in dm^3) - Students will describe the effect of changes in temperature, concentration, pressure, and surface area on rate of reaction - Students will explain the effects of changes in temperature, concentration and pressure in terms of frequency and energy of collision between particles - Students will explain the effects of changes in the size of the pieces of a reacting solid in terms of surface area to volume ratio - Students will suggest

					Debatable: Is speed of reaction always the best indicator for industrial progress?		- Students will describe the characteristics of catalysts and their effect on rates of reaction - Students will describe the role of catalysts in reactions - Students will explain catalytic action in terms of activation energy, including energy diagrams - Students will recall that enzymes act as catalysts in biological systems. - Effect of changes of rate graphs - reward (exam type qs) - Students will be able to identify how many atoms of each type of element are present in a molecule. - Students will be able to calculate relative molecular mass - Students will describe the mole concept. - Students will be able to use the equations n=M/m, - Students will apply principles of stoichiometry to calculate reacting masses, concentrations, and volumes. Before lab: - Students will be able to determine the appropriate number of decimal places to read equipment to. - Students will quantify the uncertainty of particular measurements (absolute and percentage). - Students will be able to draw error bars based on the measurement uncertainty and/or max-min value. - **Extension**: Students will be able to propagate measurement uncertainties.
10	3. Flight	Systems Balance and Movement	Scientific and Technical Innovation	We will inquire into how various flight systems have innovated to allow flight through balance and movement.	**Factual:** How can the understanding of Newton's laws of motion and Bernoulli's principle help us to understand how objects can fly? **Conceptual:** How do four forces (Thrust, Friction, Gravity, Lift) allow for a perfect balance to an airplane flying at a constant velocity. **Debatable:** Can the future of air travel be sustained without the continued use of fossil fuels?	Transfer skills Creative Thinking	-Students will state the basic quantities of gravity, gravitational force, gravitational field strength and weight, and know the units for each of these -Students will describe resultant force in relation to weight, the contact force of the ground, and the buoyancy force exerted by fluids. -Students will describe density and its relationship to mass, volume and buoyancy. -Students will describe the concept of pressure -Students will state the units for density and pressure. -Students will apply the variation of pressure with depth to calculate the resultant buoyancy force. -Students will apply Archimedes principle and the formula B = gV to solve problems involving buoyancy and apply this formula to find whether an object will float or fly -Students will apply the above to lighter-than-air craft including hot air, hydrogen and helium balloons and airships. -Students will state the terms aerostat and aerodyne for lighter-than-air and heavier-than-air flying craft respectively. -Students will describe Bernoulli's principle qualitatively and apply it to heavier-than-air craft such as aeroplanes, helicopters and gliders. Include both propeller driven planes as well as jet planes. -Students will explain why helicopter blades cause the craft to rotate, and how this can be counteracted. -Students will explain how an aerosol provides lift in terms of both Newton's third law and Bernoulli's principle. -Students will explain Newton's third law as the principle behind rocket propulsion. -Students will explain the law of conservation of linear momentum as a way of expressing Newton's third law. Apply this to calculating the speed attained by rockets. -Students will suggest an investigation for the efficiency of design for a rotor or turbine made from one or more aerofoils. -Students will suggest an investigation of the factors that affect the rate of falling on a rotating helicopter blade. -Students will summarize the effect of long haul flights on the increase of greenhouse gases and global warming. - Students will understand the concepts of work and energy and how they relate to each other and to forces.
10	4. Environmental Sustainability	Systems Consequences and Interactions	Globalization and Sustainability	Interactions with systems can have unexpected consequences if we don't make sustainable decisions.	**Factual:**What are the Sustainable Development Goals? **Conceptual:** How can a model be created with stores, flows, inputs, and outputs? **Conceptual:** What are the pros and cons of using models to determine the impacts of sustainability? **Debatable:** Can systemic structures change patterns of behavior?	Critical Thinking Skills Transfer Skills	- Students will learn how to use the compass method to analyze results of sustainable models. - Students will explain how more sustainable practices can keep systems away from the Tragedy of the Commons. - Students will determine whether ignorance is a solvable problem. - Students will evaluate whether technology can help to manage sustainable development. - Students will discuss whether the current human culture represents the pinnacle of human achievement.