Grade 6 Sciences

Units of Study

UNIT 1:	Particles and Mixtures	Start: September	Duration: 8 Weeks

- **Concepts:** Change: Change of state, chromatography, mixtures, solubility, solutions, distillation, evaporation, condensation, sublimation, expansion, diffusion, air pressure, form, suspensions, disparity and equity, colloids, moving particle theory.
- **Subject Specific Skills**: Designing of scientific investigations, writing and illustrating scientific explanations, drawing tables to compare solids, liquids, and gases, researching solutions to condensation problems, critical thinking and designing scientific investigations, considering carefully the range of measurements needed in a scientific method.
- **Learning Experiences**: Students will develop their understanding of the different properties of solids, liquids, and gases and will use the particle model to dissolve and separate mixtures within the context of obtaining and accessing safe drinking water and basic sanitation worldwide. They will separate colors using chromatography.

UNIT 2:	Cells and Classification	Start: November	Duration: 7 Weeks

- **Concepts:** Systems: Cells as systems, form, and function of cells, classification systems to sort and classify the natural world into kingdoms, species, multicellular, unicellular organisms, evidence for classification.
- **Subject Specific Skills**: Communicating scientific discoveries that led to the classification of the natural world through a presentation technique of student choice, using microscopes to observe different samples containing cells, researching specialized cells and reporting on how the structure of each type relates to its function.
- **Learning Experiences**: Students will collect leaves to construct keys to classify them, create acrostic devices to learn the seven levels of classification, investigate the structure of cells and using microscopes to observe and draw them, prepare an onion skin slide and compare cells to other systems.

UNIT 3:	Mangroves and Ecosystems	Start: February	Duration: 8 Weeks

- **Concepts:** Systems, predator-prey relationships, interactions, environment, adaptations, food webs, biodiversity, ecosystems, food chains, sustainability, mangroves, organisms.
- **Subject Specific Skills**: Making connections between scientific research on endangered animals and related moral, ethical, social, economic, political, cultural or environmental factors; critical thinking and understanding of the importance of predictions in a scientific investigation.
- **Learning Experiences**: Students will investigate bird beak adaptations in mangroves and will take a field trip to the mangroves in KAUST. They will inquire into feeding relationships by constructing and analyzing food webs. They will create a proposal to release endangered rhinoceroses to their natural habitat.

UNIT 4:	Forces and Motion	Start: March	Duration: 10 Weeks

- **Concepts:** Relationships, movement, evidence, balance, friction, safety, contact forces, non-contact forces, mass, weight, gravitational forces, speed, air resistance, buoyancy force, equilibrium.
- **Subject Specific Skills**: critical thinking and considering evidence carefully, reflectively analyzing and evaluating the evidence before making conclusions, communicating and considering how best to present data from experiments.
- **Learning Experiences**: Students will explore different types of forces and will draw force diagrams to show balanced and unbalanced forces acting on different objects. They will also investigate into the difference between mass and weight and the effect of friction into our lives, the use, and design of safety helmets, the effect of increasing the height of a ramp on the speed of a moving object.

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Unit 1: Particles and Mixtures

Start: September **Duration:** 9 Weeks

LEARNING EXPERIENCES:
In this unit, students will be introduced to the concept of matter being made up of particles. They will develop their understanding of the different properties of solids, liquids, and gases. They will also use the particle model to dissolve and separate mixtures while applying the scientific method. Students will also research purification methods of obtaining and accessing safe drinking water and basic sanitation worldwide. They will also learn about expansion, diffusion, filtration, and distillation through various lab experiments. Students will separate colors using the technique of chromatography.

KEY CONCEPT: Change	**Related Concepts / Subject Specific:** Movement, Form, Equity

STATEMENT OF INQUIRY:	The separation of mixtures based on the form of particles in solids, liquids, and gases can be applied to the process of making water safe to drink.

INQUIRY QUESTIONS:	
Factual:	What are the characteristics of solids, liquids, and gases? What causes air pressure? What are the different separation techniques?
Conceptual:	How do we explain the idea of expansion? How do we distinguish the difference in phases at a particle level? How can separation techniques make water safe to drink?
Debatable:	What is the best method for obtaining safe drinking water?

OBJECTIVES AND ASSESSMENT CRITERIA:		
A:	**Knowing and Understanding**	Outline scientific knowledge, apply it to solve problems set in familiar and unfamiliar situations, and interpret information to make scientifically supported judgments.
B:	**Inquiring and Designing**	Outline a problem to be tested by a scientific investigation and outline a testable prediction and manipulate variables. Finally, design an investigation.
C:	**Processing and Evaluating**	Present, transform and interpret data and outline the results using scientific reasoning. Discuss the validity of the prediction and method used and describe improvements or extensions to the method.
D:	**Reflecting on the Impacts of Science**	Describe the ways in which science is applied and used to address a specific problem or issue. Discuss and analyze the various implications of the science solution and its application in solving the problem. Apply scientific language effectively. Document the work and the sources of information used.

ATLs:	Communication (Using a variety of media to express ideas), Critical thinking.

RESOURCES / LITERATURE OPTIONS:

- Science 1 and 2 for the International Student Textbooks; Exploring Science: Working Scientifically Year 7; Explore Learning Gizmos and Simulations (online source); Adaptive Curriculum (online source).

SUMMATIVE ASSESSMENT TASKS:

1. End of Unit Test Criterion A
2. Research: Students will research a method of water purification and find out how the method works for that source of water. They will present the findings on a poster that aims to make the school community better informed. Criterion D
3. Students will investigate a factor that affects the time taken for a substance to settle out of a suspension and will write a lab report about it. Criterion B, C

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Unit 2: Cells and Classification

Start: November **Duration:** 5 Weeks

LEARNING EXPERIENCES:
In this unit, students will learn about the laws of the natural world that determine the classification of organisms into six kingdoms based on patterns found in their form. They will also investigate the structure of plant and animal cells and will use microscopes to observe and draw plants and animal cells, as well as to prepare an onion skin slide and a cheek cell slide. Students will then analyze how cells represent systems with parts that depend on one another. They will compare the function of each cell part to a similar component in different systems such as a school or a factory. Students will also investigate the factors that affect how quickly yeast causes bread to rise.

KEY CONCEPT: Systems	**Related Concepts / Subject Specific:** Evidence, function, form, structure.

STATEMENT OF INQUIRY:	Scientists have classified the world around us through gathering evidence, and their recent research into the form and function of cells is leading to exciting though controversial, developments in medicine.

INQUIRY QUESTIONS:	
Factual:	What is living and nonliving? What are the six kingdoms? What is inside a cell? What do cells need to survive?
Conceptual:	How do we group different organisms? How do cells differ in form? How does the form of a cell relate to its function?
Debatable:	Should all people who die automatically have their organs made available for transplantation?

OBJECTIVES AND ASSESSMENT CRITERIA:		
A:	**Knowing and Understanding**	Outline scientific knowledge and apply it to solve problems set in familiar and unfamiliar situations. Interpret information to make scientifically supported judgments.
B:	**Inquiring and Designing**	Outline a problem and a testable prediction for the problem using scientific reasoning. Then outline how to manipulate the variables and how data will be collected. Finally, design an investigation.
C:	**Processing and Evaluating**	Present, transform and interpret the collected data to outline the results using scientific reasoning. Discuss the validity of the prediction and method used and describe improvements or extensions to the method.
D:	**Reflecting on the Impacts of Science**	Describe the ways in which science is applied and used to address a specific problem or issue. Discuss and analyze the various implications of the science solution and its application in solving the problem. Apply scientific language effectively. Document the work and the sources of information used.

ATLs:	Thinking: Critical thinking by discussing the importance of fair testing in scientific experimentation.

RESOURCES / LITERATURE OPTIONS:

- Science 1 and 2 for the International Student Textbooks; Exploring Science: Working Scientifically Year 7; Explore Learning Gizmos and Simulations (online source); Adaptive Curriculum (online source).

SUMMATIVE ASSESSMENT TASKS:

End of Unit Test Criterion A.

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Unit 3: Mangroves and Ecosystems

Start: February **Duration:** 8 Weeks

LEARNING EXPERIENCES:
Students will learn about how plants and animals adapt in habitats and will investigate which bird beaks would be best suited for birds living in a mangrove swamp. They will explore feeding relationships by constructing and analyzing food webs and by using a simulation to study a predator-prey relationship. Students will research major threats to mangrove ecosystems and will take a field trip to the mangroves in KAUST to observe birds and the biodiversity of life in them. The unit will conclude in research and a debate on reintroducing the endangered rhinoceros to its natural sub-Saharan habitat.

KEY CONCEPT: Systems	**Related Concepts / Subject Specific:** Environment, Interactions.
STATEMENT OF INQUIRY:	Organisms and the physical environment interact to form sustainable ecosystems; the impact of humans is threatening many of these systems.
INQUIRY QUESTIONS:	
Factual:	What is an ecosystem? What are adaptations? What is a food chain?
Conceptual:	How does energy move through a system? How have organisms adapted to better suit their environment? How are endangered organisms reintroduced into their natural habitat?
Debatable:	To what extent have human interactions with ecosystems damaged environments? To what extent will a loss of biodiversity affect humans?
OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Knowing and Understanding	Outline scientific knowledge and apply it to solve problems set in familiar and unfamiliar situations. Interpret information to make scientifically supported judgments.
B: Inquiring and Designing	Outline a problem to be tested by a scientific investigation and outline a testable prediction for the problem using scientific reasoning. Then outline how to manipulate the variables and how data will be collected. Finally, design an investigation.
C: Processing and Evaluating	Present, transform and interpret the collected data and outline the results using scientific reasoning. Then discuss the validity of the prediction and method used and describe improvements or extensions to the method.
D: Reflecting on the Impacts of Science	Describe the ways in which science is applied and used to address a specific problem or issue. Discuss and analyze the various implications of the science solution and its application in solving the problem. Apply scientific language effectively. Document the work and the sources of information used.
ATLs:	Research: Information literacy - selecting information from a range of sources; Critical thinking: understanding the importance of predictions/hypotheses in scientific investigations.

RESOURCES / LITERATURE OPTIONS:

- Science 1 and 2 for the International Student Textbooks; Exploring Science: Working Scientifically Year 7; Explore Learning Gizmos and Simulations (online source); Adaptive Curriculum (online source).

SUMMATIVE ASSESSMENT TASKS:

1. Test Criterion A.
2. Criterion D Research: Students will research endangered animals and how Science and Technology contributes to solving the problem.

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Unit 4: Forces and Motion

Start: March **Duration:** 10 Weeks

LEARNING EXPERIENCES: Students will explore different types of forces and will draw force diagrams to show balanced and unbalanced forces acting on different objects. They will also investigate the difference between mass and weight and the effect of friction in our lives. Students will also learn how to calculate speed and will investigate the effect of increasing the height of a ramp on the speed of a moving object as it reaches the end of the ramp. Other investigations in this unit will include friction between different surfaces and how shape affects resistance.

KEY CONCEPT: Relationships	**Related Concepts / Subject Specific:** Movement, evidence, balance.
STATEMENT OF INQUIRY:	Understanding forces and how they affect the movement of objects can improve safety in sports and the quality our lives.
INQUIRY QUESTIONS:	
Factual:	What types of forces exist? What effect does friction have on our lives? How is speed calculated?
Conceptual:	How do balanced and unbalanced forces relate to the movement of objects? How is knowledge of forces used when designing safety equipment for sports or our daily lives?
Debatable:	Why is friction a good thing and a bad thing for motion when motion occurs? Should safety gear be compulsory when playing contact sports?
OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Knowing and Understanding	Outline scientific knowledge and apply it to solve problems set in familiar and unfamiliar situations. Interpret information to make scientifically supported judgments.
B: Inquiring and Designing	Outline a problem to be tested by a scientific investigation and outline a testable prediction for the problem using scientific reasoning. Then outline how to manipulate the variables and how data will be collected. Finally, design an investigation.
C: Processing and Evaluating	Present, transform and interpret the collected data to outline the results using scientific reasoning. Then discuss the validity of the prediction and method used and describe improvements or extensions to the method.
D: Reflecting on the Impacts of Science	Describe the ways in which science is applied and used to address a specific problem or issue. Discuss and analyze the various implications of the science solution and its application in solving the problem. Apply scientific language effectively. Document the work and the sources of information used.
ATLs:	Social skills in practicing giving feedback on the design of experimental methods; research skills.

RESOURCES / LITERATURE OPTIONS:

- Science 1 and 2 for the International Student Textbooks
- Exploring Science: Working Scientifically Year 7
- Explore Learning Gizmos and Simulations (online source)
- Adaptive Curriculum (online source)

SUMMATIVE ASSESSMENT TASKS:

1. Criterion A Test.
2. Criterion B and C Lab on the effect of increasing the height of a ramp on the speed of a moving object down the ramp.