Grade 10 Sciences

Units of Study

UNIT 1:	Measurements and Evaluation of the Environment	**Start:** Aug/Dec	**Duration:** 7 Weeks

- **Concepts:** Global interaction, environment and systems- transformation of materials within an ecosystem; consequences - the result of poor use and misuse of resources
- **Subject Specific Skills**: Students will measure and evaluate units of environmental monitoring. They will learn how to convert between units of measurement.
- **Learning Experiences**: Students will explore the components that are measurable within an environment. They will be able to collect some of these values at KAUST using Vernier probes.

UNIT 2:	Bonding and Fuels	**Start:** Oct/Feb	**Duration:** 7 Weeks

- **Concepts:** Form - the form taken by compounds; Interaction - how matter interacts; Patterns - grouping chemicals by bonding.
- **Subject Specific Skills**: Students will research how theories develop and the background of fuels. They will design an experiment to gather data, and analysing and evaluating this data will lead to a conclusion. Applying math to problems, as a key component, will be done either working individually or collaborating in small groups.
- **Learning Experiences**: Students will research and present their findings on models of atoms. They will gather data for their investigation into fuels and also devise tests that can distinguish the bonding in a substance.

UNIT 3:	Systems and Evolution	**Start:** Oct/Feb	**Duration:** 7 Weeks

- **Concepts:** Systems - human physiological systems; interactions - how these systems work together.
- **Subject Specific Skills**: Students will investigate different systems. They will learn how to do academic research, design an experiment, and be able to describe and evaluate their results. They will be able to explain their scientific knowledge in a unit test.
- **Learning Experiences**: Students will use microscopes to look at plant pores (stomata) and fish gills. They will conduct an experiment about effects on the nervous system.

UNIT 4:	Waves and Electromagnetism	**Start:** Aug/Dec	**Duration:** 7 Weeks

- **Concepts:** Consequences - action and reaction in practice; Models - how they can be used to explain complex phenomena; Transformation - between different forms of energy.
- **Subject Specific Skills**: Students will develop the skills of making connections and representing abstract concepts, such as fields, in visual forms. They will need to use clear communication, in class debates and opinion pieces, to support fellow students in their learning.
- **Learning Experiences**: Students will actively investigate wave properties and interactions with mirrors and lenses. They will also research tsunamis, how waves and energy relate to them, and communicate their findings. They may model wave behaviour using springs or simulations in order to link these to the physical world.

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Unit 1: Measurements and Evaluations of the Environment

Start: August/December **Duration:** 7 Weeks

Learning Experiences: In this unit**,** we will explore the cycles important in environments - such as carbon, nitrogen and water cycles. Students will research the efficiency of energy sources. We will examine components of the atmosphere and will use 'environmental monitoring' as a way for students to learn what kinds of measurements are made to ensure a healthy environment. For example, they might research how many ppm of NO_2 is permissible in an area, and how this legal level varies in different countries. We will look at how measurements are made in this field, and will become familiar with conversions between units.

KEY CONCEPT: Global Interaction	**Related Concepts / Subject Specific:** Systems, Consequences, Environment.

STATEMENT OF INQUIRY:	Understanding how data is collected allows us to make more informed decisions.

INQUIRY QUESTIONS:	
Factual:	What is dimensional analysis? What are the parameters for a 'healthy' environment?
Conceptual:	How many big is my carbon footprint when driving to Jeddah? How many H_2O molecules are created by a KAUST air conditioning unit per hour?
Debatable:	When is the presentation of data misleading and causes confusion?

OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Knowing and Understanding	The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.
B: Inquiring and Designing	The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis/prediction for an experiment, and can explain what will be changed in an experiment and how they will collect the data appropriately.
C: Processing and Evaluating	The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.
D: Reflecting on the impacts of Science	Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others that they have used.

ATLs:	Self management; Research; Thinking.

RESOURCES:

- Worksheets put on Classroom and Managebac.

SUMMATIVE ASSESSMENT TASKS:

1. End of unit test. (Criterion A)
2. Essay about technology that is designed to improve water security (Criterion D).

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Unit 2: Bonding and Fuels

Start: October/February **Duration:** 7 Weeks

LEARNING EXPERIENCES: Students will develop their understanding of atomic structure and what differentiates elements, and even atoms of the same element. This will extend to researching how atoms can combine to form compounds and how this affects the properties of the compounds formed. They will also look at what fuels are and how they fit into the bigger picture locally and globally. The concept of the mole will be introduced, with some simple calculations. They will produce an opinion piece on "To what extent does mankind need to find alternatives to hydrocarbon fuels?"

KEY CONCEPT: Development	**Related Concepts / Subject Specific:** Form, Interaction, Patterns.

STATEMENT OF INQUIRY:	People explore solutions in response to changing energy needs.

INQUIRY QUESTIONS:	
Factual:	How do we define atoms? What are the core principles of atomic and bonding models? What is a fuel? What is a combustion reaction?
Conceptual:	How did we arrive at the atomic model? What happens in a reaction? How do we calculate energy need? How do we measure the 'best fuel'?
Debatable:	Do we know what an atom is? What is the 'best fuel'? Do we need fuels (benefits and drawbacks)?

OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Analyzing	The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.
B: Organizing	The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis/prediction for an experiment, and can explain what will be changed in an experiment and how they will collect the data appropriately.
C: Producing Text	The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.
D: Using Language	Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others that they have used.

ATLs:	Social; Research; Communication.

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be provided on Classroom.

SUMMATIVE ASSESSMENT TASKS:

1. Criterion A - End of unit test.
2. Criteria D - Opinion Piece: 'To what extent does mankind need to find alternatives to hydrocarbon fuels?'

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Unit 3: Systems and Evolution

Start: October/February **Duration:** 7 Weeks

LEARNING EXPERIENCES: Learning Experiences: In this unit , students will explore the amazing world of human physiological systems. They will see how these systems function and work together to produce something even more complex. We will also study about how change occurs in organisms over time. All students will conduct a research lab about some aspect that affects the speed of a nervous response.

KEY CONCEPT: Relationships	**Related Concepts / Subject Specific:** Systems/Interactions

STATEMENT OF INQUIRY:	Systems and organisms adapt over time to allow specific functions that are suited to their job or environment.

INQUIRY QUESTIONS:	
Factual:	How does oxygen get around cells? How are messages passed around organisms? How are cells faithfully replicated?
Conceptual:	What are the similarities between plants and animals? What are the similarities/differences between gills and lungs?
Debatable:	How does genetic information get passed onto offspring? How much should we interfere with our genetic makeup?

OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Analyzing	The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.
B: Organizing	The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis/prediction for an experiment, and can explain what will be changed in an experiment and how they will collect the data appropriately.
C: Producing Text	The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.
D: Using Language	Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others that they have used.

ATLs:	Communication; Self-management

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be posted on Classroom.

SUMMATIVE ASSESSMENT TASKS:

1. Criterion A - End of unit test.
2. 2. Criterion B/C - Experimental Lab. about the effect on the speed of response of the nervous system.

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Unit 4: Waves and Electromagnetism

Start: August/December **Duration:** 7 Weeks

LEARNING EXPERIENCES: Students will be exploring the world of waves, looking at the different types and their similarities and differences. This will extend to looking at magnetism and electricity. Each of these major topics will allow opportunities to plan and carry out practical work to investigate these phenomena, as well as a chance to reflect on how understanding waves can help to deal with tsunamis. Models and simulations will be studied and students may produce posters and debate topics such as renewable energy.

KEY CONCEPT: Change	**Related Concepts / Subject Specific:** Consequences, Models, Transformation.
STATEMENT OF INQUIRY:	Using a variety of understandings can help society address global issues.
INQUIRY QUESTIONS:	
Factual:	What are waves? How are waves created?
Conceptual:	How is electricity produced in the context of the energy transformations of coal, nuclear, wind, water and light?
Debatable:	Can you construct your own generator using everyday materials?
OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Analyzing	The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.
B: Organizing	The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis/prediction for an experiment, and can explain what will be changed in an experiment and how they will collect the data appropriately.
C: Producing Text	The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.
D: Using Language	Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others that they have used.
ATLs:	Thinking; Self-management.

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be posted on Classroom.

SUMMATIVE ASSESSMENT TASKS:

1. Criterion A - End of unit test.
2. Criterion B and C- Lab Report on Electromagnets