Grade 8 Sciences

Units of Study

UNIT 1:	Plant Biology	**Start:** August	**Duration:** 8 Weeks

- **Concepts:** Relationships, Biology; Interaction - between plants and their environment. Transformation - many processes transform a plant (e.g. fertilization, germination, photosynthesis).
- **Subject Specific Skills**: Students will describe the structure and function of different parts of plants and consider how humans use this knowledge. They will explain germination and photosynthesis and other processes that occur in plants.
- **Learning Experiences**: Students will explore plants through microscopes, dissections, simulations, models, and learn about the processes that occur in plants (like fertilization, germination, photosynthesis). They will also discuss the implications of genetically modified plants.

UNIT 2:	Science Fair	**Start:** October	**Duration:** 5 Weeks

- **Concepts:** Communication, Evidence - for experimental design and hypothesis validation. As a means for scientists to share their ideas.
- **Subject Specific Skills**: Students will design an investigation that connects to a world issue, they will choose variables and design a method to control them. They will collect, process, analyse and report on their data.
- **Learning Experiences**: Students will choose a science fair project that addresses an issue in the world. They will come up with their own design for investigating their hypothesis and will create a science fair project.

UNIT 3:	Energy and Chemical Reactions	**Start:** November	**Duration:** 10 Weeks

- **Concepts:** Change, Chemistry; Energy - energy in forming and breaking bonds. Interaction - reactions happen through the interactions of atoms. Students will use these concepts to predict the products of reactions and explain various phenomena.
- **Subject Specific Skills**: Students will analyse data obtained through a calorimetry investigation. They will discuss the implications of a particular insulator. They will explain their knowledge and understanding of heat transfer in various chemical reactions, using $q=mc\Delta T$ to quantify results.
- **Learning Experiences**: Students will investigate different types of chemical reactions in the laboratory. They will model reactions and practice naming simple compounds in some of these reactions. They will investigate the heat produced in a reaction and use the principles of calorimetry to explain what occurred, including calculations.

UNIT 4:	Astrophysics	**Start:** March	**Duration**: 9 Weeks

- **Concepts:** Systems, Physics; Development - how we are able to study the stars with increased understanding and technology, Scale - relative size/speed/etc. of celestial bodies and how the scale is very different than what we think of in our everyday lives.
- **Subject Specific Skills**: Students will describe distance between various stellar bodies using appropriate astronomical units of measurement. Students will design an investigation so they can collect and analyse data. They will use many formulas and new units of measurement (like parsec, light year, and astronomical unit). .
- **Learning Experiences**: Students will investigate the formation of craters on the moon through an investigation. They will learn about gravity on various planets and also describe its effect on the universe, including the use of various astronomical units to describe the distances between different stellar bodies.

UNIT 5:	Structure of DNA	**Start:** May	**Duration**: 4 Weeks

- **Concepts:** Relationships, Biology; Form - The structure of DNA allows it to store information. Function - Each feature of the structure of DNA gives it different abilities.
- **Subject Specific Skills**: Students will discuss the nature of science in regards to the discovery of the structure of DNA. They will describe how structure and function are related in DNA. They will analyse the process of mitosis.
- **Learning Experiences**: Students will explore the structure of DNA using simulations, building models, and extracting DNA in the lab. They will create a stop motion animation of the process of mitosis to demonstrate their understanding.

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Unit 1: Plant Biology

Start: August **Duration:** 8 Weeks

LEARNING EXPERIENCES: In this unit, students will learn about the processes that allow plants to survive. They will study plant and flower structure in the lab. They will learn about the processes of pollination, fertilization, germination, and seed dispersal through a variety of simulations, investigations, and lab projects. Students will learn about the process of photosynthesis and study the factors that can affect it. Finally, they'll grapple with the implications of scientists manipulating plants to give them new properties (GMOs).

KEY CONCEPT: Relationships	**Related Concepts / Subject Specific:** Biology Interaction - between plants and their environment. Transformation - many processes (e.g. fertilization, germination, photosynthesis) transform a plant.
STATEMENT OF INQUIRY:	Interactions in plants lead to transformations that can help people but politics may decide who can benefit.

INQUIRY QUESTIONS:	
Factual:	What is the word equation for photosynthesis? What are the reproductive structures in a flower?
Conceptual:	Why is photosynthesis important? How does pollination happen?
Debatable:	Why is photosynthesis arguably the most important process on Earth? Should we use GMOs to improve our quality of life?

OBJECTIVES AND ASSESSMENT CRITERIA:		
A:	**Knowing and understanding**	Students will describe scientific knowledge and apply it to solve problems set in familiar and unfamiliar situations. They will analyse information to make scientifically supported judgments.
B:	**Inquiring and designing**	Students will describe a problem or question to be tested by a scientific investigation, outline and explain a testable hypothesis using scientific reasoning. They will describe how to manipulate the variables, and how sufficient, relevant data will be collected. They will design a logical, complete and safe method in which he or she selects appropriate materials and equipment.
C:	**Processing and evaluating**	Students will correctly collect, organize, transform and present data in numerical and/or visual forms and then accurately interpret it and describe results using scientific reasoning. They will discuss the validity of a hypothesis and method based on the outcome of a scientific investigation and describe improvements or extensions to the method that would benefit the scientific investigation.
D:	**Reflecting on the impacts of science**	Students will describe the ways in which science is applied and used to address a specific problem or issue. This will allow them to discuss and analyse the implications of using science while consistently applying scientific language to communicate understanding clearly and precisely. Documenting sources completely will be required.

ATLs:	Research (information literacy), Communication

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be posted on Classroom.
- Gale Science in Context (database, available through the library) - Plants.

SUMMATIVE ASSESSMENT TASKS:

- A - unit test.
- B - germination lab design.
- D - project (podcast) on Golden Rice.

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Unit 2: Science Fair

Start: October **Duration:** 5 Weeks

LEARNING EXPERIENCES: In this unit, students will learn how to create a science fair project. They will be guided through choosing an investigation that interests them and is related to a world issue. Then they will select the variables that will allow them to investigate their topic and collect data. The goal is for students to create a project that they will share in the WEP Science Fair.

KEY CONCEPT: Communication	**Related Concepts / Subject Specific:** Evidence - experimental design, hypothesis validation

STATEMENT OF INQUIRY:	Scientists use their understanding of scientific principles alongside experimental evidence to communicate ideas.

INQUIRY QUESTIONS:	
Factual:	How do you create a science fair project? What are the different parts of a science fair projects?
Conceptual:	Why do scientists participate in science fairs? How do you share data?
Debatable:	Which science (biology, chemistry, physics, environmental science) lends itself best to science fairs? Which is more useful; qualitative or quantitative data?

OBJECTIVES AND ASSESSMENT CRITERIA:		
A:	**Knowing and understanding**	Students will describe scientific knowledge, apply it to solve problems set in familiar and unfamiliar situations. They will analyse information to make scientifically supported judgments.
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 determine if their 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 describe the ways in which their project can be applied and used to address a problem or issue in the world. This will allow them to discuss and analyse the implications of using science while practicing the application of scientific language to communicate their understanding. Documenting sources completely will be required.

ATLs:	Social, Self-Management (organization)

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be posted on Classroom.
- Gale Science in Context (database, available through the library).

SUMMATIVE ASSESSMENT TASKS:

- B - Student interest-based experimental design.
- C - Experimental data analysis.
- D - Considering the implications of their project on a world issue.

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Unit 3: Energy and Chemical Reactions

Start: November **Duration:** 10 Weeks

LEARNING EXPERIENCES: In this unit, students will learn about different types of chemical reactions. They will learn to name simple compounds and predict what is formed in various reactions. Then they will learn about the ways heat and energy are transferred including the idea of specific heat capacity. They will investigate a reaction in the lab and process the data to make a conclusion about the change in heat. Finally, they will use these ideas to research an insulator and describe how it works.

KEY CONCEPT: Change	**Related Concepts / Subject Specific:** Chemistry - Energy - energy in forming and breaking bonds; Interaction - reactions happen through interactions of atoms.
STATEMENT OF INQUIRY:	Understanding individual interactions allows us to develop our understanding of energy and use it for innovations.
INQUIRY QUESTIONS:	
Factual:	What observations indicate a chemical reaction has occurred? What do subscripts and coefficients show in a chemical equation? What are exothermic and endothermic processes? How is heat energy transferred? What affects the change in temperature of a substance?
Conceptual:	What holds atoms together? How does the breaking or formation of bonds relate to the energy in a system? How do we measure energy changes? How does the specific heat capacity affect the properties of materials? How can the kinetic theory be used to explain the phenomena studied in this unit?
Debatable:	Why was Gebers search for an al-iksir (elixir or philosopher's stone) ultimately unsuccessful? Why did Alfred Nobel protect his patent for dynamite very closely - was he greedy or safety conscious? Why do scientists find it so difficult to define energy?
OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Knowing and understanding	Students will describe scientific knowledge about chemical reactions and heat transfer and apply it to solve problems. They will analyse information to make scientifically supported judgments.
B: Inquiring and designing	Students will learn how to design scientific investigations. They will write a research question about a calorimetry experiment. They will make a useful hypothesis / prediction for this experiment, and will explain what will be changed in an experiment and how they will collect the data appropriately (based on their understanding of calorimetry).
C: Processing and evaluating	The student will collect and process their data and be able to understand what that data is showing. They will learn how to determine if their 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 describe the ways in which materials are used to address our need for insulation. This will allow them to discuss and analyse the implications of using science while consistently applying scientific language to communicate understanding clearly and precisely. Documenting sources completely will be required.
ATLs:	Thinking (transfer), Communication

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be posted on Classroom.
- Gale Science in Context (database, available through the library) - Heat.

SUMMATIVE ASSESSMENT TASKS:

- A - Unit Test.
- C - Calorimetry data analysis task.
- D - Insulation infomercial project.

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Unit 4: Astrophysics

Start: March **Duration:** 9 Weeks

LEARNING EXPERIENCES: In this unit, students will engage in an exploration into how our astronomical theories have developed over time. They will learn about various ways of measuring distances in space (e.g. astronomical units, light years, parsecs). They will study gravity and its effect on various stellar bodies. Students will investigate how meteors create craters on an object like the moon. They will also learn about parallax and the various units of measurement in space and why we need them.

KEY CONCEPT: Systems	**Related Concepts / Subject Specific:** Physics Development - how we were able to study the stars. Scale - relative size/speed/etc of celestial bodies.
STATEMENT OF INQUIRY:	Explorations and discoveries may develop systems for understanding the scale of the universe.
INQUIRY QUESTIONS:	
Factual:	Why do we experience seasons? What are the phases of the Moon? What is a light year?
Conceptual:	How has our understanding of the universe developed since ancient times and why have these developments caused some controversy? How do we make sense of how the universe formed and is changing? Why do we need different measurements to talk about the distances to stars and galaxies?
Debatable:	Will we ever be sure about the origin and state of the universe? Is funding space research worthwhile?
OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Knowing and understanding	Students will describe scientific knowledge, apply it to solve problems in various situations. They will analyse information to make scientifically supported judgments.
B: Inquiring and designing	Students will practice designing a scientific investigation about crater formation. They will write a research question that could be tested in this 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	Students 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 describe the ways in which science is applied and used to address problems. This will allow them to discuss and analyse the implications of using science while consistently applying scientific language to communicate understanding clearly and precisely. Documenting sources completely will be required.
ATLs:	Thinking (critical), Self-Management (affective)

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be posted on Classroom.
- Gale Science in Context (database, available through the library) - Astronomy.

SUMMATIVE ASSESSMENT TASKS:

- A - Unit test.
- B - Crater formation experiment design.

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Unit 5: Structure of DNA

Start: May **Duration:** 4 Weeks

LEARNING EXPERIENCES: In this unit, students will learn about the history behind the discovery of DNA. This is an excellent example of the nature of science. Students will then review how the structure of DNA relates to its function, and they will review this through the creation of various models. They will also extract DNA from samples. Finally, they will investigate how cells have a predictable cycle of events that they follow (cell cycle), including the duplication of DNA through a process called mitosis. They will then demonstrate their understanding by creating a stop-motion animation of mitosis.

KEY CONCEPT: Relationships	**Related Concepts / Subject Specific:** Biology Form - The structure of DNA allows it to store and access information. Function - Each feature of DNA gives it different abilities.
STATEMENT OF INQUIRY:	The relationship between form and function may help us model and make predictions.

INQUIRY QUESTIONS:	
Factual:	What is the structure of DNA? What are the 4 nitrogenous bases that make up DNA? What is mitosis?
Conceptual:	Why do cells divide? What is the relationship between form and function in DNA?
Debatable:	Should humans tamper with DNA? Are we just vehicles for our DNA? Are structure and function always related?

OBJECTIVES AND ASSESSMENT CRITERIA:	
A: Knowing and understanding	Students will describe scientific knowledge, apply it to solve problems set in familiar and unfamiliar situations. They will analyse information to make scientifically supported judgments.
B: Inquiring and designing	Students will learn about designing 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 describe the ways in which science is applied and used to address a specific problem or issue. This will allow them to discuss and analyse the implications of using science while consistently applying scientific language to communicate understanding clearly and precisely. Documenting sources completely will be required.

ATLs:	Social, Thinking (creative & critical)

RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be posted on Classroom.
- Gale Science in Context (database, available through the library) - DNA.
- DNA Interactive Website (www.dnai.org/)

SUMMATIVE ASSESSMENT TASKS:

- A* - Stop-Motion animation of the process of mitosis. (*not all strands of A)
- D* - Stop-Motion animation of the process of mitosis (*not all strands of D)