2019 H CHEM Unit 5: Weather and Climate

Content Area: **Science**
Course(s): **Chemistry**
Time Period: **March**
Length: **20 days**
Status: **Published**

Unit Overview:

In this unit of study, students evaluate claims, analyze and interpret data, and develop and use models to explore the core ideas centered on the Earth's climate system. Students evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by the atmosphere and Earth's various surfaces. They apply these core ideas when they use a quantitative model to describe how variations in the flow of energy into an out of the Earth's systems result in changes in climate, and how carbon is cycle through all of the Earth's spheres. They analyze geoscience data to make the claim that one change to Earth's surface can cause changes to other Earth systems, such as the climate system. Finally, students analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. The crosscutting concepts of cause and effect, stability and change, energy and matter, and structure and function arecalled out as an organizing concept for these disciplinary core ideas.

Enduring Understandings:

- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
- The foundation for Earth’s global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the 30 atmosphere, ocean, and land systems, and this energy’s re-radiation into space.

Essential Questions:

- How do changes in the geosphere effect the atmosphere?
- How does carbon cycle among the hydrosphere, atmosphere, geosphere, and biosphere?
- What happens if we change the chemical composition of our atmosphere?
- What happens to solar energy as it moves through the atmosphere and strikes a surface?
- What is the current rate of global or regional climate change and what are the associated future impacts to Earth’s systems?

Standards/Indicators/Student Learning Objectives (SLOs):

- Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth

systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]

- Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

- Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]

- Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]

9-12.HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
9-12.HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
9-12.HS-ESS2-4.ESS2.D.1	The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
9-12.HS-ESS2-6.ESS2.D.1	Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
9-12.HS-ESS2-4.ESS2.D.2	Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
9-12.HS-ESS2-6.ESS2.D.2	Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
9-12.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
9-12.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Lesson Titles:

- Air Pollution
- Climate Definition
- Climate Factors

- Global Warming

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Inter-Disciplinary Connections:

LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
LA.RST.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LA.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.WHST.11-12.1.A	Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
LA.WHST.11-12.1.B	Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
LA.WHST.11-12.1.C	Use transitions (e.g., words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

LA.WHST.11-12.1.D	Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
LA.WHST.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented.
MA.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning
MA.A-REI.D	Represent and solve equations and inequalities graphically
TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Acid Rain Lab
- Concentration of Greenhouse Gasses Activity
- Convection Currents/Coriolis Effect Act. Sht
- Factors that Influence Climate Activity Sht
- Global Air Pollution Chromebook Activity
- Graphing Climate of Three Cities Act
- Latitude/Altitude Act. Sheet
- Milankovitch Cycles Chromebook Act
- NJ Climate Change Activity
- Particulate Matter Lab
- Rain Shadow Effect Activity Sht.
- Read/Answer Questions on a Current Event Article
- Seasons Chromebook Activity
- Seasons Lab

- Tree Ring Activity

Modifications

ELL Modifications:

- 1:1 testing
- Be flexible with time frames and deadlines
- Digital translators
- Group students
- Offer alternate/modify assessments
- Offer resources for specific topics in primary language
- Provide formal and informal verbal interaction to provide practice
- Provide multiple literacy strategies
- Repeat, reword, clarify
- Tap prior knowledge
- Use real objects when possible

IEP & 504 Modifications:

- Allowing student to edit with teacher comments the first attempt at a graded assignment
- Breaking up larger assignments into shorter tasks with clear deadlines for each section
- Less problems/questions per page or assignment
- Modeling and showing lots of examples
- Non-verbal redirection of behaviors
- Provide a copy of the notes from class
- Provide paraphrased or modified reading materials at the student's reading level
- Provide student with content vocab prior to lesson that includes that vocab
- Provide study guides that pare down the material to study
- Pull student(s) aside for individualized teaching by the special ed teacher
- Rewording questions
- Teach main concept multiple ways over multiple days or interactions

G&T Modifications:

- Allow generation and testing of hypotheses
- Ask students higher level questions to make conclusions and connections

- Employ differentiated curriculum to keep interest high
- Encourage further exploration of topics through reading or investigations
- Offer additional activities that solicit a deeper understanding of the material
- Offer opportunities for peer leadership or mentoring
- Provide additional challenging problems
- Provide different test items
- Provide opportunities for inquiry based learning
- Refrain from having them complete more work in the same manner
- Require graphical analysis and interpretation

At Risk Modifications

- Assign a peer to help keep the student on task
- Break tests down into smaller increments
- Check in with student often to keep on task
- If possible, one on one testing or oral exams
- Increase interaction time between you and the student
- Make directions and instruction short and simple
- Modify or reduce assignments
- Preferential seating
- Provide hands on tasks when applicable
- Regular communication with parents and guardians

Formative Assessment:

- Demonstration
- Exit ticket
- Google survey
- Image/Video clip
- Kahoot
- KWL form
- Lesson summary
- Object
- Previous class review
- Question of the day
- Think-pair-share

Summative Assessment:

- Acid Rain Lab Report
- Air Pollution Project
- Particulate Matter Lab Report
- Quiz (Air Pollution)
- Quiz (Climate Change)
- Quiz (Climate)
- Test (Weather and Climate)

Benchmark Assessments

Skills-based assessment
Reading response
Writing prompt
Lab practical

Alternative Assessments

Performance tasks
Project-based assignments
Problem-based assignments
Presentations
Reflective pieces
Concept maps
Case-based scenarios
Portfolios

Resources & Materials:

- Acid Rain:http://tinyurl.com/2e7k3z9
- Global Air Pollution: : http://tinyurl.com/j2xv4nu
- Milankovitch Cycles: http://tinyurl.com/jpmudck
- NJ Climate: http://www.nj.gov/dep/dsr/trends/pdfs/climate-change.pdf
- Seasons: http://tinyurl.com/2ddtuvn

Technology:

- Chromebooks
- Graphing Calculators

- LoggerPro
- Temperature Probe

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.