BLACK HORSE PIKE REGIONAL HIGH SCHOOL
HIGHLAND TIMBER CREEK TRITON
SCIENCE DEPARTMENT

SYLLABUS

Introduction to Physical Science

Course Content

1. **September: Performing Experiments through collection of data and communicating results (HS-ETS1-2)**
    - Demonstrate appropriate lab safety skills.
    - Demonstrate safe utilization and proper measurement usage of the basic laboratory equipment.
    - Distinguish the different parts of a controlled experiment through case studies.
    - Convert from one metric unit to another using dimensional analysis.
2. **October/November: Atomic Structure and Periodic Table Trends (HS-PS1-1)**
    - Identify the names and symbols of common elements.
    - Describe the present atomic model.
    - Analyze the atomic structure's components including atom, ion, isotope, subatomic particle, atomic number, mass number, average atomic mass, and atomic mass unit
    - Identify and calculate the number of protons, neutrons, and electrons in any atom, ion, or isotope given sufficient information.
    - Determine both the full and shorthand electron configurations for an atom
    - Dissect the Periodic Table to locate atomic number, atomic mass, family, period, classification of element (metal, nonmetal, semimetal, or metalloid), and the state of the element at room temperature.
    - Identify regions of the periodic table including alkali metals, alkaline earth metals, transition metals, halogens, noble gases, lanthanide, and actinide series.
    - Relate the family or group of elements to their corresponding number of valence electrons.
    - Relate a period of elements to the energy level of valence electrons.
3. **December/January: Chemical Bonding and Reactions(HS-PS1-4)**
    - Describe ionic and covalent bonding by using Lewis Dot Structures and Bohr Models.
    - Apply the law of conservation of mass by balancing chemical equations.
    - Analyze chemical equations and classify them as synthesis, decomposition, or single/double replacement.
    - Differentiate between endo and exothermic reactions.
4. **February: Nuclear Fusion of Stars(HS-ESS1-1, 3)**
    - Sequence the life cycle of a star based on its mass
    - Explain why the sun is considered an average star
    - Predict the fate of our sun based on its characteristics
    - Using the HR diagram, characterize the relationship of absolute magnitude and surface temperature of stars
    - Recognize that all normal stars are powered by fusion reactions that form elements
5. **March/April: Big Bang Theory and Waves (HS-ESS1-2)**
    - Relate the sound of the Doppler effect for vehicles to the red shifting effect with stars.
    - Describe the Big Bang Theory with three pieces of evidence.
    - Relate the light spectra to the Big Bang Theory.
    - Create a light spectra to describe a fictional galaxies shift.
    - Explain why the universe is expanding.
6. **May/June: Motion and Forces with relation with Solar System (HS-ESS1-4, HS-PS2-1)**
    - Define, describe, calculate, and differentiate among position, acceleration, mass, and force.
    - Apply appropriate mathematical processes to solving orbital motion problems.
    - Describe how all bodies of the solar system follow a predictable orbital path using Kepler's Law.
    - Calculate the force between two objects using the universal law of gravitation
    - Calculate the eccentricity
    - Differentiate the aphelion and perihelion
    - Describe the relationship between orbital period and the distance between two objects

Course Expectations
&
Skills

1. Perform laboratory experiments as instructed.
2. Organize a notebook
3. Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that can be solved through engineering
4. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms
5. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy
6. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation
7. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe
8. Communicate scientific ideas about the way stars, over their life cycle, produce elements
9. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system

Resources

Text Book: Science Spectrum: Physical Science 2011 Holt

Supplementary Resources: *Gizmos*

Grading Scale

Major	40%
Labs	30%
Minor	10%
Practice	20%

BLACK HORSE PIKE REGIONAL HIGH SCHOOL
HIGHLAND TIMBER CREEK TRITON
SCIENCE DEPARTMENT

SYLLABUS

Physical Systems

Course Content

1. **September: Performing Experiments through collection of data and communicating results (HS-ETS1-2)**
    - Demonstrate appropriate lab safety skills.
    - Demonstrate safe utilization and proper measurement usage of the basic laboratory equipment.
    - Distinguish the different parts of a controlled experiment through case studies.
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    - Identify the names and symbols of common elements.
    - Describe the present atomic model.
    - Analyze the atomic structure's components including atom, ion, isotope, subatomic particle, atomic number, mass number, average atomic mass, and atomic mass unit
    - Identify and calculate the number of protons, neutrons, and electrons in any atom, ion, or isotope given sufficient information.
    - Determine both the full and shorthand electron configurations for an atom
    - Dissect the Periodic Table to locate atomic number, atomic mass, family, period, classification of element (metal, nonmetal, semimetal, or metalloid), and the state of the element at room temperature.
    - Identify regions of the periodic table including alkali metals, alkaline earth metals, transition metals, halogens, noble gases, lanthanide, and actinide series.
    - Relate the family or group of elements to their corresponding number of valence electrons.
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    - Sequence the life cycle of a star based on its mass
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- Describe the relationship between orbital period and the distance between two objects

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Resources

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Supplementary Resources: *Gizmos*

Grading Scale

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Black Horse Pike Regional School District Curriculum Template
Introduction to Physical Science and Physical Systems Curriculum

ENGAGING STUDENTS ● FOSTERING ACHIEVEMENT ● CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit 1: Problem Solving Science Skills

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Introduction to Physical Sciences - Physical Systems /Science Skills **Grade Level(s):** **9 -10**	**Unit Summary**: **Prior knowledge skills assessment** **In this unit students will be introduced to the requirements of a laboratory course. They will demonstrate safe utilization and proper measuring skills of the basic equipment of the course through activities. They will perform varying laboratory experiments and learn how to extrapolate lab data to form conclusions based on initial hypotheses. Throughout their laboratory investigations students will be able to differentiate between variables through Experimental Design. Students will be able to convert scientific units of measurements via Dimensional Analysis. A strong base in the laboratory skills and techniques will be essential for successful completion of this course. Skills will be revisited frequently throughout the year.**
Essential Question(s): **1. What rules must be followed in order for a laboratory activity to be performed safely?** **2. How do you to properly use laboratory equipment?** 3. **What steps must be followed in order for you to successfully complete a laboratory activities?** 4. **How can you effectively communicate results of a laboratory activity with other scientists?**	**Enduring Understanding(s):** 1. In order for students to successfully complete this course they must understand and demonstrate the safety requirements of a laboratory course through successfully performing different laboratory activities. 2. There are many different types of lab equipment found in every classroom, with specific methods necessary for proper use of said equipment. 3. Students will understand the key elements and steps of Experimental design such as hypothesis, procedure, data collection and conclusion to successfully complete lab activities. 4. Data can either be presented in numbers or words and there are specific situations where each is appropriate through dimensional analysis.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NGSS standards that are applicable

Learning Target: Students will be able to: Red and Bold Apply to both IPS and PS- Just red- Just IPS **1. Demonstrate appropriate lab safety skills.**	**NGSS** **1. HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**

2. Demonstrate safe utilization and proper measurement usage of the basic laboratory equipment to successfully collect data	**2. HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
3. Distinguish the different parts of a controlled experiment through case studies.	**3. HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
4. Convert from one metric unit to another using dimensional analysis to break down into smaller steps.	**4. HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**

Inter-Disciplinary Connections:

Common Core State Standards Connections:

ELA/Literacy -

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. (HS-ETS1-1),*(HS-ETS1-3)*
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. *(HS-ETS1-1)*,(HS-ETS1-3)
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. (HS-ETS1-1),*(HS-ETS1-3)*

Mathematics -

MP.2	Reason abstractly and quantitatively. (HS-ETS1-1),*(HS-ETS1-3),(HS-ETS1-4)*
MP.4	Model with mathematics. (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4)

Students will engage with the following text:

1. *Science Spectrum,* 2001; 2011, Holt
2. Any and all articles and readings pertinent to current subject matter (i.e. *Popular Science Magazine)*.
3. Any and all instructions related to current subject matter (i.e. laboratory guidelines).

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities.

Example of lab report rubric used to assess student performance and understanding of task.

- examples of strategies and modified strategies are in the District Shared Google Drive IPS/PS Folder

Accommodations and/or modifications will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to: read aloud directions to help students understand the chapter/unit, read aloud specific paragraphs to assist auditory learners, read captions in the book that describe concepts being discussed.

Students will write:

In addition to the usual warm ups, closing activities, lab reports, example(s) of student activities requiring them to write are as follows:

1. **Personal reflections to current scientific events**
2. **Writing Prompts used as introductions to current subject matter**
3. **Daily Summaries to Cornell Note-Taking**

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities.

Example of lab report rubric used to assess student performance and understanding of task.

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Accommodations and/or modifications will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to: provide prewriting outline for students to organize their thoughts, teach students how to self-edit, provide a list of punctuation marks and their uses in writing.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

The following instructional strategies are utilized on an as needed basis throughout the year:

1. **Direct Instruction**
2. **Cornell Note-Taking**
3. **Scaffolding**
4. **Project Based Learning**
5. **Peer Based Learning/Review**
6. **Student presentations with peer review in addition to teacher assessment**
7. **Modeling**
8. **Drawing**
9. **Guided Discussion with analysis/prediction/defense of conclusions**
10. **Directed Reading**
11. **Guided Notes**
12. **Outlining**
13. **Technology: Microsoft Excel, PowerPoint, Word, SmartBoard, LCD Projectors**
14. **Media Resources: Gizmos, Discovery Streaming, commercial video resources, YouTube, course websites (i.e. OnCourse and Google classroom)**

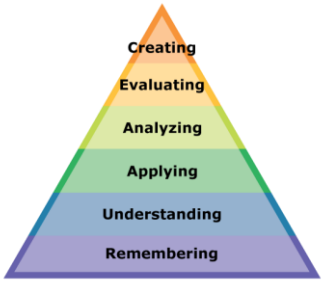
Once per quarter students are given a topical presentation assignment to research, present, and review.

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Throughout the year students will

continually connect, utilize, and apply math skills including but not limited to graphing, solving for unknowns, and formulaic interpretation. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities. They will need to correctly and safely use basic laboratory equipment. The environment will foster interpersonal relations in a work-like atmosphere.
Example of lab report rubric used to assess student performance and understanding of task.
- examples of strategies and modified strategies are in the District Shared Google Drive IPS/PS Folder

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The students will be assessed via multiple quizzes, tests, and laboratory assignments.

The following are examples : **Experimental Design Quiz** Blooms Levels- Remembering through Understanding
On a daily basis there are also many class work activities, as well as warm up and closing activities.
- examples of assessments and modified assessments are in the District Shared Google Drive IPS/PS Folder

Accommodations/Modifications:

Accommodations and/or modifications will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to :
Modifications: Extra space for responses, fill-in worksheets, chunk material in groups for easier readability, reword directions for clarity and comprehension, modify laboratory reports by providing a template on course website or Google classroom, adjust length of assignments as needed, modify supplemental materials for readability.

Accommodations: 1:1 assistance as needed, restate or rephrase instructions, answer key provided for students after competition of assignment, extended time to complete assessment, provide alternate access to any material or media via course website or Google classroom, monitor assignment book, assist in binder/notebook organization, preferential seating.

Summative Assessments:

There are various summative assessments that will be used over the course of the year. These include but are not limited to Tests, Benchmarks common marking period exams, and labs. The following summative assessment is an example of a performance assessment that can be used in both IPS and Physical Systems. The students will be given a problem to solve and provided with an over-abundance of materials with which to solve the problem. The students must determine which materials are useful to adequately and collaboratively solve the problem. Students must then construct a laboratory report to present and defend their methods and conclusions. I.E. Salt and Pepper lab- Give students a box of varying materials. Tell them that you need them to separate salt and pepper (Tell them a story giving them a reason to do it, i.e. you are allergic to salt.) Have them determine at least 3 ways to separate the salt and pepper using the materials provided. Students will then write a lab report on their findings and how they used the scientific method to arrive at

their conclusions.

Unit 1 Test Blooms Levels- Remembering through Understanding

Example of lab report rubric used to assess student performance and understanding of task.. Blooms Levels- All Levels Covered Remembering through Creating

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Modifications: Extra space for responses, fill-in worksheets, chunk material in groups for easier readability, reword directions for clarity and comprehension, modify laboratory reports by providing a template on course website or Google classroom, adjust length of assignments as needed, modify supplemental materials for readability.

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Performance Assessments:

The students will be given a problem to solve and provided with an over-abundance of materials with which to solve the problem. The students must determine which materials are useful to adequately and collaboratively solve the problem. Students must then construct a laboratory report to present and defend their methods and conclusions. I.E. Salt and Pepper lab- Give students a box of varying materials. Tell them that you need them to separate salt and pepper. (Tell them a story giving them a reason to do it, i.e. you are allergic to salt.) Have them determine at least 3 ways to separate the salt and pepper using the materials provided. Students will then write a lab report on their findings and how they used the scientific method to arrive at their conclusions.

Example of lab report rubric used to assess student performance and understanding of task.. Blooms Levels- All Levels Covered Remembering through Creating

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assignment book, assist in binder/notebook organization, preferential seating.

Unit 2: Atomic Theory & the Periodic Table
PART I: UNIT RATIONALE
WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: **Introduction to Physical Sciences -** Physical Systems/ **Atomic Theory & Periodic Table** **Grade Level(s):** **9 -10**	**Unit Summary**: Atomic Theory and Arrangement of Elements This unit is focused on the development of the theory of the atom, the structure of the atom and the organization of elements in the periodic table. Students will examine the structure of the atom and analyze nuclear energy as it relates to the atom. They will explore the arrangement of elements on the periodic table in reference to groups and periods, and describe trends seen in their properties.
Essential Question(s): 1. How does the current atomic model explain the interactions of elements and the formation of compounds? 2. How does the arrangement of the subatomic particles of atoms relate to the reactivity and behavior of each element? 3. How are elements currently arranged on the Periodic Table? 4. What do atoms of an element have in common with other atoms of the same element?	**Enduring Understanding(s):** 1,2: PS1.A: Structure and Properties of Matter Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons 3,4: PS1.A: Structure and Properties of Matter The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NGSS that are applicable

Learning Target: Bold: Identifies both courses Students will be able to:	**NGSS**
1. Identify the names and symbols of common elements. **2. Describe the present atomic model using the periodic table.** **3. Analyze the atomic structure's components including atom, ion, isotope, subatomic particle, atomic number, mass number, average atomic mass, and atomic mass unit** **4. Identify and calculate the number of protons, neutrons, and electrons in any atom, ion, or isotope given sufficient information.** **5. Determine both the full and shorthand electron configurations for an atom using the Periodic table as a resource** **6. Dissect the Periodic Table to locate atomic number, atomic mass, family, period, classification of element (metal, nonmetal, semimetal, or metalloid), and the state of the element at room temperature.** **7. Identify regions of the periodic table including alkali metals, alkaline earth metals, transition metals, halogens, noble gases, lanthanide, and actinide series.** **8. Relate the family or group of elements to their corresponding number of valence electrons.** **9. Relate a period of elements to the energy level of valence electrons.**	**1-9. HS-PS1-1: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms**

Inter-Disciplinary Connections:

Common Core State Standards Connections:

ELA/Literacy -

RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. *(HS-PS1-1)*

Students will engage with the following text:

1. ***Science Spectrum*, 2001; 2011, Holt**
2. **Any and all articles and readings pertinent to current subject matter (i.e. *Popular Science Magazine)*.**
3. **Any and all instructions related to current subject matter (i.e. laboratory guidelines).**

Throughout the year, students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities.

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Accommodations and/or modifications will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to: read captions in the text to help students understand concepts, rewrite portions of the chapters to assist students with independent reading level, read portions of the text aloud to assist the comprehension for ELL students and auditory learners, read chapter headings for prereading prompts.

Students will write:

In addition to the usual warm ups, closing activities, lab reports, example(s) of student activities requiring them to write are as follows:

1. **Personal reflections to current scientific events**
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PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

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The following instructional strategies are utilized on an as needed basis throughout the year:

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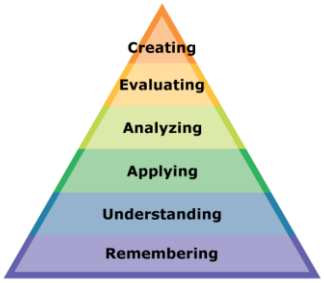

Formative Assessments:

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The following are examples : Atomic Theory Quiz Blooms Levels- Remembering, Understanding
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Accommodations/Modifications:

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Accommodations: 1:1 assistance as needed, restate or rephrase instructions, answer key provided for students after competition of assignment, extended time to complete assessment, provide alternate access to any material or media via course website or Google classroom, monitor assignment book, assist in binder/notebook organization, preferential seating.

Suggestions for modified instruction and scaffolding for LEP students and/or students who need additional support are embedded in the unit plan and/or are added to the specific examples cited in the curriculum unit. The amount of scaffolding needed will depend on the level of English proficiency of each LEP student. Therefore, novice level students will need more support with the language needed to understand and demonstrate the acquisition of concepts than intermediate or advanced students.

Some of the recommended activities are computer based and require students to visit various internet sites and view animations of various processes. These animations require various players and plug-ins which may or may not already be installed on computers. Additionally some firewalls block downloading these types of files. Before assigning these activities to students it is essential for the teacher to try them on the computers that the students will use and to consult with the technology specialist if there are issues. These animations also have sound. Teachers may wish to provide headphones/speakers.

Summative Assessments:

Students will apply the periodic table trends to several situations. The students will evaluate the validity of these trends by analyzing data collect during the lab process.

Atomic Theory and Periodic Table Test Blooms Levels- Remembering, Understanding
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Accommodations: 1:1 assistance as needed, restate or rephrase instructions, answer key provided for students after competition of assignment, extended time to complete assessment, provide alternate access to any material or media via course website or Google classroom, monitor assignment book, assist in binder/notebook organization, preferential seating.

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Some of the recommended activities are computer based and require students to visit various internet sites and view animations of various processes. These animations require various players and plug-ins which may or may not already be installed on computers. Additionally some firewalls block downloading these types of files. Before assigning these activities to students it is essential for the teacher to try them on the computers that the students will use and to consult with the technology specialist if there are issues. These animations also have sound. Teachers may wish to provide headphones/speakers.

Performance Assessments:

Students will apply the periodic table trends to several situations. The students will evaluate the validity of these trends by analyzing data collect during the lab process.
Penny Lab Blooms Levels-Remembering, Understanding, Applying
- examples of strategies and modified strategies are in the District Shared Google Drive IPS/PS Folder

Accommodations/Modifications:

Accommodations and/or modifications will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to

Modifications: Extra space for responses, fill-in worksheets, chunk material in groups for easier readability, reword directions for clarity and comprehension, modify laboratory reports by providing a template on course website or Google classroom, adjust length of assignments as needed, modify supplemental materials for readability.

Accommodations: 1:1 assistance as needed, restate or rephrase instructions, answer key provided for students after competition of assignment, extended time to complete assessment, provide alternate access to any material or media via course website or Google classroom, monitor assignment book, assist in binder/notebook organization, preferential seating.

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Unit 3: Chemical Bonding and Reactions

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: **Introduction to Physical Sciences -** Physical Systems/ **Chemical Bonding and Reactions** **Grade Level(s):** **9 -10**	**Unit Summary**: Chemical Bonding and Reactions This unit is focused on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.
Essential Question(s): 1. How are electrons arranged in both the Bohr and Lewis Model? 2. How do elements interact with each other? 3. What is a chemical equation and why is it important that it is balanced? 4. How do you predict products of a reaction?	**Enduring Understanding(s):** 2, 4 PS1.A: Structure and Properties of Matter A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. 1, 3, 4 PS1.B: Chemical Reactions Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NGSS that are applicable

Learning Target: Bold: Identifies both courses	**NGSS**
Students will be able to: **1. Describe ionic and covalent bonding by using Lewis Dot Structures and Bohr Models.**	**1. HS-PS1-4. Develop a model based on evidence to illustrate the**

2. Apply the law of conservation of mass by balancing chemical equations. **3. Analyze chemical equations and classify them as synthesis, decomposition, or single/double replacement.** **4. Differentiate between endo and exothermic reactions in a system.**	**relationships between systems or between components of a system. the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.** **2. HS-PS1-4. Develop a model based on evidence to illustrate the relationships between systems or between components of a system. the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.** **3. HS-PS1-4. Develop a model based on evidence to illustrate the relationships between systems or between components of a system. the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.** **4. HS-PS1-4. Develop a model based on evidence to illustrate the relationships between systems or between components of a system. the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.**

Inter-Disciplinary Connections:

Common Core State Standards Connections:

ELA/Literacy -

SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.** ***(HS-PS1-4)***

Mathematics -

MP.4	**Model with mathematics.** ***(HS-PS1-4),(HS-PS1-8)***
HSN-Q.A.1	**Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-2),*(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),*(HS-PS1-7),(HS-PS1-8)**
HSN-Q.A.2	**Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),*(HS-PS1-7),*(HS-PS1-8)**
HSN-Q.A.3	**Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.** ***(HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8)***

Students will engage with the following text:

1. *Science Spectrum*, 2001; 2011, Holt
2. Any and all articles and readings pertinent to current subject matter (i.e. *Popular Science Magazine)*.
3. Any and all instructions related to current subject matter (i.e. laboratory guidelines).

Throughout the year, students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities.

Example of lab report rubric used to assess student performance and understanding of task.- examples of strategies and modified strategies are in the District Shared Google Drive IPS/PS Folder

Accommodations and/or modifications will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to: read captions in the text to help students understand concepts, rewrite portions of the chapters to assist students with independent reading level, read portions of the text aloud to assist the comprehension for ELL students and auditory learners, read chapter headings for prereading prompts.

Students will write:

In addition to the usual warm ups, closing activities, lab reports, example(s) of student activities requiring them to write are as follows:

1. **Personal reflections to current scientific events**
2. **Writing Prompts used as introductions to current subject matter**
3. **Daily Summaries to Cornell Note-Taking**

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies.

Example of lab report rubric used to assess student performance and understanding of task. - examples of strategies and modified strategies are in the District Shared Google Drive IPS/PS Folder

Accommodations and/or modifications will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to: provide students with a prewriting outline to organize their thoughts, provide punctuation mark usage sheet, provide outline for self-editing.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

The following instructional strategies are utilized on an as needed basis throughout the year:

1. **Direct Instruction**
2. **Cornell Note-Taking**
3. **Scaffolding**
4. **Project Based Learning**
5. **Peer Based Learning/Review**
6. **Student presentations with peer review in addition to teacher assessment**

7. **Modeling**
8. **Drawing**
9. **Guided Discussion with analysis/prediction/defense of conclusions**
10. **Directed Reading**
11. **Guided Notes**
12. **Outlining**
13. **Technology: Microsoft Excel, PowerPoint, Word, Smartboard, LCD Projectors**
14. **Media Resources: Gizmos, Discovery Streaming, commercial video resources, YouTube, course websites (i.e. OnCourse and Google classroom)**

Once per quarter students are given a topical presentation assignment to research, present, and review.

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Throughout the year students will continually connect, utilize, and apply math skills including but not limited to graphing, solving for unknowns, and formulaic interpretation. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities. They will need to correctly and safely use basic laboratory equipment. The environment will foster interpersonal relations in a work-like atmosphere.

Example of lab report rubric used to assess student performance and understanding of task.
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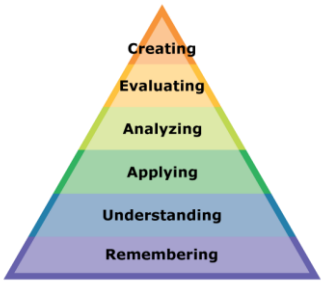
PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The students will be assessed via multiple quizzes, tests, and laboratory assignments.

The following are examples :

Predict the Product Blooms Levels- Analyzing, Evalutating

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Accommodations/Modifications:

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Summative Assessments:

Students will apply the law of conservation of mass to several situations. The students will evaluate the validity of the law by analyzing data collect during the lab process. The students will observe the chemical reactions occurring and be able to classify the reaction type.

Covalent and Ionic Test Blooms Levels- Remembering, Understanding, Applying

Chemical Reaction Test Blooms Levels- Remembering, Understanding, Applying, Analyzing

Example of lab report rubric used to assess student performance and understanding of task.- examples of strategies and modified strategies are in the District Shared Google Drive IPS/PS Folder

Accommodations/Modifications:

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Performance Assessments:

Students will apply the law of conservation of mass to several situations. The students will evaluate the validity of the law by analyzing data collect during the lab process. The students will observe the chemical reactions occurring and be able to classify the reaction type.

Law of Conservation Popcorn Lab Blooms Levels- Remembering, Understanding, Applying
RAFT RXN Project Blooms Levels- Remembering, Understanding, Applying, Creating
Example of lab report rubric used to assess student performance and understanding of task.
- examples of strategies and modified strategies are in the District Shared Google Drive IPS/PS Folder

Accommodations/Modifications:

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Unit 4: Stars and Nuclear Fusion

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: **Introduction to Physical Sciences** - Stars and Nuclear Fusion **Grade Level(s):** **9 -10**	**Unit Summary**: This unit focuses on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars. In addition, nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.
Essential Question(s): 1. What affects the life cycle of a star? 2. Which life cycle is our Sun in? 3. How can we distinguish which elements are found in stars and how are they formed? 4. What are the two major types of spectroscopy?	**Enduring Understanding(s):** ESS1.A: The Universe and Its Stars ● The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. ● The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. PS3.D: Energy in Chemical Processes and Everyday Life Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (secondary to HS-ESS1-1)

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NGSS that are applicable

Learning Target: Bold: Indicates both courses Students will be able to:	**NGSS**
1. Sequence the life cycle of a star based on its mass **2. Explain why the sun is considered an average star** **3. Predict the fate of our sun based on its characteristics** **4. Using the HR diagram, characterize the relationship of absolute magnitude and surface**	2, 3, 4, 5 HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. 1, HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.

temperature of stars **5. Recognize that all normal stars are powered by fusion reactions that form elements**	

Inter-Disciplinary Connections:

Common Core State Standards Connections:

ELA/Literacy -

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.** ***(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-5),(HS-ESS1-6)***
WHST.9-12.1	**Write arguments focused on *discipline-specific content.* (HS-ESS1-6)**
WHST.9-12.2	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS1-2),*(HS-ESS1-3),(HS-ESS1-5)***
SL.11-12.4	**Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.** ***(HS-ESS1-3)***

Mathematics -

MP.2	**Reason abstractly and quantitatively. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
MP.4	**Model with mathematics. (HS-ESS1-1),(HS-ESS1-4)**
HSN-Q.A.1	**Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
HSN-Q.A.2	**Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS1-1),*(HS-ESS1-2)*,(HS-ESS1-4),*(HS-ESS1-5),(HS-ESS1-6)***
HSN-Q.A.3	**Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
HSA-SSE.A.1	**Interpret expressions that represent a quantity in terms of its context.** ***(HS-ESS1-1),(HS-ESS1-2),*****(HS-ESS1-4)**
HSA-CED.A.2	**Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.** ***(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)***
HSA-CED.A.4	**Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.** ***(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)***

Students will engage with the following text:

1. *Science Spectrum*, 2001; 2011, Holt
2. Any and all articles and readings pertinent to current subject matter (i.e. *Popular Science Magazine)*.
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On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities. They will need to correctly and safely use basic laboratory equipment. The environment will foster interpersonal relations in a work-like atmosphere.

Example of lab report rubric used to assess student performance and understanding of task.

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<u>Students will write:</u>

In addition to the usual warm ups, closing activities, lab reports, example(s) of student activities requiring them to write are as follows:

1. **Personal reflections to current scientific events**
2. **Writing Prompts used as introductions to current subject matter**
3. **Daily Summaries to Cornell Note-Taking**

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies.
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PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

<u>How</u> will students uncover content and build skills.

The following instructional strategies are utilized on an as needed basis throughout the year:

1. **Direct Instruction (Sample notes)**
2. **Cornell Note-Taking**
3. **Scaffolding**
4. **Project Based Learning**
5. **Peer Based Learning/Review**
6. **Student presentations with peer review in addition to teacher assessment**
7. **Modeling**
8. **Drawing**
9. **Guided Discussion with analysis/prediction/defense of conclusions**
10. **Directed Reading**
11. **Guided Notes**
12. **Outlining**
13. **Technology: Microsoft Excel, PowerPoint, Word, Smartboard, LCD Projectors**
14. **Media Resources: Gizmos, Discovery Streaming, commercial video resources, YouTube, course websites (i.e. OnCourse and Google classroom)**

Once per quarter students are given a topical presentation assignment to research, present, and review.

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Throughout the year students will continually connect, utilize, and apply math skills including but not limited to graphing, solving for unknowns, and formulaic interpretation. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities. They will need to correctly and safely use basic laboratory equipment. The environment will foster interpersonal relations in a work-like atmosphere.
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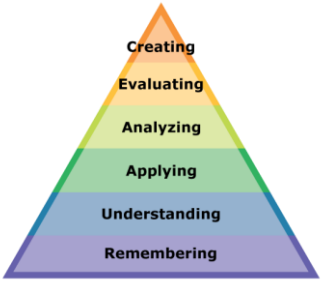

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The students will be assessed via multiple quizzes, tests, and laboratory assignments.

The following are examples : **Life Cycle of Stars Quiz** Blooms Levels- Remembering, Understanding, Applying

- examples of assessments and modified assessment are in the District Shared Google Shared IPS/PS folder

Accommodations/Modifications:

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Modifications: Extra space for responses, fill-in worksheets, chunk material in groups for easier readability, reword directions for clarity and comprehension, modify laboratory reports by providing a template on course website or Google classroom, adjust length of assignments as needed, modify supplemental materials for readability.

Accommodations: 1:1 assistance as needed, restate or rephrase instructions, answer key provided for students after competition of assignment, extended time to complete assessment, provide alternate access to any material or media via course website or Google classroom, monitor assignment book, assist in binder/notebook organization, preferential seating.

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may not already be installed on computers. Additionally some firewalls block downloading these types of files. Before assigning these activities to students it is essential for the teacher to try them on the computers that the students will use and to consult with the technology specialist if there are issues. These animations also have sound. Teachers may wish to provide headphones/speakers.

Summative Assessments:

The students will be asked to determine the life cycle a star is in based on the composition of core.

Stars Test Blooms Levels- Remembering, Understanding, Applying
Example of lab report rubric used to assess student performance and understanding of task.

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Performance Assessments:

The students will be asked to complete a Nuclear fusion and fission project. .

Nuclear fusion and fission Project Blooms Levels- Remembering, Understanding, Applying
Example of lab report rubric used to assess student performance and understanding of task.

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Accommodations/Modifications:

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Modifications: Extra space for responses, fill-in worksheets, chunk material in groups for easier readability, reword directions for clarity and comprehension, modify laboratory reports by

providing a template on course website or Google classroom, adjust length of assignments as needed, modify supplemental materials for readability.

<u>Accommodations:</u> 1:1 assistance as needed, restate or rephrase instructions, answer key provided for students after competition of assignment, extended time to complete assessment, provide alternate access to any material or media via course website or Google classroom, monitor assignment book, assist in binder/notebook organization, preferential seating.

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Unit 5: Big Bang Theory, Waves and Spectra

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: **Introduction to Physical Sciences** - Big Bang, Waves, and Light Spectra **Grade Level(s):** **9 -10**	**Unit Summary**: This unit focuses on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).
Essential Question(s): 1. **What is the evidence of the Big Bang Theory?** 2. **What evidence supports the expansion of the universe?** 3. **How does the light spectra relate to the Big Bang?**	**Enduring Understanding(s):** ESS1.A: The Universe and Its Stars ● The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. ● The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. PS4.B: Electromagnetic Radiation Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NGSS that are applicable

Learning Target: Bold: Indicates both courses Students will be able to:	**NGSS**
1.Relate how the Doppler effect supports the concept of an expanding universe and the Big Bang Theory **2. Describe the Big Bang Theory with three pieces of evidence.** **3. Analyze the absorption and emission line spectra to determine the movement and elemental composition of star and how this relates to the Big Bang Theory.** **4. Create a light spectra to describe the shifting of fictional galaxies.**	2, 3, 5 HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. 1, 4 HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

5. Explain why the universe is expanding.	

Inter-Disciplinary Connections:

Common Core State Standards Connections:

ELA/Literacy -

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.** ***(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-5),(HS-ESS1-6)***
WHST.9-12.1	**Write arguments focused on *discipline-specific content.* (HS-ESS1-6)**
WHST.9-12.2	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS1-2),*(HS-ESS1-3),(HS-ESS1-5)***
SL.11-12.4	**Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.** ***(HS-ESS1-3)***

Mathematics -

MP.2	**Reason abstractly and quantitatively. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
MP.4	**Model with mathematics. (HS-ESS1-1),(HS-ESS1-4)**
HSN-Q.A.1	**Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
HSN-Q.A.2	**Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS1-1),*(HS-ESS1-2)*,(HS-ESS1-4),*(HS-ESS1-5),(HS-ESS1-6)***
HSN-Q.A.3	**Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
HSA-SSE.A.1	**Interpret expressions that represent a quantity in terms of its context.** ***(HS-ESS1-1),(HS-ESS1-2),*****(HS-ESS1-4)**
HSA-CED.A.2	**Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.** ***(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)***
HSA-CED.A.4	**Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.** ***(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)***

Students will engage with the following text:

1. *Science Spectrum*, 2001; 2011, Holt
2. Any and all articles and readings pertinent to current subject matter (i.e. *Popular Science Magazine)*.
3. Any and all instructions related to current subject matter (i.e. laboratory guidelines).

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities. They will need to correctly and safely use basic laboratory equipment. The environment will foster interpersonal relations in a work-like atmosphere.

Example of lab report rubric used to assess student performance and understanding of task. - examples of strategies and modified strategies are in the District Shared Google Shared

IPS/PS folder

<u>Accommodations and/or modifications</u> will be made on a case by case basis in accordance with individual student needs. They may include but not be limited to: Read captions for understanding of concepts, read aloud passages for ELL students and auditory learners, demonstrate written concepts relating to force using manipulatives, rewrite specific passages in the text to assist students with independent readability levels and ELL students.

<u>Students will write:</u>

In addition to the usual warm ups, closing activities, lab reports, example(s) of student activities requiring them to write are as follows:

1. **Personal reflections to current scientific events**
2. **Writing Prompts used as introductions to current subject matter**
3. **Daily Summaries to Cornell Note-Taking**

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies.
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PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

<u>How</u> will students uncover content and build skills.

The following instructional strategies are utilized on an as needed basis throughout the year:

1. **Direct Instruction (Sample notes)**
2. **Cornell Note-Taking**
3. **Scaffolding**
4. **Project Based Learning**
5. **Peer Based Learning/Review**
6. **Student presentations with peer review in addition to teacher assessment**
7. **Modeling**
8. **Drawing**
9. **Guided Discussion with analysis/prediction/defense of conclusions**
10. **Directed Reading**
11. **Guided Notes**
12. **Outlining**
13. **Technology: Microsoft Excel, PowerPoint, Word, Smartboard, LCD Projectors**
14. **Media Resources: Gizmos, Discovery Streaming, commercial video resources, YouTube, course websites (i.e. OnCourse and Google classroom)**

Once per quarter students are given a topical presentation assignment to research, present, and review.

On a daily basis, students will enrich their reading, writing, and interpretation skills through the use of Cornell note-taking strategies. Throughout the year students will continually connect, utilize, and apply math skills including but not limited to graphing, solving for unknowns, and formulaic interpretation. Students must read and properly interpret laboratory directions in order to successfully and safely perform laboratory activities. They will need to correctly and safely use basic laboratory equipment. The environment will foster interpersonal relations in a work-like atmosphere.
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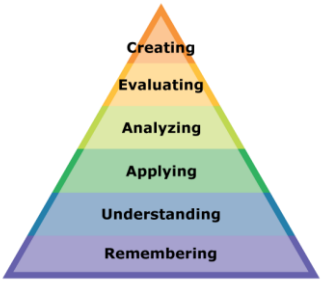
PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The students will be assessed via multiple quizzes, tests, and laboratory assignments.

The following are examples :
Doppler Shift Activity Blooms Levels- Remembering, Understanding, Applying
Star Spectra Gizmo Blooms Levels- Remembering, Understanding, Applying

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Accommodations/Modifications:

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Modifications: Extra space for responses, fill-in worksheets, chunk material in groups for easier readability, reword directions for clarity and comprehension, modify laboratory reports by providing a template on course website or Google classroom, adjust length of assignments as needed, modify supplemental materials for readability.

Accommodations: 1:1 assistance as needed, restate or rephrase instructions, answer key provided for students after competition of assignment, extended time to complete assessment, provide alternate access to any material or media via course website or Google classroom, monitor assignment book, assist in binder/notebook organization, preferential seating.

Suggestions for modified instruction and scaffolding for LEP students and/or students who need additional support are embedded in the unit plan and/or are added to the specific examples cited in the curriculum unit. The amount of scaffolding needed will depend on the level of English proficiency of each LEP student. Therefore, novice level students will need more support with the language needed to understand and demonstrate the acquisition of concepts than intermediate or advanced students.

Some of the recommended activities are computer based and require students to visit various internet sites and view animations of various processes. These animations require various players and plug-ins which may or

may not already be installed on computers. Additionally some firewalls block downloading these types of files. Before assigning these activities to students it is essential for the teacher to try them on the computers that the students will use and to consult with the technology specialist if there are issues. These animations also have sound. Teachers may wish to provide headphones/speakers.

Summative Assessments:

The students will be asked to determine the waves and the Big Bang Theory.

Big Bang Test Blooms Levels- Remembering, Understanding, Applying, Analyzing
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Performance Assessments:

The students will be asked to complete an analysis of the Shifts of Galaxies.

Analyzing the Spectra Blooms Levels- Analyzing, Evaluating
Investigating Hubbles Law Activities Blooms Levels- Remembering, Understanding, Applying, Analyzing

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Accommodations/Modifications:

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Unit 6: Motion in the Universe
PART I: UNIT RATIONALE
WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: **Introduction to Physical Sciences** - Motion in the Universe **Grade Level(s):** **9 -10**	**Unit Summary**: This unit focuses on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons. Examples of data could include tables or graphs of position or velocity as one object orbits a secondary object. In addition, there is a focus on the quantitative conservation of momentum in interactions of orbiting objects.
Essential Question(s): 1. **Why do objects travel in elliptical orbits in solar system?** 2. **How can one explain and predict interactions between objects and within systems of objects?** 3. **How is energy transferred and conserved?**	**Enduring Understanding(s):** **PS2.A: Forces and Motion** • Newton's second law accurately predicts changes in the motion of macroscopic objects. • Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. **ESS1.B: Earth and the Solar System** • Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES
DESCRIBE THE LEARNING TARGETS.
After each target, identify the NGSS that are applicable

Learning Target: Bold: Indicates both courses Students will be able to:	**NGSS**
1. Define, describe, calculate, and differentiate among position, acceleration, mass, and force. **2. Apply appropriate mathematical processes to solving orbital motion problems.** **3. Describe how all bodies of the solar system follow a predictable orbital path using Kepler's Law.** **4. Calculate the force between two objects using the universal law of gravitation** **5. Calculate the eccentricity**	1, 2, 3, 4, 5, 6, 7 HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. 1, HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

6. Differentiate the aphelion and perihelion **7. Describe the relationship between orbital period and the distance between two objects**	

Inter-Disciplinary Connections:

Common Core State Standards Connections:

Mathematics -

MP.2	**Reason abstractly and quantitatively. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
MP.4	**Model with mathematics. (HS-ESS1-1),(HS-ESS1-4)**
HSN-Q.A.1	**Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
HSN-Q.A.2	**Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS1-1),*(HS-ESS1-2)*,(HS-ESS1-4),*(HS-ESS1-5),(HS-ESS1-6)***
HSN-Q.A.3	**Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)**
HSA-SSE.A.1	**Interpret expressions that represent a quantity in terms of its context. *(HS-ESS1-1),(HS-ESS1-2)*,(HS-ESS1-4)**
HSA-CED.A.2	**Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)***
HSA-CED.A.4	**Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)***
HSF-IF.B.5	**Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *(HS-ESS1-6)***
HSS-ID.B.6	**Represent data on two quantitative variables on a scatter plot, and describe how those variables are related. *(HS-ESS1-6)***

ELA/Literacy -

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS2-1),(HS-PS2-6)

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. (HS-PS2-1)

WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS2-1),(HS-PS2-5)

Mathematics -

MP.2 Reason abstractly and quantitatively. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4)

MP.4 Model with mathematics. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4)

HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),(HS-PS2-5),(HS-PS2-6)

HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-PS2-

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HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),(HS-PS2-5),(HS-PS2-6)
HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context. (HS-PS2-1),(HS-PS2-4)
HSA.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (HS-PS2-1),(HS-PS2-4)
HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. (HS-PS2-1),(HS-PS2-2)
HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (HS-PS2-1),(HS-PS2-2)
HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (HS-PS2-1),(HS-PS2-2)
HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases. (HS-PS2-1)
HSS-IS.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). (HS-PS2-1)

Students will engage with the following text:

1. ***Science Spectrum*, 2001; 2011, Holt**
2. **Any and all articles and readings pertinent to current subject matter (i.e. *Popular Science Magazine)*.**
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PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.
<u>How</u> will students uncover content and build skills.

The following instructional strategies are utilized on an as needed basis throughout the year:

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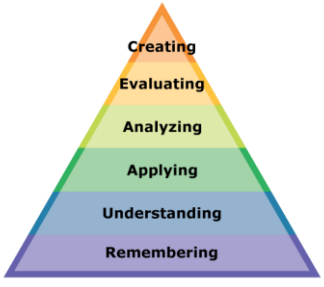
PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.



IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The students will be assessed via multiple quizzes, tests, and laboratory assignments.

The following are examples : **X-men Motion Quiz** Blooms Levels- Remembering, Understanding, Applying

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Suggestions for modified instruction and scaffolding for LEP students and/or students who need additional support are embedded in the unit plan and/or are added to the specific examples cited in the curriculum unit. The amount of scaffolding needed will depend on the level of English proficiency of each LEP student. Therefore, novice level students will need more support with the language needed to understand and demonstrate the acquisition of concepts than intermediate or advanced students.

Some of the recommended activities are computer based and require students to visit various internet sites and view animations of various processes. These animations require various players and plug-ins which may or may not already be installed on computers. Additionally some firewalls block downloading these types of files. Before assigning these activities to students it is essential for the teacher to try them on the computers that the students will use and to consult with the technology specialist if there are issues. These animations also have sound. Teachers may wish to provide headphones/speakers.

Summative Assessments:

The students will be asked to determine the life cycle a star is in based on the composition of core.
Orbital Motion Test Blooms Levels- Remembering, Understanding, Applying

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Performance Assessments:

The students will be asked to complete different labs and activities to support Kepler's Laws

Orbit Shape Activity Blooms Levels- Remembering, Understanding, Applying
Ellipse Lab Blooms Levels- Remembering, Understanding, Applying
Orbital Motion and Kepler's Law Simulation Blooms Levels- Remembering, Understanding, Applying, Analyzing
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Suggestions for modified instruction and scaffolding for LEP students and/or students who need additional support are embedded in the unit plan and/or are added to the specific examples cited in the curriculum unit. The amount of scaffolding needed will depend on the level of English proficiency of each LEP student. Therefore, novice level students will need more support with the language needed to understand and demonstrate the acquisition of concepts than intermediate or advanced students.

Some of the recommended activities are computer based and require students to visit various internet sites and view animations of various processes. These animations require various players and plug-ins which may or may not already be installed on computers. Additionally some firewalls block downloading these types of files.

Before assigning these activities to students it is essential for the teacher to try them on the computers that the students will use and to consult with the technology specialist if there are issues. These animations also have sound. Teachers may wish to provide headphones/speakers.