Physical Science Curriculum Map

Unit/Topic:

Study of Matter

Time Frame/Pacing:

Approximately 4 weeks

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.M.1: Classification of Matter

- **Heterogeneous vs. homogeneous**
- **Properties of matter**
- **State of matter and its changes**

1. Student will be able to distinguish between pure substances and mixtures.
2. Student will be able to identify homogeneous mixtures.
3. Student will be able to identify heterogeneous mixtures.
4. Student will be able to describe the molecular properties of various mixtures and pure substances.
5. Student will be able to generate models of elements, compounds, pure substances, and mixtures.
6. Student will be able to physically separate mixtures based on molecular properties.
7. Student will be able to chemically separate mixtures based on molecular properties.
8. Student will be able to identify the physical properties of a substance.
9. Student will be able to identify the chemical properties of a substance.
10. Student will be able to distinguish between the chemical and physical properties of a substance.

Instructional Resources

- Guided notes
- Whiteboarding
- Labs
- Nearpod
- Powerpoints
- Edpuzzle
- Gizmos/PhET simulations

Unit/Topic:

Study of Matter

Time Frame/Pacing:

3 Weeks

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.M.2: Atoms

- **Models of the atom (components)**
- **Isotopes**
- **Ions (cations and anions)**

Models of the atom

1. Student will be able to identify the parts of an atom.
    a. Protons, neutrons, electrons
2. Student will be able to define the properties and location of the parts of an atom.
    a. Relative mass, charge, location
3. Student will be able to determine the number of subatomic particles in a neutral atom.
4. Student will be able to recognize that each element has a unique atomic spectrum that can be used to identify the element.
5. Student will be able to determine the number of subatomic particles in an atom.
6. Student will be able to trace the development of atomic models including, the Dalton, Thompson, Rutherford, and Bohr.
7. Student will be able to model and explain Rutherford's gold foil experiment.
8. Student will be able to represent elements using the modified Bohr model of an atom.

Isotopes

1. Student will be able to define an isotope.

Instructional Resources

- Guided notes
- Whiteboarding
- Labs
- Nearpod
- Powerpoints
- Edpuzzle
- Gizmos/PhET simulations

2. Student will be able to calculate the average atomic mass of an element.

Ions

1. Student will be able to define an ion.
2. Student will be able to distinguish between cations and anions.
3. Student will be able to determine the number of subatomic particles in an ion.
4. Student will be able to demonstrate the behavior of charged particles.
5. Student will be able to predict the charge (or lack of charge) of a substance through experimentation.

Unit/Topic:

Study of Matter

Time Frame/Pacing:

2 weeks

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.M.3: Periodic trends of the elements

- **Periodic law**
- **Representative groups**

Periodic Law

1. Student will be able to predict the chemical and physical properties of elements based on placement on the periodic table.
    - Reactivity, mass, charge, number of valence electrons, atomic size, valence energy level, atomic number
2. Student will be able to identify substances as metals and non-metals based on physical and chemical properties.
3. Student will be able to differentiate between metals, non-metals, and metalloids.

Instructional Resources

- Guided notes
- Whiteboarding
- Labs
- Nearpod
- Powerpoints
- Edpuzzle
- Gizmos/PhET simulations

4. Student will be able to determine the molecular structure of compounds made of elements in groups (families) 1, 2, and 7.

Representative groups

1. Student will be able to identify elemental family groups.
    - Alkali Metals, Alkaline Earth Metals, Transition Metals, Halogens, and Nobel Gasses
2. Students will be able to explain why elements belong to a specific group or family.

Unit/Topic:

Study of Matter

Time Frame/Pacing:

14-15 days

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.M.4: Bonding and compounds
• Bonding (ionic and covalent)
• Nomenclature

Ionic and Covalent Bonding

1. Student will be able to distinguish between single elements and compounds.
2. Student will be able to define ionic bonding.
3. Student will be able to define covalent bonding.
4. Student will be able to distinguish between different bonding types.
5. Student will be able to model ionic and covalent bonding using Lewis Structures.
6. Student will be able to display examples of covalent bonding.
7. Student will be able to determine the molecular structure of compounds made of elements in groups (families) 1, 2, and 7.

Nomenclature

1. Student will be able to name covalent compounds using Greek prefixes when given the formula.

Instructional Resources

- Guided notes
- Whiteboarding
- Labs
- Nearpod
- Powerpoints
- Edpuzzle
- Gizmos/PhET simulations

2. Student will be able to write the formula for ionic and covalent compounds given the name.
3. Student will be able to name the ionic compound given the formula.
4. Student will be able to identify and can name a compound containing one or more polyatomic ions.

Unit/Topic:

Study of Matter

Time Frame/Pacing:

10-11 Days

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.M.5: Reactions of matter

- **Chemical reactions**
- **Nuclear reactions**

Chemical reactions

1. Student will be able to identify the reactants in a chemical reaction.
2. Student will be able to identify the products in a chemical reaction.
3. Student will be able to balance a chemical equation by manipulating coefficients for each substance.

Nuclear reactions

1. Student will be able to differentiate between chemical and nuclear reactions.
2. Student will be able to define nuclear force.
3. Student will be able to define electrical force referencing individual charges.
4. Student will be able to explain how nuclear force and electrical force determine the stability of an atom.
5. Student will be able to describe the process of nuclear decay.
6. Student will be able to graph the amount of substance vs. time during a simulated nuclear decay.

Instructional Resources

- Guided notes
- Whiteboarding
- Labs
- Nearpod
- Powerpoints
- Edpuzzle
- Gizmos/PhET simulations

7. Student will be able to analyze the graph of amount of substance vs. time to determine the age of a sample based on its half-life.
8. Student will be able to calculate the half-life of an isotope base on a simulation or model.
9. Student will be able to identify and provide examples of nuclear processes, Fission, Fusion

Unit/Topic:

Energy and Waves

Time Frame/Pacing:

About 2 Weeks for Conservation of Energy

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.EW.1: Conservation of energy

- **Quantifying kinetic energy**
- **Quantifying gravitational potential energy**
- **Energy is relative**

Conservation of Energy

1. Student will be able to utilize the relationship between kinetic and potential energy to determine the total energy of a system.Given the total energy of a system, Student will be able to determine the kinetic and/or potential energy.
2. Student will be able to model the conservation of energy in a collision.

Quantifying kinetic energy

1. Student will be able to calculate kinetic energy (E_k) of an object using the formula $E_k = ½\ mv^2$.
2. Student will be able to use the kinetic energy formula to solve for the mass or velocity of an object in motion.

Quantifying gravitational potential energy

1. Student will be able to calculate gravitational potential energy (E_g) of an object using the formula $E_g = mgh$.
2. Student will be able to use the gravitational potential energy formula to solve for mass, gravity, or height of an object.

Instructional Resources

Guided notes
Whiteboarding
Labs
Nearpod
Powerpoints
Edpuzzle
Gizmos/PhET simulations

Energy is relative

1. Student will be able to select or recognize a “zero energy” reference point.

Unit/Topic:	Time Frame/Pacing:
Energy and Waves	3 Days
Standards and Evidence of Learning (Learning Targets/I Can Statements)	**Instructional Resources**
PS.EW.2: Transfer and transformation of energy (including work) 1. Student will be able to trace energy conversions within a system. 2. Student will be able to calculate the amount of work done in a system by using the equation Work = the change in energy. 3. Student will be able to calculate the amount of work done in a system by using the equation work = force x distance. 4. Student will be able to identify if work is done based on direction of motion.	Guided notes Whiteboarding Labs Nearpod Powerpoints Edpuzzle Gizmos/PhET simulations

Unit/Topic:	Time Frame/Pacing:
Energy and Waves	8-11 Days
Standards and Evidence of Learning (Learning Targets/I Can Statements)	**Instructional Resources**
PW.EW.3: Waves • **Refraction, reflection, diffraction, absorption, superposition** • **Radiant energy and the electromagnetic spectrum** • **Doppler shift** **Refraction, reflection, diffraction, absorption, superposition** 1. Student will be able to define wave properties.	Guided notes Whiteboarding Labs Nearpod Powerpoints Edpuzzle Gizmos/PhET simulations

2. Student will be able to identify different types of waves -Longitudinal, transverse, surface
3. Student will be able to recognize wave interactions.
4. Student will be able to demonstrate reflection, refraction, diffraction, and interference.
5. Student will be able to trace energy changes in a wave.

Radiant energy and the electromagnetic spectrum

1. Student will be able to describe the characteristics of the electromagnetic spectrum using frequency, wavelength, and energy.
2. Student will be able to calculate the wave characteristics using $V = f\lambda$
3. Student will be able to identify the bands of the electromagnetic spectrum based on relative wavelength.
4. Student will be able to recognize that electromagnetic energy does not require a medium through which to travel at the speed of light.
5. Student will be able to explain why there is no sound produced in a vacuum such as space.
6. Student will be able to predict the color of an object based on wavelengths reflected.
7. Student will be able to identify if an object is transparent, translucent, or opaque.
8. Student will be able to evaluate a surface and describe the behavior of the waves reflected.
9. Student will be able to use the law of reflection to determine reflection of images in a plane mirror.

Doppler shift

1. Student will be able to describe the apparent behavior of a wave then the source of the wave and/or the observer is moving.
2. Student will be able to represent a Doppler shift using a diagram.

Unit/Topic:

Energy and Waves

Time Frame/Pacing:

1-2 Weeks

Standards and Evidence of Learning (Learning Targets/I Can Statements)	Instructional Resources
PS.EW.4: Thermal energy • **States of matter and its changes** **States of matter and its changes** 1. Student will be able to distinguish between solids, liquids, and gasses. 2. Student will be able to describe solids, liquids, and gasses using particle motion and kinetic energy (temperature). 3. Student will be able to collect data of the mass and volume of a substance in more than one way. 4. Student will be able to interpret a mass vs. volume graph to determine the density of a substance.	Guided notes Whiteboarding Labs Nearpod Powerpoints Edpuzzle Gizmos/PhET simulations

Unit/Topic:	Time Frame/Pacing:
Energy and Waves	8-9 Days (About 2 Weeks)

Standards and Evidence of Learning (Learning Targets/I Can Statements)	Instructional Resources
PS.EW.5: Electricity • **Alternating current, direct current** • **Movement of electrons** • **Electric potential (voltage)** • **Resistors and transfer of energy** **Alternating current, direct current** 1. Student will be able to predict the electrical properties of a substance based on the chemical properties. 2. Student will be able to describe the relationship between voltage, current, and resistance 3. Student will be able to define charge and use appropriate units to quantify charge.	Guided notes Whiteboarding Labs Nearpod Powerpoints Edpuzzle Gizmos/PhET simulations

Movement of electrons

1. Student will be able to predict the effect of excess charge on an object brought in contact with an uncharged object.

Electric Potential (voltage)

1. Student will be able to describe the movement of charges as a current.
2. Student will be able to describe ways that current is produced.

Resistors and transfer of energy

1. Student will be able to evaluate the amount of resistance caused by materials in a closed circuit.

Unit/Topic:

Forces and Motion

Time Frame/Pacing:

About 3 Weeks

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.FM.1: Motion

- **Introduction to one-dimensional vectors**
- **Displacement, velocity (constant, average and instantaneous) and acceleration**
- **Interpreting position**

Introduction to one-dimensional vectors

1. Student will be able to add negative and positive vectors.
2. Student will be able to distinguish between vector and scalar quantities.

Displacement, velocity (constant, average and instantaneous) and acceleration

1. Student will be able to summarize the difference between displacement and distance.
2. Student will be able to summarize the difference between velocity and speed.

Instructional Resources

Guided notes
Whiteboarding
Labs
Nearpod
Powerpoints
Edpuzzle
Gizmos/PhET simulations

3. Student will be able to calculate constant velocity using the formula v = d/t.
4. Student will be able to measure instantaneous velocity.
5. Student will be able to calculate average velocity.

Interpreting position vs. time and velocity vs. time graphs

1. Student will be able to plot a position vs. time graph using data I collect.
2. Student will be able to analyze a position vs. time graph to determine displacement, velocity, and acceleration.
3. Student will be able to produce a velocity vs. time graph using data I collect.
4. Student will be able to produce a velocity vs. time graph by analyzing a position vs. time graph.
5. Student will be able to analyze a velocity vs. time graph to determine displacement, average velocity, direction, and acceleration

Unit/Topic:

Forces and Motion

Time Frame/Pacing:

12-13 Days (3 Weeks)

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.FM.2: Forces

- **Force diagrams**
- **Types of forces (gravity, friction, normal, tension)**
- **Field model for forces at a distance**
- **Dynamics (how forces affect motion)**
- **Newton's Laws**

Force diagrams

1. Student will be able to model forces acting on an object using a force diagram.

Instructional Resources

Guided notes
Whiteboarding
Labs
Nearpod
Powerpoints
Edpuzzle
Gizmos/PhET simulations

2. Student will be able to represent the relative magnitude of forces acting on objects using appropriate vectors.

Types of forces (gravity, friction, normal, tension)

1. Student will be able to identify different types of forces.

Field model for forces at a distance

1. Student will be able to conduct an experiment that will measure the force of gravity on an object.
2. Student will be able to calculate the weight of an object using the force of gravity and mass of the object.
3. Student will be able to distinguish between weight and mass.

Dynamics (how forces affect motion)

1. Student will be able to analyze whether the forces in a system are balanced or unbalanced.
2. Objects at rest
3. Student will be able to identify and label the forces on an object at rest.
4. Objects moving at a constant velocity
5. Student will be able to identify and label forces acting on a non-accelerating moving object.
6. Accelerating objects
7. Student will be able to identify and label forces acting on an accelerating object.
8. Student will be able to investigate the effect of outside forces on the direction and speed of an object.

Newton's Laws

1. Student will be able to show how Newton's three laws affect the motion of an object.

Unit/Topic:	Time Frame/Pacing:
Forces and Motion	12 Days (3 Weeks)

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.FM.3: Dynamics (how forces affect motion)
- **Objects at rest**
- **Objects moving with constant velocity**
- **Accelerating objects**

1. Student will be able to distinguish between positive and negative velocity and acceleration.
2. Student will be able to model constant acceleration.
3. Student will be able to plot a position vs. time graph using data he/she collects.
4. Student will be able to analyze a position vs. time graph to determine displacement, velocity, and acceleration.
5. Student will be able to produce a velocity vs. time graph using data he/she collects.
6. Student will be able to produce a velocity vs. time graph by analyzing a position vs. time graph.
7. Student will be able to analyze a velocity vs. time graph to determine displacement, average velocity, direction, and acceleration.

Instructional Resources

Guided notes
Whiteboarding
Labs
Nearpod
Powerpoints
Edpuzzle
Gizmos/PhET simulations

Unit/Topic:

The Universe

Time Frame/Pacing:

3 Days

Standards and Evidence of Learning (Learning Targets/I Can Statements)

PS.U.1: History of the universe

1. Student will be able to trace the evolution of the universe citing evidence of the Big Bang Theory.
2. Student will be able to cite evidence that the universe is expanding.

Instructional Resources

Guided notes
Whiteboarding
Labs
Nearpod
Powerpoints

	Edpuzzle Gizmos/PhET simulations Hubble Telescope Invisible Universe Video

Unit/Topic:	Time Frame/Pacing:
The Universe	1-2 Weeks
Standards and Evidence of Learning (Learning Targets/I Can Statements)	**Instructional Resources**
PS.U.2: Galaxies **Galaxy formation** 1. Student will be able to distinguish between a galaxy, solar system, and universe. 2. Student will be able to recognize that if a galaxy is red shifted, it is moving away at a great speed. 3. Student will be able to distinguish between spiral, elliptical, and irregular shaped galaxies.	Guided notes Whiteboarding Labs Nearpod Powerpoints (galaxies) Edpuzzle Gizmos/PhET simulations https://www.astrocappella.com/doppler.shtml

Unit/Topic:	Time Frame/Pacing:
The Universe	1-2 Weeks
Standards and Evidence of Learning (Learning Targets/I Can Statements)	**Instructional Resources**
PS.U.3: Stars **• Formation: stages of evolution** **• Fusion in stars** **Formation; stages of evolution**	Guided notes Whiteboarding Labs Nearpod Powerpoints (All about stars and Star in a box) Edpuzzle

1. Student will be able to trace the evolutionary steps of star formation.
2. Student will be able to classify a star based on its position on a Hertzprung-Russell diagram.

Fusion in stars

1. Student will be able to summarize how stars form elements through fusion.

Gizmos/PhET simulations