**Window Rock Unified School District # 8**

**Curriculum Guide**

**2021 - 2022**

**SUBJECT: Physics GRADE: 10 TIMELINE : 1st Quarter (Aug.5 - Oct.8, 2021)**

**Theme/Big Ideas for this Unit: MECHANICS: Motion and Energy**

**Essential Questions for this Unit:**

1.

2.

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| --- | --- | --- | --- | --- | --- |
| **Standards** | **Core Ideas** | **Student Friendly Objectives** | **Assessment** | **Resources** | **Vocabulary** |
| **HS.P3.U1.6** - Collect, analyze, and interpret data regarding the change in the motion of an object or system in one dimension, to construct an explanation using Newton’s Laws.**HS.P3.U2.7** - Use mathematics and computational thinking to explain how Newton’s laws are used in engineering and technologies to create products to serve human ends.**Supporting Plus Standards:**HS+Phy.P3U1.3 (Projectile)HS+Phy.P3U1.2 HS+Phy.P3U1.3 HS+Phy.P3U1.4HS+Phy.P3U2.5**HS.P3.U1.6** - Collect, analyze, and interpret data regarding the change in the motion of an object or system in one dimension, to construct an explanation using Newton’s Laws.**HS.P3.U2.7** - Use mathematics and computational thinking to explain how Newton’s laws are used in engineering and technologies to create products to serve human ends.**Supporting Plus Standards:**HS+Phy.P3U1.3 (Projectile)HS+Phy.P3U1.2 HS+Phy.P3U1.3 HS+Phy.P3U1.4HS+Phy.P3U2.5 |  | 1.Identify what is and is not science.2. Explain the basics of the study of physics.3. Identify scientific and nonscientific questions.4. Explain the role of physics in society.5. Identify careers based in physics.6. Distinguish between hypotheses, theories, laws,  and observations.7. Use the correct number of significant figures.8. Explain what can cause measurement error.9. Convert between units.10. Determine the best type of graph for a set of  data.11. Determine the slope of a line.12. Interpolate and extrapolate data on a linear  graph.13. Determine the area under a curve.14. Distinguish between scalar and vector  quantities.15. Use and analyze vectors graphically.16. Add vector quantities.17. Resolve vectors into their components.18. Apply trigonometry to basic problems involving angles.19. Complete the lab titled "Measuring and  Estimating."20. Communicate lab results with your peers in an  online discussion.21.Differentiate among different types of energy.22.Describe the four fundamental forces.23. Identify everyday forces.24. Describe how the strengths of the fundamental  forces vary with distance.25. Calculate the kinetic energy of a moving object.26. Calculate the gravitational potential energy of a  system.27. Describe transformations of energy in simple and  complex systems.28. Perform calculations that illustrate the law of  conservation of energy.29. Diagram energy transfers.30. Differentiate between work, power, and energy.31. Calculate the work done and power produced in  simple systems.32. Identify various types of simple machines.33. Determine the mechanical advantage of various  simple machines.34. Compare the advantages and disadvantages of  various energy sources.35. Determine the energy use and efficiency of various  household electronics.36. Perform calculations involving distance, speed,  displacement, time, and velocity.37. Create and interpret graphs representing motion  versus time.38. Perform calculations involving the acceleration of an object.39. Relate acceleration to velocity, displacement, and  time.40. Perform calculations that relate the force of  gravity to time, distance, velocity, and maximum  height of an object.41. Perform calculations involving two-dimensional  trajectory.42. Solve problems involving circular motion.43. Demonstrate that the solution to a problem  Involving motion depends on the frame of  reference.44. Solve motion problems with respect to a variety of  frames of reference. | To view the differentiated video lessons and quizzes,**Join De Guzman's Virtual Physics Classroom on Edpuzzle -** <https://edpuzzle.com/join/daulsof>[Chapter 1 Test - About Science](https://drive.google.com/file/d/1SpUYLhpxz3RPxBB5ctyUsTkxWzXPgPXQ/view?usp=sharing)[Chapter 4 Test - Linear Motion](https://drive.google.com/file/d/1OHyQJQz_ujumdcuxJShImHP8gHMaLloP/view?usp=sharing)[Chapter 5 Test - Projectile Motion](https://drive.google.com/file/d/1DvwabQcb0pdu497yaZzQY72FZu3dThzh/view?usp=sharing)To view the differentiated video lessons and quizzes,**Join De Guzman's Virtual Physics Classroom on Edpuzzle -** <https://edpuzzle.com/join/daulsof>[Chapter 9 Test - Energy](https://drive.google.com/file/d/1jVha5ZBewX33qut5rJiJlP_sj98memI3/view?usp=sharing) | APEX (Units 1-3)LABSTERSMART Board**CANVAS will be used for assessments and email communications from students.**EdPuzzle Videos (Interactive Video Lessons)Quizziz and KahootConceptual Physics by Paul Hewitt[Chapter 1 eBook](https://drive.google.com/file/d/1-YlfYBlwFkKZaObzPMiMFkydUaNtHJ8X/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1O5SQY57c1oZGlpKxUGhGpth90uuWm52S/view?usp=sharing)[Chapter 9 Energy eBook](https://drive.google.com/file/d/1tg2jVKVEV8rITqzPQA3ayVPx7MqaR_kD/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1Cwj3hNyCBrJ9sOVROs7Ho1m1_wua0-MM/view?usp=sharing)[Chapter 4 Linear Motion ebook](https://drive.google.com/file/d/1kJptGjDsTAFVfwVNzxcDt9FnH-A9vw4Z/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1fRS7C5wVPQLxtXXmr8NchMuKJ1rVOiLg/view?usp=sharing)[Motion Packet](https://drive.google.com/file/d/1gHrghsXfpet1Sx1Ex3it6menQYrGiQxI/view?usp=sharing)[Acceleration, Speed, Velocity Scavenger Hunt](https://drive.google.com/file/d/1eGeWNSn2kwLb4rEC1FDEh3ooYJNLuV9w/view?usp=sharing)[Kinematics Example Problems](https://docs.google.com/document/d/1re_V5iXTuysYSZG96B8wqc3L-hZK7qMhIvZalP6O8t4/edit?usp=sharing)[Chapter 5 Projectile Motion eBook](https://drive.google.com/file/d/1a5LNnxzyBbrbJNle9QlFxaA0c1Uxuykn/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1b7H6iAUD_RQuKPhz2KxNwIPIbbTTR3Tk/view?usp=sharing)[Free-Fall Example Problems #1](https://docs.google.com/document/d/1ErSDCRdHvBo6FKSNP3JWCP6JzlOB9K9ux-pfcFcAd_M/edit?usp=sharing)[Free-Fall Example Problem #2](https://drive.google.com/file/d/1QLrWzNLnsUqtYikIxeorrDzsFUYfSkHr/view?usp=sharing)[Free-Fall Example Problem #3](https://drive.google.com/file/d/1krLqzEyWfghGmYu-Mqq2vHTEPP2I2UCj/view?usp=sharing)[Energy](https://drive.google.com/file/d/19DaYewcL7CYvpQjPkDlMEs2_bZaDo9b1/view?usp=sharing)[Kinetic Energy Equation](https://drive.google.com/file/d/1Ci_zGw4daX3Wwdf5nGFryX0XfSyvCh0M/view?usp=sharing)[Kinetic Energy Foldable #1](https://drive.google.com/file/d/1cSh1nbvxvKqrhwiqWZKdsakAy5MWnYaA/view?usp=sharing)[Kinetic Energy Foldable #2](https://drive.google.com/file/d/1Itr6YLIg1_3QSwtOCb7sjrhz5YT8OwF8/view?usp=sharing)[Energy Forms and Changes Simulation](https://docs.google.com/document/d/1wx8WWQtdWA2Wus4masHIc3BJ1id_lYKrLGTtHC0Llcs/edit?usp=sharing)[Energy Background and Study Guide](https://drive.google.com/file/d/18mKnMIrQDeQLpgDiE6ZWjnOeQc3zjel5/view?usp=sharing)[Scientific Categories and Their Relationship](https://drive.google.com/file/d/1t0IdH53zxIii-QHeLfom9Ka7o6Ye-e3t/view?usp=sharing) [Concept Map](https://drive.google.com/file/d/1t0IdH53zxIii-QHeLfom9Ka7o6Ye-e3t/view?usp=sharing)[Fillable Cornell Notes](https://drive.google.com/file/d/1ErtXREAOsvA1ABmwN35s-2L4Ea73twt7/view?usp=sharing)[Scientific Method Reading](https://drive.google.com/file/d/1ycmJdr7kRQbhVZ57mZfz2vBJswURPWiB/view?usp=sharing)[Representing Vectors](https://drive.google.com/file/d/1eHHJy2jQwrRH9Zo_FjaXioa8j90UHAJM/view?usp=sharing)[Practice with Dependent and Independent Variables](https://drive.google.com/file/d/1HFT7hY7pgyMftFn0uU5D7uTAonTtsYrp/view?usp=sharing)[Scientific Method Notes](https://drive.google.com/file/d/1noLxh27O_3lUJei1GxXiN5uXpPLEUDCK/view?usp=sharing)[Scientific Notation](https://drive.google.com/file/d/12W3wiVTpTDtyV8TOFQ_eiKCc6KYEU1fM/view?usp=sharing)[IV and DV Scenarios](https://drive.google.com/file/d/1yOwZXelpOuZw4CfrJE4aCYqxEhnfnNNN/view?usp=sharing)[ABC Graphic Organizer](https://drive.google.com/file/d/1yOwZXelpOuZw4CfrJE4aCYqxEhnfnNNN/view?usp=sharing) | 1. Analyze2. Conclusion3. Controlled  Experiment4. Data5. Dependent  Variable6. Empirical7. Energy8. Experiment9. Hypothesis10. Independent  Variable11. Law12. Matter13. Measurement14. Observation15. Peer Review16. Phenomenon17. Physicist18. Physics19. Primary Source20. Pseudoscience21. Scientific  Method22. Scientific  Question23. Secondary  Source24. Theory25. Variable26. Speed27. Adjacent28. Angle29. Components30. Cosine31. Hypotenuse32. Magnitude33. Scalar34. Tangent35. Vector36. Vector Addition37. Vector Quantity38. Vector Resolution39. Velocity40. Chemical Energy41. Compression42. Contact Force43. Elastic Energy44. Electric Force45. Electrical Energy46. Electromagnetic Force |
| **Crosscutting Concepts:** | **Science and Engineering Practices:** |
| * Patterns
* Cause and Effect
* Scale,Proportion, Quantity
* Systems and systems model
* Energy and Matter
* Structure and Function
* Stability and Change
 | * Collect, Analyze, and Interpret Data.
* Use Mathematics and Computational Thinking.
* Develop and Use a Mathematical Model.
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| **Anchoring Phenomenon:** | **Investigative Phenomenon:** |
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**Window Rock Unified School District # 8**

**Curriculum Guide**

**2021-2022**

**SUBJECT: Physics GRADE: 10 TIMELINE : 2nd Quarter (Oct. 12 - Dec. 17, 2021)**

**Theme/Big Ideas for this Unit: Energy and Momentum Conservation/ Newton’s Laws**

**Essential Questions for this Unit:**

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| --- | --- | --- | --- | --- | --- |
| **Standards** | **Core Ideas** | **Student Friendly Objectives** | **Assessment** | **Resources** | **Academic Vocabulary** |
| **HS.P4U1.8** - Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings.**HS.P4U3.9** - Engage in an argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.**HS.E1U1.13** - Evaluate explanations and theories about the role of energy and matter in geologic changes over time.**HS.E1U3.14** - Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.**Supporting Plus Standards**HS+Phy.P3U1.4 HS+E.E1U1.6HS+Phy.P3U2.5 HS+E.E1U1.7HS+Phy.P4U1.6 HS+E.E1U1.8HS+Phy.P4U2.7**HS.P4U1.8** - Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings.**HS.P4U3.9** - Engage in an argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.**HS.E1U1.13** - Evaluate explanations and theories about the role of energy and matter in geologic changes over time.**HS.E1U3.14** - Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.**Supporting Plus Standards**HS+Phy.P3U1.4 HS+E.E1U1.6HS+Phy.P3U2.5 HS+E.E1U1.7HS+Phy.P4U1.6 HS+E.E1U1.8HS+Phy.P4U2.7 |  | 1. Describe and apply Newton's laws.
2. Identify examples of Newton's laws in everyday scenarios.
3. Perform calculations involving Newton's second law.
4. Construct and interpret free-body diagrams for situations involving both balanced and unbalanced forces.
5. Calculate the net force or resultant force on an object.
6. Determine the change in motion of an object acted on by multiple forces.
7. Differentiate between static and kinetic friction.
8. Solve problems involving frictional forces.
9. Complete the lab titled "Dynamics."
10. Communicate lab results with your peers in an online discussion.
11. Differentiate among force, energy, and momentum.
12. Calculate the momentum of a mechanical system.
13. Explain the law of conservation of momentum.
14. Identify and explain each of the three types of collisions.
15. Solve an elastic collision problem.
16. Solve an inelastic collision problem.
17. Apply the law of conservation of energy to situations involving harmonic motion.
18. Perform calculations involving Hooke's law.
19. Describe the motion of satellites.
20. Explain planetary motion.
21. Perform calculations involving the gravitational force between two objects.
22. Differentiate rotation from revolution.
23. Describe Kepler’s Laws.
24. Explain and solve problems involving Newton’s Law of Universal Gravitation.
25. Explain work, power, and Energy.
26. Explain simple machines.
 | To view the differentiated video lessons and quizzes,**Join De Guzman's Virtual Physics Classroom on Edpuzzle -** <https://edpuzzle.com/join/daulsof>[Chapter 3 Test - Newton’s First Law of Motion](https://drive.google.com/file/d/1EbcRoKy8edbd2UZjnlhZ8pRADxEz99C9/view?usp=sharing)[Chapter 6 Test - Newton’s Second Law of Motion](https://drive.google.com/file/d/106BHUKVBmUs6Fc6DNrqMypOUDtVRcCva/view?usp=sharing)[Chapter 7 Test - Newton’s Third Law of Motion](https://drive.google.com/file/d/1HWQXm_QpQLBBGQRPNas1edTwH3SQHOtd/view?usp=sharing)[Chapter 10 Test - Circular Motion](https://drive.google.com/file/d/1gH41NxEcPNTf7aRJQ_ErF-x25jhSOrMx/view?usp=sharing)[Chapter 8 Test - Momentum](https://drive.google.com/file/d/1Ptpf17sJk90IjS26XBmfxWH5Hru85vpU/view?usp=sharing) | APEX (Units 4-6)SMART Board**CANVAS will be used for assessments and email communications from students**.EdPuzzle Videos (Interactive Video Lessons)Quizziz and KahootConceptual Physics by Paul Hewitt[Simple Machines](https://drive.google.com/file/d/1CQ-GUo9fCdzhDsmodF8lfYCAJQHwzuxR/view?usp=sharing)[Power Equation](https://drive.google.com/file/d/1pW2y0exU46O7Gl_CPK0kRRykn80kPtNr/view?usp=sharing)[Power Foldable #1](https://drive.google.com/file/d/1iFsTqZuBpYiv9wWWogKPOjpbs3NRz8JE/view?usp=sharing)[Power Foldable #2](https://drive.google.com/file/d/1xc_WxPRTXSMiYJ3svVNvl82pAE6E2gju/view?usp=sharing)[KWL Chart](https://docs.google.com/document/d/1CUiwfrdRlbjCvJtx55GUlmlZ0zrZnaDEKaEd7RBJ1xg/edit?usp=sharing)[Everyday Forces](https://drive.google.com/file/d/1Gf7LNYKUVRSDicbRZQ5ZoZ0CU-uBXFV4/view?usp=sharing)[Energy Background Student Guide](https://drive.google.com/file/d/1OQr1cnyTtLCwIJUUBPuOwkZJxeXDpIxx/view?usp=sharing)[Energy Conversions Study Guide](https://drive.google.com/file/d/1cNCYdHLyySeklWDZR42Rf7qv8IHpAiAR/view?usp=sharing)[Venn Diagram](https://docs.google.com/document/d/1O7iVzSbfV9q1fAVABJA2NJZMVYk5vYPnH9IXLqwTuw8/edit?usp=sharing)[Energy Overview](https://drive.google.com/file/d/1mB__1wd4PPgWzDTD3bBMAFBiGbxslG0Q/view?usp=sharing)[Work-Energy-Power-Machines Study Guide](https://docs.google.com/document/d/1-JXRu4YRxI5givv1UJpW-oxoogcV58TsKNO7Zuwvkio/edit?usp=sharing)[Simple Machines Study Guide](https://docs.google.com/document/d/1cVct79fWKaQNEVOqVXynbwRHiNcb5VfttHfRgTQ55t4/edit?usp=sharing)[Simple Machines Study Guide #2](https://drive.google.com/file/d/1_xtucTdF1Mh8OOQanfQL_d2_pzv8KZOo/view?usp=sharing)[Chapter 3 Newton’s First Law of](https://drive.google.com/file/d/1lzlI1XKdijqRYO4GJ7QKjEc6o59DkW2S/view?usp=sharing) [Motion ebook](https://drive.google.com/file/d/1lzlI1XKdijqRYO4GJ7QKjEc6o59DkW2S/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1mLItBxDTvqrAok6VEhruNh_uNpYmfiWq/view?usp=sharing)[Chapter 6 Newton’s Second Law of](https://drive.google.com/file/d/1BE1dYUwLg3neiaFcf0d06FPNU3YUlhOX/view?usp=sharing) [Motion ebook](https://drive.google.com/file/d/1BE1dYUwLg3neiaFcf0d06FPNU3YUlhOX/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1Ho1LSBYZLeEJgNxsNREPVQkHIFt_TpA6/view?usp=sharing)[Chapter 7 - Newton’s Third Law of Motion ebook](https://drive.google.com/file/d/1R1Ee_wF5kJxPo8BU5OsFeA6AUHYWfgPW/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1IrI0ZspMb1odBWgK_I_60QO7KQ8Ik0Mf/view?usp=sharing)[Chapter 10 Circular Motion ebook](https://drive.google.com/file/d/1dkllDmGcHvItqy-CIqvvDkOd-wuYW-3v/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1g6M52wdCXfKuYXiVAWbtC27T8dmEA7k4/view?usp=sharing)[Newton’s Laws Tutorial(Physics Classroom)](https://www.physicsclassroom.com/Physics-Tutorial/Newton-s-Laws)[Work, Energy, and Power Tutorial](https://www.physicsclassroom.com/class/energy)[Types of Forces](https://www.physicsclassroom.com/class/newtlaws/Lesson-2/Types-of-Forces)[Free-Body Diagram Interactive Activity](https://www.physicsclassroom.com/Physics-Interactives/Newtons-Laws/Free-Body-Diagrams/Free-Body-Diagram-Interactive)[Momentum and Collisions Interactive Activities](https://www.physicsclassroom.com/Physics-Interactives/Momentum-and-Collisions)[Chapter 2 Mechanical Equilibrium ebook](https://drive.google.com/file/d/1WjzXE0aPm62C1v759laCN4hZYSb2aq0A/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1HbEzHw4HDh-vZX69xZ16kNrRULrFu35M/view?usp=sharing)[Chapter 8 Momentum ebook](https://drive.google.com/file/d/1YqcpPjutsYfn8bXv9TYpMUoWpFf8-kuk/view?usp=sharing) and [Study Guide](https://drive.google.com/file/d/1GlDEILF85hSWeaeLWYHNup4DfVKPfNY8/view?usp=sharing) | 1. Action-reaction pair2. Inertia3. Newton’s First Law4. Newton’s Second  Law5.Newton’s Third Law6. Balanced Force7. Dynamic Equilibrium8. Free-Body Diagram9. Frictional Force10. Kinetic Friction11. Static Equilibrium12. Static Friction13. Unbalanced Force14. Elastic Collision15. Impulse16. Inelastic Collision17. Law of  Conservation  of Momentum18. Momentum19. Perfectly Inelastic  Collision20. Time of Impact21. Elastic Potential  Energy22. Harmonic Motion23. Hooke’s Law 24. Pendulum25. Periodic Motion26. Spring27. Spring Constant |
| **Crosscutting Concepts:** | **Science and Engineering Practices:** |
| * Patterns
* Cause and Effect
* Scale,Proportion, Quantity
* Systems and systems model
* Energy and Matter
* Structure and Function
* Stability and Change
 | * Engage in argument from evidence
* Develop and use models
* Design, evaluate, and refine a device
* Analyze and interpret data
 |
| **Anchoring Phenomenon:** | **Investigative Phenomenon:** |
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**Window Rock Unified School District # 8**

**Curriculum Guide**

**2021-2022**

**SUBJECT: Physics GRADE: 10 TIMELINE : 3rd Quarter (Jan.5 - March 11, 2022)**

**Theme/Big Ideas for this Unit: Gravitation, Electrostatics, and Simple Circuits**

**Essential Questions for this Unit:**

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2.

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| **Standards** | **Core Ideas** | **Student Friendly Objectives** | **Assessment** | **Resources** | **Vocabulary** |
| **HS.P2U1.5 -** Construct an explanation for a field’s strength and influence on an object (electric, gravitational, magnetic).**HS.E2U1.17 -** Construct an explanation of the origin, expansion, and scale of the universe based on astronomical evidence.**HS.E2U1.16 -** Construct an explanation of how gravitational forces impact the evolution of planetary motion, structure, surfaces, atmospheres, moons, and rings.**Supporting Plus Standards****HS.Phy.P3U1.2 -** Develop and use mathematical models of Newton’s Law of gravitation and Coulomb;s law to describe and predict the gravitational and electrostatic forces between objects.**HS.Phy.P3U1.3** - Develop a mathematical model, using Newton’s laws, to predict the motion of an object or system in two dimensions (Circular Motion). **HS.P4U1.8** - Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchange between the system and the surroundings.**HS+E.E2U1.13** - Analyze and interpret data showing how gravitational forces are influenced by mass, and distance between objects.**HS+E.E2U1.14** - Use mathematics and computational thinking to explain the movement of planets and objects in the solar system. |  | 1. Describe the history of the development of atomic theory and the structure of an atom.2. Use the periodic table to find the atomic number and atomic mass number of an element and the number of electrons, protons, and neutrons in an atom or ion.3. Distinguish between atoms and molecules.Distinguish among ionic, covalent, and metallic bonding.4. Use the periodic table to determine whether an element is a metal, nonmetal, or metalloid.Explain how the atomic structure of metals leads to the conductive properties of metals.5. Describe the various states of matter in terms of kinetic molecular theory.6. Relate temperature and pressure at the molecular level of matter.7. Relate internal, kinetic, and potential energies.8. Determine the relationship between the temperature and molecular velocity of a gas.9. Understand and apply Archimedes', Bernoulli's, and Pascal's principles.10. Describe the unique properties of water.11. Compare exothermic and endothermic reactions.12. Draw a potential energy diagram for a chemical reaction.13. Understand and apply the first law of thermodynamics.14. Differentiate between open, closed, and isolated systems.15. Calculate the heat, work, and internal energy of a thermodynamic system.16. Describe entropy.17. Understand what affects the efficiency of a heat engine.18. Compare methods of heat flow.19. Describe the connections between specific heat capacity and molecular properties.20. Solve problems using specific heat capacity and latent heat values.21.Determine the final temperature when two objects at different temperatures are in contact.22. Interpret heating and cooling curves.23. Determine the force between two electric charges.24. Calculate an electric field.25. Relate electric potential energy to the positions of two charges.26. Recognize and describe energy conversions in systems involving electric potential energy.27. Perform calculations involving electric potential energy, capacitance, and potential difference.28. Solve problems using Ohm's law.29. Calculate the energy dissipation in a resistor.30. Explain the relationships among current, voltage, resistance, and power.31. Diagram series, parallel, and combined circuits.32. Determine the current, resistance, or voltage in a series or parallel circuit.33. Differentiate among complete, open, and short circuits.34. Describe the properties of magnetic fields.35. Map the magnetic field of a permanent magnet.36. Explain how magnetic fields can produce electric fields, and how electric fields can produce magnetic fields.37. Describe the properties of electromagnetic waves.38. Explain how generators, motors, and transformers rely on electric and magnetic fields. | 1. [Chapter 17 Test - The atomic nature of matter.](https://drive.google.com/file/d/1c1AR8cV-9ePAAnTNBXQLtKL9cWNExJq1/view?usp=sharing)
2. [Chapter 18 Test - Solids](https://drive.google.com/file/d/17dpzLifJedGMubRxT4uH4jOoMwZ5el0l/view?usp=sharing)
3. [Chapter 19 Test - Liquids](https://drive.google.com/file/d/1Kp8bGGYXg8y7HNYo0X0zWRyDlRcQ1Tz6/view?usp=sharing)
4. [Chapter 20 Test - Gases](https://drive.google.com/file/d/1UI7o_shJBLJuHxYI-qX6Abo3DyqzMM-Q/view?usp=sharing)
5. [Chapter 21 Test - Temperature, Heat, Expansion](https://drive.google.com/file/d/131SD25MjVjQtAgvfqH2WUFq8s718Mon8/view?usp=sharing)
6. [Chapter 22 Test - Heat Transfer](https://drive.google.com/file/d/1kMXxULiNNF7GS5G3VI3q8WtV_U9XGUVb/view?usp=sharing)
7. [Chapter 23 Test - Change of Phase](https://drive.google.com/file/d/1M_vLYPkd2SlhikC8UkbykgO60t48cFFk/view?usp=sharing)
8. [Chapter 24 Test - Thermodynamics](https://drive.google.com/file/d/1NcdpUyZz13SF32C1ogKhnd0zzK_RQtxx/view?usp=sharing)
 | APEX (Units 1-3)LABSTERSMART Board**CANVAS will be used for assessments and email communications from students**.1. EdPuzzle Videos (Interactive Video Lessons)
2. Quizziz and Kahoot
3. Conceptual Physics by Paul Hewitt
* [**Ch.17 The Atomic Nature of Matter**](https://drive.google.com/file/d/1LwPyv-KMwI7ik7Vqc43V9vaMOuiZ7MYn/view?usp=sharing) and [**Ch.17 Study Guide**](https://drive.google.com/file/d/1feAorcHWBxa7q4F0eqY7sVHArCE7GTQk/view?usp=sharing)
* [**Ch.18 Solids**](https://drive.google.com/file/d/14Bg-XFS6KWBXFc8qr-FCEiI64-kNphuM/view?usp=sharing) and [**Ch.18 Study Guide**](https://drive.google.com/file/d/1r_mxxj5MtX1VEftTZswqEoEdTWqfkAuM/view?usp=sharing)
* [**Ch.19 Liquids**](https://drive.google.com/file/d/1QEU_GQkkO51gMdkbGUDftvKYgbZyvjav/view?usp=sharing) and [**Ch. 19 Study Guide**](https://drive.google.com/file/d/1f4lVf7vFP-UqVSXyGRN33weTXH8MtByJ/view?usp=sharing)
* [**Ch.20 Gases**](https://drive.google.com/file/d/1r6sDMVcHE9BYB4UplYSCf9sklY1pD0Fk/view?usp=sharing)and [**Ch.20 Study Guide**](https://drive.google.com/file/d/10GedOceFSPIcvT8Dr_ZVanb3Q0xYcwur/view?usp=sharing)
* [**Chapter 21 - Temperature, Heat, Expansion**](https://drive.google.com/file/d/1tR8TbBxwuQlw7EnfqklSXByl6otx36sN/view?usp=sharing) and [**Study Guide**](https://drive.google.com/file/d/14cq66jOBk5QOBKAZrRkEMCDtv42cPtaL/view?usp=sharing)
* [**Chapter 22 - Heat Transfer eBook**](https://drive.google.com/file/d/1fW83jUhRuOwFGxvWnPqaElNQZLsFJJUw/view?usp=sharing)and[**Study Guide**](https://drive.google.com/file/d/1eXpNKPxRpTh6wA6C6iDGYILB3F-o4r0B/view?usp=sharing)
* [**Chapter 23 - Change of Phase eBook**](https://drive.google.com/file/d/1SdoFjweQolZPdjiwI6wvZCBv-L2Y462X/view?usp=sharing)and[**Study Guide**](https://drive.google.com/file/d/1SquJzAKtIQVAMQPckcUH7_Q81tn1WUJI/view?usp=sharing)
* [**Chapter 24 - Thermodynamics eBook**](https://drive.google.com/file/d/165SvXygGDCorKyAQlTelnz6J0g8m5vpS/view?usp=sharing) **and** [**Study Guide**](https://drive.google.com/file/d/1W_lGPP_mS339BA7jxcMDoznO_qsJUPRh/view?usp=sharing)
1. [3rd Qtr. Weeks 1-4 Physics Packet](https://docs.google.com/document/d/18rtwVDN-TBMGP9BY6yRXITqtKr9JktM38OgftTIoWg8/edit?usp=sharing)
2. [3rd Qtr. Weeks 5-8 Physics Packet](https://docs.google.com/document/d/1ovJRC6BR7HfjRYk48POnvrdBIPr_io3ZR-ivPvE26Nk/edit?usp=sharing)
3. [Archimedes’ Principle](https://docs.google.com/presentation/d/1JJOKpSlhnlt8KyqRDs1R7daEr7O_M899xQEwcTPWQKk/edit?usp=sharing)
4. [Pascal’s Principle](https://docs.google.com/document/d/1INkrj7onT0PkK8CZ5TlNpIw3PP5gysGlG_LO0syWKIc/edit?usp=sharing)

**Video Lessons**1. [**Basic Atomic Structure (7.44 min)**](https://youtu.be/h6LPAwAmnCQ)
2. [**Atomic Number, Mass Number, Net Charge (6.26 min.)**](https://youtu.be/dRfrvpVdKGM)
3. [**Practice Problems: Net Charge, Mass Number, Atomic Number (4.56 min.)**](https://youtu.be/ZzkL3DNjz_s)
4. [**Models of the atom timeline (10.51 min.)**](https://youtu.be/NSAgLvKOPLQ)
5. [**Atomic Structure: Discovery of Neutron (10.11 min.)**](https://youtu.be/_7DAlvRI1M4)
6. [**Discovery of the Nucleus: Rutherford’s Gold Foil Experiment (15.58 min.)**](https://youtu.be/dNp-vP17asI)
7. [**Discovery of the Electron: Cathode Ray Tube Experiment (11.07 min.)**](https://youtu.be/Rb6MguN0Uj4)
8. [**What are isotopes? (7.55 min.)**](https://youtu.be/EboWeWmh5Pg)
9. [**Isotope Notation (7.31 min.)**](https://youtu.be/BYiu0kIWd30)
10. [**Types of Chemical Bonds (4.17 min.)**](https://youtu.be/AE5QcL4VfH4)
11. [**Types of Bonding (11.50 min.)**](https://youtu.be/vUbUoyR6Log)
12. [**Phases of Matter and Phase Change (6.05)**](https://youtu.be/xf8O6ZaIPtw)
13. [**What are metals? (13.27 min.)**](https://youtu.be/zGI0jBb1A7M)
14. [**Modern Periodic Table (18.52 min.)**](https://youtu.be/bKKJkxqIg94)
15. [**Archimedes’ Principle (12.23 min.)**](https://youtu.be/_p-hwElkrlk)
16. [**Pascal’s Principle Part 1 (9.46 min.)**](https://youtu.be/Pn5YEMwQb4Y)
17. [**Pascal’s Principle Part 2 (10.12 min.)**](https://youtu.be/lWDtFHDVqqk)
 | Alpha ParticleAtomic mass numberAtomic numberAtomic theoryAverage atomic massConductorCovalent bondDelocalized electronElectric chargeElectricityElectronElectron cloudElementInsulatorIntermolecular ForceIonIonic bondIonic compoundIsotopesMetalMetallic bondMetalloidMoleculeNeutronNon-metalNucleusPeriodic tableProtonRadiationRadioactiveValence shellAdhesionArchimedes’ principleBernoulli’s principleBuoyancyBuoyant forceCohesionDensityDissolveFlow rate equationFluidFluid dynamicsGasIdeal gasInternal energyKinetic molecular theoryLiquidMolecularPascals’ principlePhasePistonPlasmaPressureRandom motionSolidSolubilitySoluteSolutionSolventSurface tensionThermal energyTranslationVibrationAdiabaticChemical reactionClosed systemEndothermicEntropyExothermicFirst law of thermodynamicsHeat engineHeat pumpIsobaricIsolated systemOpen systemPotential energy diagramSecond law of thermodynamicsSurroundingsThermodynamicsConvectionHeating curveLatent heat of fusionLatent heat of vaporizationPhase changeRadiationSpecific heat capacityThermal conductionVaporizationBatteryCapacitanceCapacitorConductorCoulomb’s lawElectric fieldElectric field lineVoltage, Current |
| **Crosscutting Concepts:** | **Science and Engineering Practices:** |
| * Patterns
* Cause and Effect
* Scale,Proportion, Quantity
* Systems and systems model
* Energy and Matter
* Structure and Function
* Stability and Change
 | * Construct an explanation
* Plan and carry out investigations
* Design, build, and refine a device

Develop and use a mathematical model* Use mathematics and computational thinking
* Analyze and interpret data
 |
| **Anchoring Phenomenon:** | **Investigative Phenomenon:** |
|  |  |

**Window Rock Unified School District # 8**

**Curriculum Guide**

**2021-2022**

**SUBJECT: Physics GRADE: 10 TIMELINE : 4th Quarter (March 21 - May 26, 2022)**

**Theme/Big Ideas for this Unit: Thermodynamics, Waves, and Nuclear**

**Essential Questions for this Unit:**

1.

2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Standards** | **Core Ideas** | **Student Friendly Objectives** | **Assessment** | **Resources** | **Vocabulary** |
| **HS.P4U1.10 -** Construct an explanation about the relationships among the frequency, wavelength, and speed of waves traveling in various media, and their applications to modern technology.**HS.E1U1.11 -** Analyze and interpret data to determine how energy from the sun affects weather patterns and climate.**HS. E1U1.12 -** Develop and use models of the Earth that explains the role of energy and matter in Earth’s constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).**HS.E2U1.15 -** Construct an explanation based on evidence to illustrate the role of nuclear fusion in the life cycle of a star.**Supporting Plus Standards****HS+E.E1U1.1 -** Construct an explanation based on evidence for how the Sun’s energy transfers between Earth;s systems.**HS+E.E2U1.12 -** Obtain, evaluate, and communicate scientific information about the way stars, throughout their stellar stages, produce elements and energy.**HS+E.E1U1.4 -** Analyze and interpret geoscience data to make the claim that dynamic interactions with Earth’s surface can create feedback that cause changes to other Earth systems.**HS+E.E1U1.5 -** Obtain, evaluate, and communicate information on the effect of water on Earth’s materials, surface processes, and groundwater systems.**HS+E.E1U1.2 -** Develop and use models to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.**HS+E.E1U1.3 -** Analyze geoscience data and the results from global climate models to make evidence-based predictions of current rate and scale of global or regional climate changes.**HS.P4U1.10 -** Construct an explanation about the relationships among the frequency, wavelength, and speed of waves traveling in various media, and their applications to modern technology.**HS.E1U1.11 -** Analyze and interpret data to determine how energy from the sun affects weather patterns and climate.**HS. E1U1.12 -** Develop and use models of the Earth that explains the role of energy and matter in Earth’s constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).**HS.E2U1.15 -** Construct an explanation based on evidence to illustrate the role of nuclear fusion in the life cycle of a star.**Supporting Plus Standards****HS+E.E1U1.1 -** Construct an explanation based on evidence for how the Sun’s energy transfers between Earth;s systems.**HS+E.E2U1.12 -** Obtain, evaluate, and communicate scientific information about the way stars, throughout their stellar stages, produce elements and energy.**HS+E.E1U1.4 -** Analyze and interpret geoscience data to make the claim that dynamic interactions with Earth’s surface can create feedback that cause changes to other Earth systems.**HS+E.E1U1.5 -** Obtain, evaluate, and communicate information on the effect of water on Earth’s materials, surface processes, and groundwater systems.**HS+E.E1U1.2 -** Develop and use models to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.**HS+E.E1U1.3 -** Analyze geoscience data and the results from global climate models to make evidence-based predictions of current rate and scale of global or regional climate changes.**HS.P4U1.10 -** Construct an explanation about the relationships among the frequency, wavelength, and speed of waves traveling in various media, and their applications to modern technology.**HS.E1U1.11 -** Analyze and interpret data to determine how energy from the sun affects weather patterns and climate.**HS. E1U1.12 -** Develop and use models of the Earth that explains the role of energy and matter in Earth’s constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).**HS.E2U1.15 -** Construct an explanation based on evidence to illustrate the role of nuclear fusion in the life cycle of a star. |  | 1. Compare different types of waves.
2. Identify examples of waves in everyday life.
3. Describe the properties of waves: period, speed, frequency, wavelength, and amplitude.
4. Solve problems involving wave speed, frequency, and wavelength.
5. Describe how waves interact with media and with other waves.
6. Differentiate between constructive and destructive interference.
7. Describe the properties of sound waves.
8. Describe the Doppler effect.
9. Explain the regions of the electromagnetic spectrum.
10. Solve problems involving electromagnetic wave speed, frequency, and wavelength.
11. Interpret and draw ray diagrams.
12. Use ray diagrams to show how light reflects and refracts.
13. Describe the process of image formation.
14. Use lens and mirror equations.
15. Describe how competing forces in a nucleus determine the stability of the nucleus.
16. Apply Einstein's mass-energy equivalence formula to nuclear reactions.
17. Differentiate between nuclear and chemical reactions.
18. Describe the processes of radioactive decay.
19. Do calculations involving half-life.
20. Differentiate among the levels of danger from various radiation sources.
21. Describe fission and fusion.
22. Explain the energy changes involved in fission and fusion reactions.
23. Identify and explain the six different types of nuclear reactions.
24. Describe the dual nature of light and matter.
25. Describe the key experiments that led to the current understanding of the nature of light.
26. Explain the concept of quantization.
27. Describe and evaluate the evidence for the big bang theory.
 | 1. [Chapter 32 Test - Electrostatics](https://drive.google.com/file/d/1C8xZYZnPwKpjAd-UDeMd6-sWDZN4IrHN/view?usp=sharing)
2. [Chapter 33 Test - Electric Field and Potential](https://drive.google.com/file/d/1nFozs-D-MJgzGy4WhXYdtfyNdAxcdbFY/view?usp=sharing)
3. [Chapter 34 Test - Electric Current](https://drive.google.com/file/d/1BTZAdzHzAda1XTP51eVx9JmSJzfRSN9h/view?usp=sharing)
4. [Chapter 35 Test - Electric Circuits](https://drive.google.com/file/d/1UIXllLW6U2bhx-UEn-Q1QZl1ZKwwWtyO/view?usp=sharing)

1. [Chapter 36 Test - Magnetism](https://drive.google.com/file/d/1BmoIjKjQFmfuDdaJHEEcfmm7mh8VJHqV/view?usp=sharing)
2. [Chapter 25 Test - Waves](https://drive.google.com/file/d/1XlMlj9uoXb_j51CTnWZyOoWLc6UoIYh8/view?usp=sharing)
3. [Chapter 26 Test - Sound](https://drive.google.com/file/d/1W3S8GmclvJyjivN2pVys8V_0OrtAjWai/view?usp=sharing)
4. [Chapter 27 Test - Light](https://drive.google.com/file/d/1WQ6WJJum7rW1AApvec4pWlDt-3J2HNNY/view?usp=sharing)
5. [Chapter 30 Test - Lenses](https://drive.google.com/file/d/1ZidJeD7NYYftIAXIQToxoObgYJwXa8rX/view?usp=sharing)
 | 1. APEX (Units 4-6)
2. LABSTER
3. SMART Board
4. **CANVAS will be used for assessments and email communications from students**.
5. EdPuzzle Videos (Interactive Video Lessons)
6. Quizziz and Kahoot
7. Conceptual Physics by Paul Hewitt

[**Chapter 32 - Electrostatics eBook**](https://drive.google.com/file/d/1wTo3xpZjctIzcU9t659jYmBKp0npoL-_/view?usp=sharing) and [**Study Guide**](https://drive.google.com/file/d/1fd06pxfoAGOVhIyD_s_M7UXxHBZityMn/view?usp=sharing)[**Chapter 33 - Electric Field and Potential eBook**](https://drive.google.com/file/d/1Jyx5B9obO2PcwsE2hUgRU3078EEsdE_5/view?usp=sharing) and [**Study Guide**](https://drive.google.com/file/d/14ZC7seSY5h3-_lqrgZXJMNE7p90DAcsr/view?usp=sharing)[**Chapter 34 - Electric Current eBook**](https://drive.google.com/file/d/1ETrjkxn_6nWqVZMmIG0eC5rFqkYchpab/view?usp=sharing) and [**Study Guide**](https://drive.google.com/file/d/1J4jL0m1i0HwEZsVgwaZjPf7ZGjQYy0e2/view?usp=sharing)[**Chapter 35 - Electric Circuits eBook**](https://drive.google.com/file/d/1SeDP7T04nGOrSqObnwELsxSovG3yIgs5/view?usp=sharing) and[**Study Guide**](https://drive.google.com/file/d/1jBt0tiQuRfIqIR-EXfHiXkKLerNFRs-1/view?usp=sharing)[**Chapter 36 Magnetism eBook**](https://drive.google.com/file/d/1UXuGzQkkE7igGTDcSndh46_E5mCk1zhD/view?usp=sharing) and [**Study Guide**](https://drive.google.com/file/d/1CFwzbbBiV8aTVqpnlDW5OsnyP76kGhnY/view?usp=sharing)[**Chapter 25 Waves eBook**](https://drive.google.com/file/d/1EndkFjddNsMFCDssNqx7_83WX9rjoCcX/view?usp=sharing) and[**Study Guide**](https://drive.google.com/file/d/16gR9we07rZBWseGGgw9WUBWB7n7WWD4e/view?usp=sharing) [**Chapter 26 Sound eBook**](https://drive.google.com/file/d/1e99nvFPYayP7aG4V2yjFi7okJzpobWEn/view?usp=sharing)and[**Study Guide**](https://drive.google.com/file/d/1JSxMfErcRAGHP4IBpn8buaZCi_M9wWs8/view?usp=sharing)[**Chapter 27 Light eBook**](https://drive.google.com/file/d/1kqNzaPGMn5bTaYAqldPu3hTGyoXtdFBG/view?usp=sharing)and [**Study Guide**](https://drive.google.com/file/d/1M-acPrUJGg5O3Hx7zQUWYxHU9NogRl7l/view?usp=sharing)[**Chapter 30 Lenses eBook**](https://drive.google.com/file/d/1qrKR3oGmnoKf_8-kI8bNxiElzOhh0XDo/view?usp=sharing) and[**Study Guide**](https://drive.google.com/file/d/1AAS9ZnS8J3Qtn1R8qBPL4KPNxxejgu2O/view?usp=sharing)1. [4th Qtr. Weeks 1-5 Packet](https://docs.google.com/document/d/1tfDXvljWiNq4_Mg3iIUCxFDyA48rZ_q_xmpaSCkKU3c/edit?usp=sharing)
2. [4th Qtr. Weeks 6-9 Packet](https://docs.google.com/document/d/142M6vcv8CXqN0LsoSDEvmlTHG_sjh8fo6269Prrr47U/edit?usp=sharing)

**VIDEO LESSONS:**Static Electricity - <https://edpuzzle.com/assignments/604baeaca0eac2428241d60d/watch>Electrostatics by Paul Hewitt - <https://edpuzzle.com/assignments/604baf1612043842612e8fc5/watch>Static Charge - <https://edpuzzle.com/assignments/604baf807eacd2429bc4f2d0/watch>Coulomb’s Law - <https://edpuzzle.com/assignments/604bbd6bf5de86427d1e5bcd/watch>Resistance - <https://edpuzzle.com/assignments/604bc36688e57c4288b4f6f6/watch>Current Electricity - <https://edpuzzle.com/assignments/604bc21be4b7d8428d347b78/watch>Electric Potential - <https://edpuzzle.com/assignments/604bbff78e2a8b428c577998/watch>Resistance - <https://edpuzzle.com/assignments/604bc47a610d1142449f94b4/watch>Electric Charge - <https://edpuzzle.com/assignments/604bbd99f90d164250cac58a/watch>Electric Potential (PBS) - <https://edpuzzle.com/assignments/604bbe0860ea0842b0fdfc87/watch>Ohm’s Law Part 1 - <https://edpuzzle.com/assignments/604fa6502c8e9b42940563d2/watch>Ohm’s Law Part 2 - <https://edpuzzle.com/assignments/604bd363902a7a4268f2db31/watch>Series Circuits - <https://edpuzzle.com/assignments/605b60b80c77af425cb20b90/watch>Ohm’s Law Part 3 - <https://edpuzzle.com/assignments/605cdffba9d44842938955b5/watch>Ohm’s Law Notes Part 4 - [https://edpuzzle.com/assignments/605ce02ba4ba474271a85642/watc](https://edpuzzle.com/assignments/605ce02ba4ba474271a85642/watch)**Virtual Lab (Series and Parallel)** <https://phet.colorado.edu/sims/html/circuit-construction-kit-dc-virtual-lab/latest/circuit-construction-kit-dc-virtual-lab_en.html>Series Circuits Problem Solving Part 1 - <https://edpuzzle.com/assignments/6061e60c670e6c42280082c5/watch>Series Circuits Problem Solving Part 2 - <https://edpuzzle.com/assignments/6061e9e7a87ae7425164c912/watch> Introduction to Series and Parallel CIrcuits - <https://edpuzzle.com/assignments/6061f0be1e2550424f3ff9f9/watch>Parallel Circuits Problem Solving Part 1 - <https://edpuzzle.com/assignments/6061f47741c8874241b07405/watch>Parallel Circuits Problem Solving Part 2 - <https://edpuzzle.com/assignments/6061fa1fe707b742731a7bbf/watch>Parallel Circuits Problem Solving Part 3 - <https://edpuzzle.com/assignments/606207dcbcf705423b83a1fa/watch>Wave Properties and Types of Waves - <https://edpuzzle.com/assignments/606de8cb978e6a4276e2dd83/watch>Behavior of Waves - <https://edpuzzle.com/assignments/606deac589007a426566f360/watch>Introduction to Waves - <https://edpuzzle.com/assignments/606ded89baa233425a90eb5e/watch>Types of Waves - <https://edpuzzle.com/assignments/606df42051bfc342272a22cb/watch>Wave Interference - <https://edpuzzle.com/assignments/606e0dcc6227bd428aa8762d/watch>Types of Interference - <https://edpuzzle.com/assignments/606e10408cf739420bd38f9e/watch>Standing Waves - <https://edpuzzle.com/assignments/606e141dc02bd042624ad01b/watch>Sound - <https://edpuzzle.com/assignments/606e18fa492ce8426640a541/watch>Speed of Sound - <https://edpuzzle.com/assignments/606e1c1936296a427ec02e29/watch> | 1. Absorption
2. Amplitude
3. Antinode
4. Compression
5. Compression Wave
6. Constructive Interference
7. Crest
8. Destructive Interference
9. Diffraction
10. Frequency
11. Index of Refraction
12. Interference
13. Light Wave
14. Longitudinal Wave
15. Mechanical Wave
16. Medium
17. Node
18. Oscillation
19. Period
20. Phase
21. Polarization
22. Rarefaction
23. Reflection
24. Refraction
25. Resonance
26. Seismic Wave
27. Sound Wave
28. Standing Wave
29. Surface Wave
30. Transverse Wave
31. Trough
32. Vacuum
33. Wave
34. Wave Speed
35. Wavelength
36. Beats
37. Blueshift
38. Cosmological redshift
39. Decibel
40. Doppler effect
41. Electromagnetic Spectrum
42. Intensity
43. Pitch
44. Redshift
45. Scatter
46. Speed of Light
47. Volume
48. Angle of Incidence
49. Angle of Reflection
50. Angle of Refraction
51. Concave
52. Convex
53. Far Point
54. Image
55. Lens
56. Light Ray
57. Magnification
58. Mirror
59. Near Point
60. Plane Mirror
61. Ray Tracing
62. Real Image
63. Snell’s Law
64. Thin-Lens Equation
65. Virtual Image
66. Fission
67. Fusion
 |
| **Crosscutting Concepts:** | **Science and Engineering Practices:** |
| * Patterns
* Cause and Effect
* Scale,Proportion, Quantity
* Systems and systems model
* Energy and Matter
* Structure and Function
* Stability and Change
 | * Construct an explanation
* Analyze and interpret data
* Develop and use models
 |
| **Anchoring Phenomenon:** | **Investigative Phenomenon:** |
|  |  |