# AP PHYSICS Unit 1 - Kinematics (Physical Science, Engineering Design)

Content Area: **Science**
Course(s): **Physics AP w/Lab**
Time Period:
Length: **30 Days**
Status: **Published**

## Title Section

## Department of Curriculum and Instruction

**Belleville Public Schools**

**Curriculum Guide**

# AP PHYSICS 11,12

# KINEMATICS

**Belleville Board of Education**

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## Unit Overview

In this unit, students will be introduced to the world through the eyes of a physicist, whose principle goal is to study the underlying nature of everyday processes and to investigate the structure of the universe in terms of scientific analysis. Using the sciences of kinematics, or study of motion, this unit requires the students to put into practice previously learned skills of hypothesis creation, experimental design, data collection and analysis in order to investigate how objects move through space. The quantities to be investigated include base units such length, and time, as well as derived units such as velocity and acceleration. The interrelation of these quantities will be discussed and problems will be solved using kinematics formulas.

## Enduring Understanding

• When an object changes position in comparison to a stationary reference point, the object is in motion.

• When an object changes speed in comparison to a stationary reference point, the object is accelerating.

• When an object changes direction in comparison to a stationary reference point, the object is accelerating.

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## Essential Questions

**Unit Essential Questions:**

How does the Scientific Method apply to physics?
How does Mathematics play a role in physics
What are the various forms of motion?
How do physicists describe and quantify motion?
How does one describe motion of an object in two dimensions?
What is the difference between weight and mass?

## Exit Skills

By the end of Unit 1 Students will:

• Develop a particle model to represent a moving object
• Define coordinate systems for motion problems.
• Recognize that the chosen coordinate system affects the signs of the objects' positions.
• Define Displacement.
• Determine a time interval.
• Develop position-time graphs for moving objects.
• Use a position-time graph to interpret an object's position or displacement.

• Define velocity.
• Differentiate between speed and velocity.
• Create pictorial, physical, and mathematical models of motion problems.
• Define acceleration.
• Relate velocity and acceleration to the motion of objects.
• Create velocity-time graphs.
• Determine mathematical relationships among position, velocity, acceleration, and time.
• Define acceleration due to gravity.
• Solve problems involving objects in free fall.

## New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

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| HS-ETS1-1 | Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. |
| 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. |
| HS-ETS1-3 | Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. |
| HS-ETS1-4 | Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. |
| 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.<br><br>Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object sliding down a ramp, or a moving object being pulled by a constant force. |
| HS-PS2-2 | Use mathematical representations to support the claim that the total momentum of a |

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| | system of objects is conserved when there is no net force on the system. |
| HS-PS2-3 | Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. |
| HS-PS2-4 | Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. |
| 9-12.HS-ETS1-4 | Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. |
| 9-12.HS-ETS1-1.1.1 | Analyze complex real-world problems by specifying criteria and constraints for successful solutions. |
| 9-12.HS-ETS1-4.4.1 | Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows— within and between systems at different scales. |
| 9-12.HS-ETS1-4.5.1 | Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems. |
| 9-12.HS-ETS1-3.6.1 | Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. |
| 9-12.HS-ETS1-2.6.1 | Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. |
| 9-12.HS-ETS1-1.ETS1.A.1 | Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. |
| 9-12.HS-ETS1-1.ETS1.A.2 | Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. |
| 9-12.HS-ETS1-2.ETS1.C.1 | Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. |
| 9-12.HS-PS2-4.1.1 | students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system. |
| 9-12.HS-PS2-1.2.1 | students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects. |
| 9-12.HS-PS2-3.2.1 | Systems can be designed to cause a desired effect. |
| 9-12.HS-PS2-2.4.1 | When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. |
| 9-12.HS-PS2-1.4.1 | Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. |
| 9-12.HS-PS2-4.5.1 | Use mathematical representations of phenomena to describe explanations. |
| 9-12.HS-PS2-2.5.1 | Use mathematical representations of phenomena to describe explanations. |

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| 9-12.HS-PS2-3.6.1 | Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. |
| 9-12.HS-PS2-3.PS2.A.1 | 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. |
| 9-12.HS-PS2-2.PS2.A.1 | Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. |
| 9-12.HS-PS2-1.PS2.A.1 | Newton's second law accurately predicts changes in the motion of macroscopic objects. |
| 9-12.HS-PS2-2.PS2.A.2 | 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. |
| 9-12.HS-PS2-3.PS2.B.1 | Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. |
| 9-12.HS-PS2-4.PS2.B.1 | Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. |
| 9-12.HS-PS2-1.PS2.B.1 | Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. |
| 9-12.HS-PS2-4.PS2.B.2 | Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. |
| 9-12.HS-PS2-3.ETS1.A.1 | Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. |
| 9-12.HS-PS2-3.ETS1.C.1 | Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. |

## Interdisciplinary Connections

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list all and any additional **Interdisciplinary Connections/Cross-Curricular** New Jersey Student Learning Standards that link to this unit, and which are not included in the NJSLS section above.

| | |
|---|---|
| LA.RH.11-12.4 | Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10). |
| LA.RH.11-12.7 | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, qualitatively, as well as in words) in order to address a question or solve a problem. |

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| LA.RH.11-12.9 | Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources. |
| LA.RH.11-12.10 | By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently. |
| LA.RST.11-12.1 | Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. |
| LA.RST.11-12.2 | Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. |
| LA.WHST.11-12.2 | Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. |
| LA.WHST.11-12.2.A | Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. |
| LA.WHST.11-12.2.B | Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. |
| LA.WHST.11-12.2.D | Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. |
| LA.WHST.11-12.2.E | Provide a concluding paragraph or section that supports the argument presented. |
| LA.WHST.11-12.4 | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LA.WHST.11-12.5 | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LA.WHST.11-12.6 | Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information. |
| LA.WHST.11-12.7 | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LA.WHST.11-12.8 | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |

## Learning Objectives

**The student will be able to..**

Develop a particle model to represent a moving object.
Define coordinate systems for motion problems.
Recognize that the chosen coordinate system affects the signs of the objects' positions.
Define Displacement.

Determine a time interval.
Develop position-time graphs for moving objects.
Use a position-time graph to interpret an object's position or displacement.
Define velocity.
Differentiate between speed and velocity.
Create pictorial, physical, and mathematical models of motion problems.
Recognize that the chosen coordinate system affects the signs of the objects' positions.
Create pictorial, physical, and mathematical models of motion problems.
Draw motion diagrams to describe motion.
Develop a particle model to represent a moving object.
Define coordinate systems for motion problems.
Define Displacement.
Determine a time interval.
Use a motion diagram to answer questions about an object's position or displacement.
Develop position-time graphs for moving objects.
Use a position-time graph to interpret an object's position or displacement.
Make motion diagrams, pictorial representations, and position time graphs that are equivalent representations describing an object's motion.
Define velocity.
Create pictorial, physical, and mathematical models of motion problems. (NPS) Define acceleration.
Relate velocity and acceleration to the motion of objects.
Create velocity-time graphs.
Determine mathematical relationships among position, velocity, acceleration, and time.
Define acceleration due to gravity.
Solve problems involving objects in free fall.

**Action Verbs:** Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy.

| Remember | Understand | Apply | Analyze | Evaluate | Create |
|---|---|---|---|---|---|
| Choose | Classify | Choose | Categorize | Appraise | Combine |
| Describe | Defend | Dramatize | Classify | Judge | Compose |
| Define | Demonstrate | Explain | Compare | Criticize | Construct |
| Label | Distinguish | Generalize | Differentiate | Defend | Design |
| List | Explain | Judge | Distinguish | Compare | Develop |
| Locate | Express | Organize | Identify | Assess | Formulate |
| Match | Extend | Paint | Infer | Conclude | Hypothesize |
| Memorize | Give Examples | Prepare | Point out | Contrast | Invent |
| Name | Illustrate | Produce | Select | Critique | Make |
| Omit | Indicate | Select | Subdivide | Determine | Originate |
| Recite | Interrelate | Show | Survey | Grade | Organize |
| Select | Interpret | Sketch | Arrange | Justify | Plan |
| State | Infer | Solve | Breakdown | Measure | Produce |
| Count | Match | Use | Combine | Rank | Role Play |
| Draw | Paraphrase | Add | Detect | Rate | Drive |
| Outline | Represent | Calculate | Diagram | Support | Devise |
| Point | Restate | Change | Discriminate | Test | Generate |
| Quote | Rewrite | Classify | Illustrate | | Integrate |
| Recall | Select | Complete | Outline | | Prescribe |
| Recognize | Show | Compute | Point out | | Propose |
| Repeat | Summarize | Discover | Separate | | Reconstruct |
| Reproduce | Tell | Divide | | | Revise |
| | Translate | Examine | | | Rewrite |
| | Associate | Graph | | | Transform |
| | Compute | Interpolate | | | |
| | Convert | Manipulate | | | |
| | Discuss | Modify | | | |
| | Estimate | Operate | | | |

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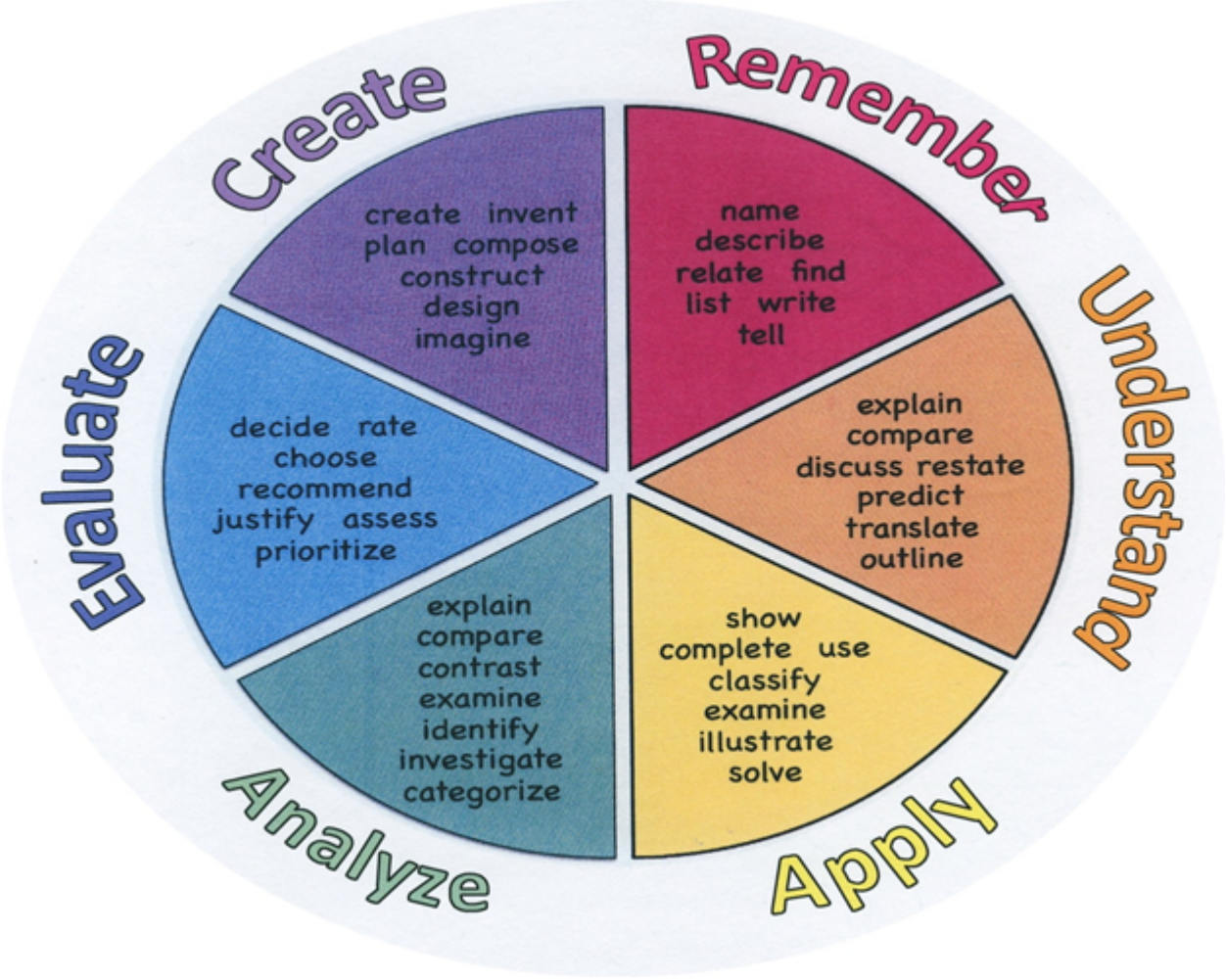
|---|---|---|---|---|---|
| | Extrapolate<br>Generalize<br>Predict | Subtract | | | |




## Suggested Activities & Best Practices

- What situations in ordinary life could help to master this unit?

Measure horizontal velocity

Measure horizontal acceleration

Analyze Free Fall

Analyze Projectile motion

Build the highest tower with limited materials

Marshmallow challenge

**Guidelines for Suggested Activities:**

- Includes activities **appropriate & specific** to the development of the Unit;
- Is comprised of the variety of learning activities that will be referenced in lesson plans, constructed/developed and instructionally delivered in the classroom;
- Are authentic;
- Recognizes the learning styles of the students;
- Integrates problem- or project-based learning.

## Assessment Evidence - Checking for Understanding (CFU)

Student must be able to graph fundamental quantities, acceleration, velocity, distance against time. (Formative)

Students must be able to read map and calculate velocity and speed of a moving object. (Formative)

Students must be able to convert polar quantities into Cartesian quantities. (Formative)

Oncourse Assessment Tools (Formative)

Unit Test/Quiz (Summative)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks

- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Learning Center Activities
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

## Primary Resources & Materials

Textbook, Giancoli AP Edition

Internet

AP Physics Exam, Princeton Review

Masteringphysics.com

Please list all district-provided Primary Resources & Materials and/or those outside that are accessed with district resources.

## Ancillary Resources

Teacher Prepared Materials
Lab Materials
Study Guide Materials
United Streaming Videos
The Physics Classroom: www.thephysicsclassroom.com
STEM Lab
AP Central Resources.

Please list all additional resources that will be used to strengthen this unit's lessons.

## Technology Infusion

Students must be able to use the photogates to measure the speed of a falling object.

Students must be able to use projectile launcher to measure the range of a projectile.

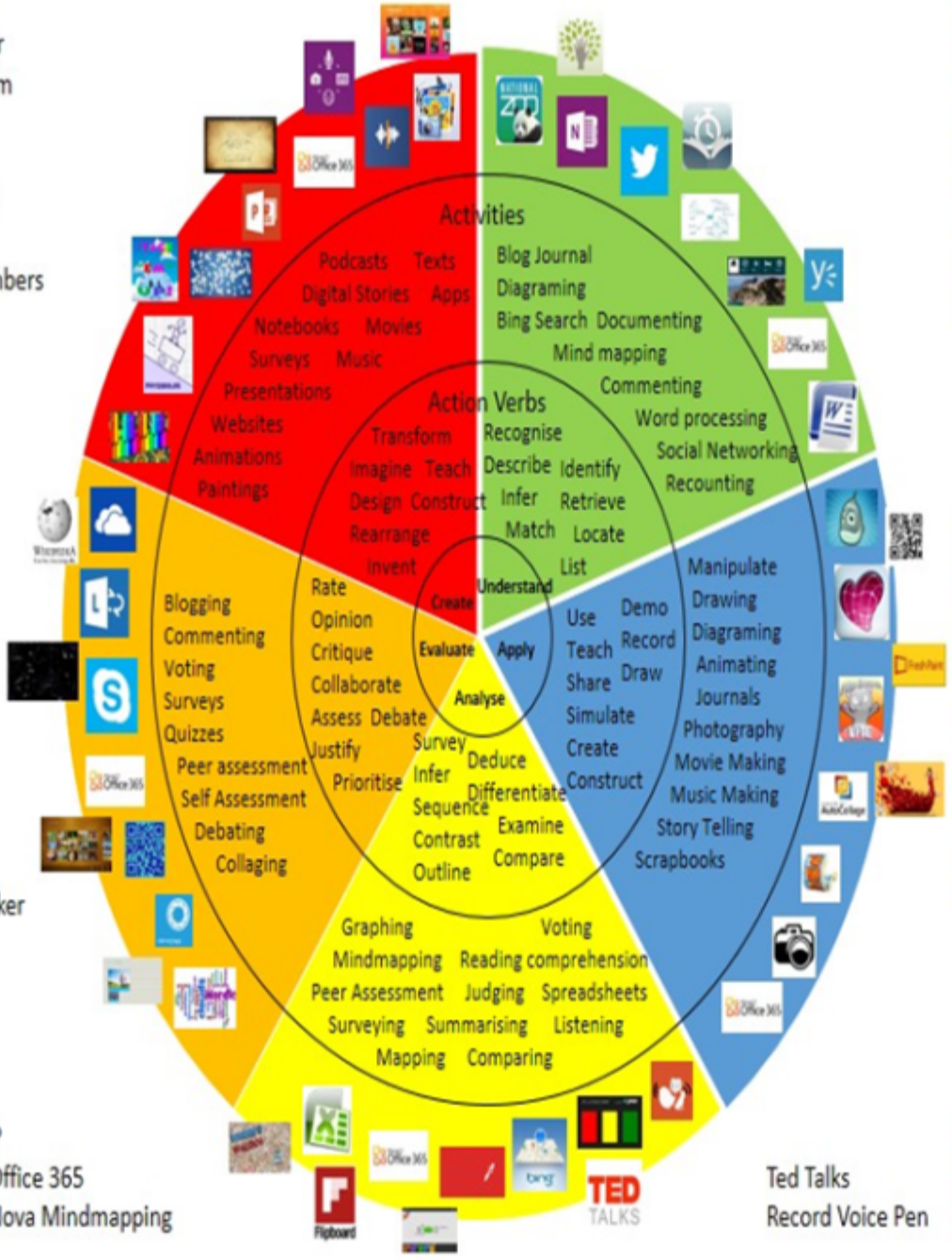
Students must be able to use virtual labs to solve kinematics problems.

What **Technology Infusion** and/or strategies are integrated into this unit to enhance learning? Please list all hardware, software and strategies. Please find a technology pedagogy wheel for assistance while completing this section.

# Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker




Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

## Alignment to 21st Century Skills & Technology

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

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| CRP.K-12.CRP2.1 | Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation. |
| CRP.K-12.CRP4.1 | Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome. |
| CAEP.9.2.12.C.2 | Modify Personalized Student Learning Plans to support declared career goals. |
| CAEP.9.2.12.C.6 | Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business. |
| TECH.8.1.12.A.2 | Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review. |
| TECH.8.1.12.A.5 | Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results. |
| TECH.8.1.12.A.CS1 | Understand and use technology systems. |
| TECH.8.1.12.A.CS2 | Select and use applications effectively and productively. |
| TECH.8.1.12.D.CS1 | Advocate and practice safe, legal, and responsible use of information and technology. |
| TECH.8.1.12.E.CS2 | Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. |

## 21st Century Skills/Interdisciplinary Themes

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list only the **21st Century/Interdisciplinary Themes** that will be incorporated into this unit.

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

## 21st Century Skills

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list only the **21st Century Skills** that will be incorporated into this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

## Differentiation

Please remember: Effective educational **Differentiation** in a lesson lies within content, process, and/or product.

Please identify the ones that will be employed in this unit.

**Differentiations:**

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

**Hi-Prep Differentiations:**

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments

- Tiered products
- Varying organizers for instructions

**Lo-Prep Differentiations**

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

## Special Education Learning (IEP's & 504's)

Please identify the **Special Education Learning** adaptations that will be employed in the unit, using the ones identified below.

- Students must be able to draw a map from home to school and calculate kinematics quantities.

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content

- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

## English Language Learning (ELL)

Please identify the **English Language Learning** adaptations that will be employed in the unit, using the ones identified below.

- Students are provided with glossary in their native language.

- Spanish speaking students may utilize Spanish Edition of a Textbook

- teaching key aspects of a topic.  Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments

- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

## At Risk

Please identify Intervention Strategies that will be employed in the unit, using the ones identified below.

- Student provided access to virtual labs, presentations, videos, and practice questions.

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

## Talented and Gifted Learning (T&G)

Please identify the **Talented and Gifted** adaptations that will be employed in the unit, using the ones identified below.

- Students must be able to solve calculus based problems.

- Above grade level placement option for qualified students
- Advanced problem-solving

- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

## Sample Lesson

Unit Name: Free Fall

NJSLS: HS-PS2-1, HS-PS2-2, HS-PS2-3, LA.RH.11-12.4, LA.RH.11-12.7, LA.RH.11-12.9, LA.RH.11-12.10,

Interdisciplinary Connection: Vocabulary and algebra contents

Statement of Objective: The students will demonstrate the ability to apply the four kinematic equations for falling objects by solving problems with 90% accuracy.

Anticipatory Set/Do Now: from m/s to mil/h

Learning Activity:

Lecture – the four kinematic equations using a and g
Classroom activity: to apply the four kinematic equations to everyday life situations.

Student Assessment/CFU's: Surveying, written report, and exit ticket

Materials: Photogates, stands, clumps, light and heavy objects

21st Century Themes and Skills: Critical thibking and problem solving

Differentiation/Modifications:

Students must be able to solve calculus based problems. (Gifted and Talented)

Students must be able to set the apparatus to perform the lab. (Special Ed)

Integration of Technology:

Using photogates, and chromebook for exit ticket