AP PHYSICS UNIT 1 - KINEMATICS

Content Area: **Science**
Course(s): **Physics AP w/Lab**
Time Period: **SeptOct**
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

56 Ralph Street

Belleville, NJ 07109

Prepared by: Dr. Recep Balki

Unit Overview

The world is in a constant state of motion. To understand the world, students must first understand movement. Unit 1 introduces students to the study of motion and serves as a foundation for all of AP Physics 1 by beginning to explore the complex idea of acceleration and showing them how representations can be used to model and analyze scientific information as it relates to the motion of objects. By studying kinematics, students will learn to represent motion—both uniform and accelerating—in narrative, graphical, and/or mathematical forms and from different frames of reference. These representations will help students analyze the specific motion of objects and systems while also dispelling some common misconceptions they may have about motion, such as exclusively using negative acceleration to describe an object slowing down. Additionally, students will have the opportunity to go beyond their traditional understanding of mathematics. Instead of solving equations, students will use them to support their reasoning and tighten their grasp on the laws of physics. Lastly, students will begin making predictions about motion and justifying claims with evidence by exploring the relationships between the physical quantities of acceleration, velocity, position, and time. This is an important starting point for students, as these fundamental science practices will spiral throughout the course and appear in multiple units.

Enduring Understanding

An observer in a reference frame can describe the motion of an object using such quantities as position, displacement, distance, velocity, speed, and acceleration.
Displacement, velocity, and acceleration are all vector quantities.
Displacement is change in position.
Velocity is the rate of change of position with time.
Acceleration is the rate of change of velocity with time.

Changes in each property are expressed by subtracting initial values from final values.
A choice of reference frame determines the direction and the magnitude of each of these quantities.
There are three fundamental interactions or forces in nature: the gravitational force, the electroweak force, and the strong force.
The fundamental forces determine both the structure of objects and the motion of objects.
In inertial reference frames, forces are detected by their influence on the motion (specifically the velocity) of an object. So force, like velocity, is a vector quantity.
A force vector has magnitude and direction.
When multiple forces are exerted on an object, the vector sum of these forces, referred to as the net force, causes a change in the motion of the object.
The acceleration of the object is proportional to the net force.
The kinematic equations only apply to constant acceleration situations.
The linear motion of a system can be described by the displacement, velocity, and acceleration of its center of mass.
The variables x, v, and a all refer to the center-of-mass quantities.
The acceleration is equal to the rate of change of velocity with time, and velocity is equal to the rate of change of position with time.
The acceleration of the center of mass of a system is directly proportional to the net force exerted on it by all objects interacting with the system and inversely proportional to the mass of the system.
Force and acceleration are both vectors, with acceleration in the same direction as the net force.
The acceleration of the center of mass of a system is equal to the rate of change of the center of mass velocity with time, and the center of mass velocity is equal to the rate of change of position of the center of mass with time.
The variables x, v, and a all refer to the center-of-mass quantities.
Vector quantities have magnitude (how large the vector quantity is) and direction, while scalar quantities have magnitude only.
All motion must be compared to a frame of reference.
Many quantities in physics are rates of change of other quantities.
Vectors are specified by magnitude and direction while scalars are magnitude only.
Velocity is a change of position during a period of time.
Acceleration is the rate at which velocity changes.
In the absence of air resistance, all bodies fall with the same acceleration.
The slope of a distance vs. time graph is velocity.
The slope of a velocity vs. time graph is acceleration.
Area under the curve: of a v-t graph is the displacement; of an a-t graph is the velocity.
Projectile motion has vertical and horizontal components and is motion under the influence of gravity.

Essential Questions

How are multiple representations used to describe an object's motion?
How do scalar measurements differ from vector measurements?
How are kinematic equations and graphs used to describe an object's motion in free-fall?
Why is it important to use vector quantities and not just scalar quantities to describe the motion of an object?
How does the resultant of two vectors change as the angle between the two changes?
How does the shape of graphs representing the relationship between displacement, velocity, or acceleration vs. time offer information about the motion of an object?
How is the motion of an object affected by the acceleration of gravity?
How can velocity be negative?
How can acceleration be negative?

Why is the initial acceleration of a sprint runner important in determining who will win the race?
How does the direction of the acceleration affect the direction of motion?
How is the distance a baseball travels before hitting the ground affected by the throwing conditions?
How does the description of motion of an object change depending of the reference frame used to describe it?
How can you prove that all objects fall at the same rate?
Why does a projectile make a parabolic path?

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

SCI.HS-PS2	Motion and Stability: Forces and Interactions
SCI.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.
SCI.HS.PS2.A	Forces and Motion
SCI.HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
SCI.HS.PS2.A	Forces and Motion
SCI.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.
SCI.HS.PS2.A	Forces and Motion
SCI.HS.ESS2.D	Weather and Climate
SCI.HS-ESS3	Earth and Human Activity
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
SCI.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
SCI.HS.ESS3.D	Global Climate Change
SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).
SCI.HS.ESS2.D	Weather and Climate
SCI.HS.ESS3.D	Global Climate Change
CS.9-12.8.1.12.DA.2	Describe the trade-offs in how and where data is organized and stored.
CS.9-12.ETW	Effects of Technology on the Natural World

Interdisciplinary Connections

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.
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.
MA.A-APR.A	Perform arithmetic operations on polynomials
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.
MA.G-SRT	Similarity, Right Triangles, and Trigonometry
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.A-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
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.
MA.A-REI.B.4a	Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
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.

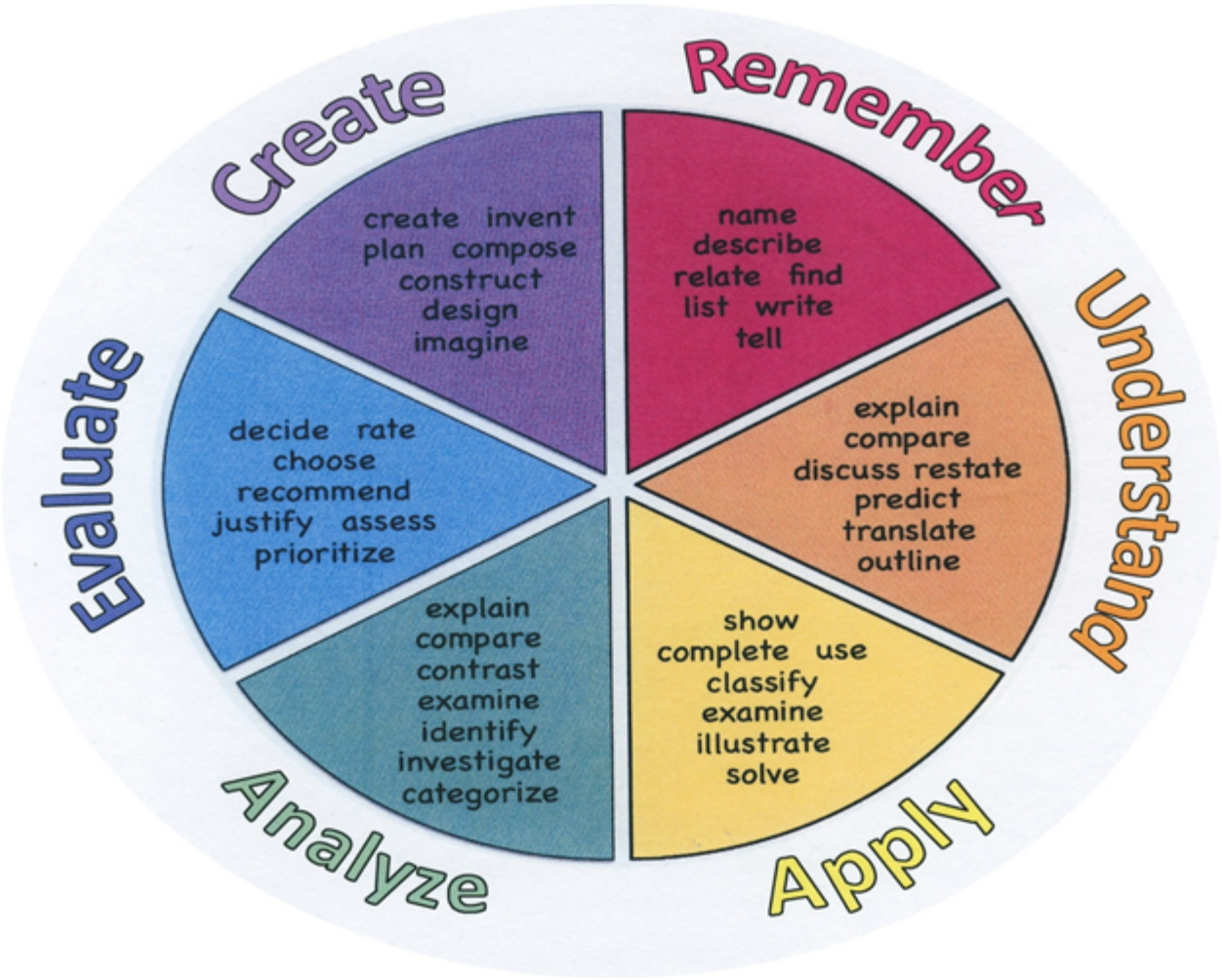
Learning Objectives

The student will be able to..

Express the motion of an object using narrative, mathematical, and graphical representations.
Design an experimental investigation of the motion of an object
Analyze experimental data describing the motion of an object and be able to express the results of the analysis using narrative, mathematical, and graphical representations.
Use representations of the center of mass of an isolated two-object system to analyze the motion of the system qualitatively and semi-quantitatively.
Make predictions about the motion of a system based on the fact that acceleration is equal to the change in velocity per unit time, and velocity is equal to the change in position per unit time.
Create mathematical models and analyze graphical relationships for acceleration, velocity, and position of the center of mass of a system and use them to calculate properties of the motion of the center of mass of a system.
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.
Calculate the average rate of change of global temperature, and make a prediction about average global temperature in 2050

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			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Desktop Experiment Task: Have students find the acceleration of a yo-yo as it falls and unwinds using only a meterstick and stopwatch. Students then draw (with correct shapes and scales) distance, speed, and acceleration versus time graphs.

Identify Subtasks: Each group is given a spring-loaded ball launcher and a meterstick. Students launch the ball horizontally from a known height and then predict where it will land on the floor when fired at a given angle from the floor. Have students articulate subtasks and then perform each one.

Changing Representations: Show a curvy x versus t graph, a v versus t graph made of connected straight-line segments, or an a versus t graph made of horizontal steps. Have students sketch the other two graphs and either walk them out along a line or move a cart on a track to demonstrate the motion (the track can be tilted slightly to provide constant acceleration in either direction).

Changing Representations: Students throw/project a ball from the second or third story to the ground and measure the ball's initial height, horizontal distance, and time in the air. From this, students calculate initial velocity components and draw (with scales) horizontal/vertical position/velocity/ acceleration versus time graphs.

Desktop Experiment Task: Give each group a pull-back toy car. Students lay out strips of paper 0.5 m apart and take a phone video of the car as it is released, speeds up, and slows down. Using a frame-byframe review app to get the time each strip is passed to get x versus t data, have students make v versus t data tables out of this, and graph both.

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

Calculate rate of change global temperature between 1980-2020, and assuming the same rate will continue, predict average global temperature in 2050

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
https://phet.colorado.edu/
STEM Lab
Albert.io
AP Central Resources.

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.

Albert.io

AP Collegeboard

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.

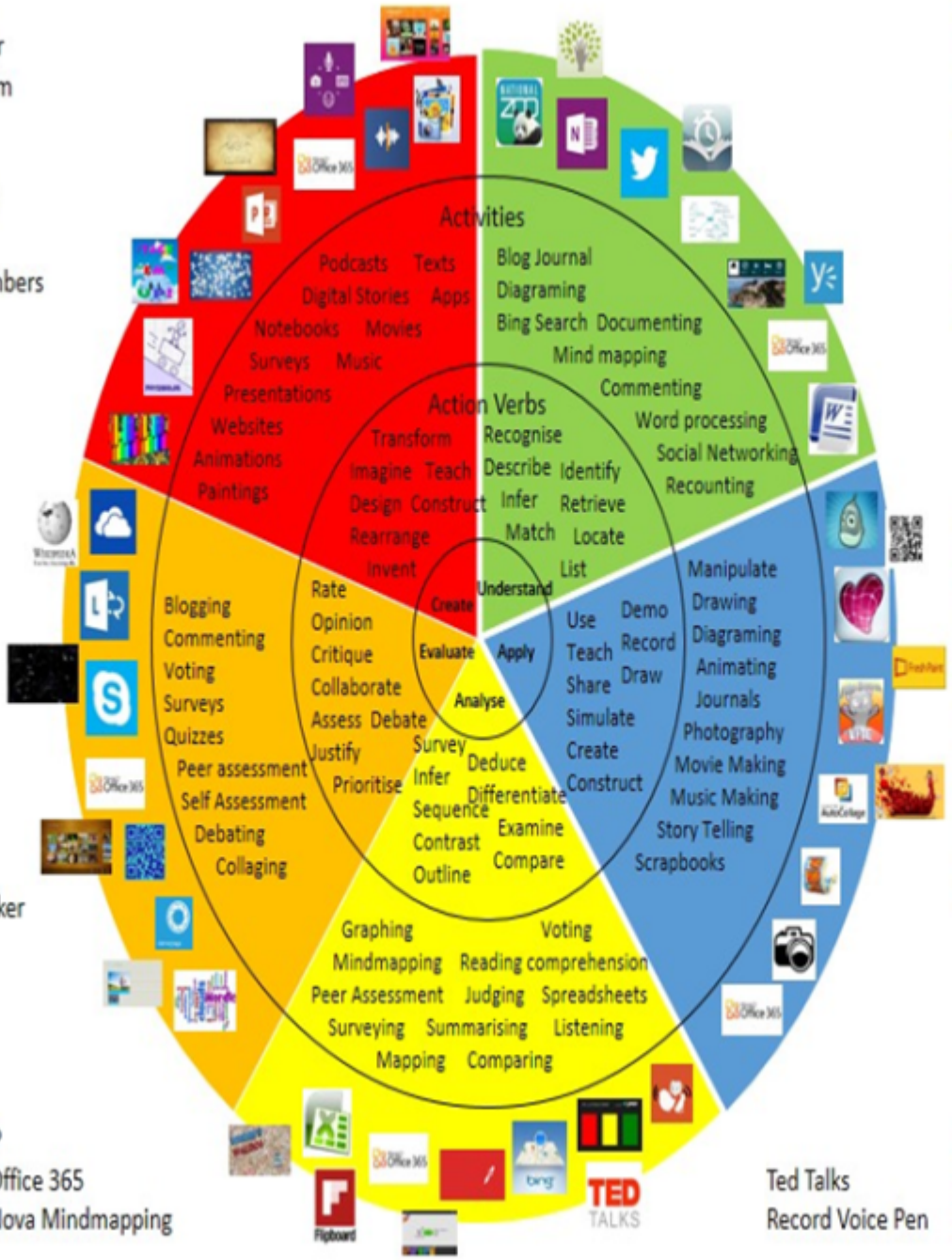
Win 8.1 Apps/Tools Pedagogy Wheel

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
Flipboard
Office 365
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

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.

WRK.9.2.12.CAP.1	Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
WRK.9.2.12.CAP.13	Analyze how the economic, social, and political conditions of a time period can affect the labor market.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).

TECH.9.4.12.DC.1	Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content (e.g., 6.1.12.CivicsPR.16.a).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).

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)

- 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
- multiple test sessions
- multi-sensory presentation
- 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)

Draw diagram of a ball making free fall and visualize velocity, acceleration, and position of the ball.

- 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

one step conversion velocity problems

- 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)

- Students must be able to solve problems by using polynomial and quadratic equations.

- 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: KINEMATICS

NJSLS: SCI.HS-PS2, SCI.HS-PS2-1, SCI.HS-PS2-2, SCI.HS.PS2.A, LA.RH.11-12.7, LA.RH.11-12.9, LA.RST.11-12.1, LA.RST.11-12.2, MA.A-APR.A, MA.A-CED.A.1, MA.A-CED.A.2

Interdisciplinary Connection: Vocabulary and algebra contents, global warming and climate change

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 thinking 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