



Conceptual Physics - Unit 1 - Kinematics

Unit Focus

Students will explore the relationship between forces on an object and the motion of that object. Students will examine how physics operates in everyday life as well as the objects they create in class. Students will engage in lessons that challenge them to use the scientific process as they perform several inquiry-based experiments to uncover and investigate fundamental principles of physics, such as acceleration and velocity. Students will practice important science skills such as metric system measurements and conversions as well as creating and analyzing graphs.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Common Core Mathematics: 9-12</p> <ul style="list-style-type: none"> Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. (CCSS.MATH.CONTENT.HSA.CED.A.1) Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R. (CCSS.MATH.CONTENT.HSA.CED.A.4) <p>Science & Technical Subjects: 9-10</p> <ul style="list-style-type: none"> Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. (CCSS.ELA-LITERACY.RST.9-10.3) Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9 10 texts and topics. (CCSS.ELALITERACY.RST.9-10.4) <p>NGSS/NSTA Science & Engineering Practices NGSS Science & Engineering Practices: 9-12</p> <ul style="list-style-type: none"> Ask questions to determine relationships, including quantitative relationships, between independent and dependent variables. (SE.9-12.1.3) Evaluate a question to determine if it is testable and relevant. (SE.9-12.1.5) Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor 	<p><i>Students will be able to independently use their learning to...</i></p> <p>T1 Use the scientific process to generate evidence that addresses the original questions. T2 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.</p>	
	Meaning	
	Understanding(s)	Essential Question(s)
<p><i>Students will understand that...</i></p> <p>U1 Scientists examine evidence to formulate interesting questions and solve problems. U2 Good experimental design leads to precise and accurate data. U3 Graphs are used by scientists to communicate information and to interpret the relationship between physical variables U4 All motions are relative to some frame of reference. U5 Scalar quantities have magnitude only and no direction. Examples: Mass, speed, volume, work, time, power energy etc. U6 Vector quantities have magnitude and direction. U7 The motion of objects can be represented quantitatively with graphs and equations, and qualitatively with words and diagrams</p>	<p><i>Students will keep considering...</i></p> <p>Q1 What information does an experiment's results provide? What trends or conclusions can be drawn from the results? Q2 How can we perceive if an object is moving or stationary? Q3 How can the motion of an object be represented?</p>	
Acquisition of Knowledge and Skill		
Knowledge	Skill(s)	
<p><i>Students will know...</i></p> <p>K1 The scientific method involves formulating a testable hypothesis, designing and conducting controlled experiments, and interpreting the results in a logical and objective manner.</p>	<p><i>Students will be skilled at...</i></p> <p>S1 Formulating a question that can be answered through investigation</p>	

Stage 1: Desired Results - Key Understandings

<p>environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory. (SE.9-12.1.6)</p> <ul style="list-style-type: none"> • Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system. (SE.9-12.2.3) • Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations. (SE. 9-12.5.3) <p>Madison Public Schools Profile of a Graduate</p> <ul style="list-style-type: none"> • Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) • Product Creation: Effectively use a medium to communicate important information. (POG.3.2) 	<p>K2 Distance is the length of the actual path covered by a moving object in a given time interval. It is a scalar quantity and is always positive.</p> <p>K3 Speed is the distance traveled by a moving object in a unit time interval. Its S.I unit is meter per second or m/s. It is a scalar quantity.</p> <p>K4 Displacement is the shortest distance covered by a body in a definite direction. It is a vector quantity and may be negative, positive or zero.</p> <p>K5 A position vs time graph shows how far away something is relative to an observer.</p> <p>K6 Velocity: It is the displacement of an object in unit a time interval. Its S.I unit is meter per second or m/s. It is a vector quantity.</p> <p>K7 A velocity vs time graph shows you how quickly something is moving, again relative to an observer.</p> <p>K8 Acceleration is the rate of change of velocity of the object. It is a vector quantity. Its S.I unit is meter/second square or m/s^2. If velocity decreases with time then acceleration is negative.</p> <p>K9 An acceleration vs time graph shows how quickly something is speeding up or slowing down, relative to an observer.</p>	<p>S2 Solving motion problems using mathematical computations</p> <p>S3 Sketch motion graphs given the qualitative description of an object's motion</p> <p>S4 Interpreting motion graphs to describe the behavior of an object.</p>
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