Springdale Public Schools
Physics Unit 1

Title of Unit	1D Kinematics & Dynamics	**Grade Level**	secondary
Subject	Physics	**Time Frame**	5 weeks* incorporates beginning of school culture
Developed By	SPS Science	**Date Modified**	06/17/2021

Identify Desired Results

Standards Covered in this Unit
(Evidence statements are LINKED from the standard number. Evidence statements assist in clarifying outcomes)

P-PS1-1AR Create a model of motion and forces, including vectors graphed on the coordinate plane, to describe and predict the behavior of a system. [Clarification Statement: **Emphasis is on vector addition for 1-D (frame of reference)**, vectors applied to force diagrams, and vector direction for gravitational forces.] **Arkansas designed, no evidence statement**

P-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [**AR** Clarification Statement: Emphasis is on balanced and unbalanced forces (Newton's first law) in a system, qualitative and quantitative comparisons of forces, mass and changes in motion (Newton's first law) in a system, qualitative and reference, and specification of units. Emphasis is on 1dimensional forces.]

- ★ **The above is marked as HS standard in the full standard link from DESE. It is mismarked. The above is the MS standard PS2-2. The correct standard for HS-PS2-2 is as follows:** 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. *[Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] [Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.]*

P-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. [**AR** Clarification Statement: Examples of data could include tables and graphs of position or velocity as functions of time for objects subject to a new unbalanced force (falling object, moving object being pulled by a constant force.]

Learning Outcomes for the Unit
What relevant goals will this unit address? These must come from the standards.

- Students will use experimental design to determine and analyze changes in 1-D motion.
- Students will use graphical and mathematical models to describe 1-D motion of an object.

Key Vocabulary for the Unit

kinematics	1-dimensional	distance	displacement	speed
velocity	acceleration	vector	scalar	force
mass	Frame of reference	Unit analysis	Conversion factor	inertia
slope	Area under the curve	friction	Acceleration due to gravity	equilibrium
static	Net force	Coefficient of friction	Restoring force	Resultant

Enduring Understandings for the Unit (for discussion within science and across content areas)

- All forces share certain common characteristics when considered by observers in inertial reference frames.
- The acceleration of the center of mass of a system is related to the net force exerted on the system
- Frame of reference is determined by the observer
- Justification for phenomena in everyday experiences can be supported through graphical and data analysis.

Essential Questions for the Unit

- How can the motion of objects be predicted and/or explained?
- How can the idea of frames of reference allow two people to tell the truth yet have conflicting reports?
- How can we use models to help us understand motion?
- What relationships exist between distance, speed, acceleration, and time?

Misunderstandings That Will Be Addressed

- 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 kinematic equations only apply to constant acceleration situations

Content Literacy Skills for the Unit (Interpretation of data, experimental design, SEPs, CCs) [minimum list]

- **determines how the value of a variable changes as the value of another variable changes in moderately complex data presentation.**
- **performs an interpolation using data in a moderately complex table or graph.**
- **performs an extrapolation using data in a simple table or graph.**
- **understands a moderately complex experimental design.**
- **predicts the results of an additional trial or measurement in a moderately complex experiment.**
- **determines what conditions in a simple experiment would produce specified results.**

Assessment Evidence
What type(s) of Common Formative Assessment (CFA) will be given?
Ticket out the door, quick write, graphic organizer, golden line, three question quiz, hot/cold sticky note,
What type of District Formative Assessment will be given?
TBD

Overview of All Choices of Lessons for Unit This is not a lesson plan!.			
Standard(s) #	**Formative Assessment(s)** (Indicate which is the CFA)	**Main Instructional Strategy**	**Activity/Activities**
P-PS1-1AR	Google Form	**Discussion**	Words Matter
	Graph Analysis/Self Assessment	**Graphs**	Describing Velocity
		Lab	Speed walking Lab
	Free Body Diagrams	**Lab**	**ADI PS 9**
HS-PS2-2			

HS-PS2-1			

Common Resources	
Title and Description of Usage	**Location**
This is an option for a lab notebook that is virtual.	Blank Digital Lab Notebook
This is a lesson plan template that pairs with the Unit plan. It allows for easy information transfer.	Lesson Plan Template