PHYSICS

ORANGE HIGH SCHOOL

DOL | **UNIT** #: 1

UNIT NAME: FORCES

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PHYSICS	ORANGE HIGH SCHOOL	UNIT #: 1	UNIT NAME: FORCES

SCOPE AND SEQUENCE



OVERVIEW

ORANGE HIGH SCHOOL

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Lesson	Торіс	PE's and DCI's	Chapter	Suggested Pacing (Blocks)
1	Fundamental Forces	HS-PS2-4	1	1
2	Gravity	HS-PS2-4	1	2
3	Nuclear Forces	HS-PS2-6 HS-PS1-8	1	4
4	Electric Forces	HS-PS2-6	1	2
5	Centripetal Force and Circular Motion	HS-PS2-1	1	2
6	Work and Power	HS-PS3-2	1	3

SEPTEMBER 2016

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Μ	Т		W		R		F
5	6		7		8A		9 Fundamental Forces
12A	13 Gravity		14		15		16
19 B	20 Nuclear	·Forces	21		22 Nuclear Fe	orces	23
26A Nuclear Forces	27		28 Nuclear Forces		29		30 Electric Forces

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М	Т	W	R	F
3B Electric Forces	4	5	6 Centripetal Force and Circular Motion	7
10A	11	12 Work and Power	13	14
17B	18 Work and Power	19	20	21

What underlying forces explain the variety of interactions observed? (p.116, Framework)

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. Forces at a distance are explained by fields permeating space that can transfer energy through space. (p. 118, Framework).

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#	STUDENT LEARNING	CORRESPONDING		ΔςςεςςΜεντ
Blocks	OBJECTIVES	Pes and DCIs	CONNECTAN & SOFT LEWENTAL RESCORCES	ASSESSIVIEI
1	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. 1. Describe out the electric and nuclear forces that determine which materials are better for conducting electricity or how hard it is to separate. 2. Describe gravity in terms of distance between them. 3. Describe Coulomb's law in terms of distance. 4. Demonstrate that the relationships are the same between the two forces. 5. Demonstrate that gravity is weaker because G is small and works over longer distances but electric force is stronger but one at small distances.	HS-PS2-4	Coulomb Force (static): Students will investigate the relationship between distance and static force. https://www.explorelearning.com/index.cfm?method=cReso urce.dspView&ResourceID=456 Gravitational Force: Students will investigate the relationship between distance and gravitational force. https://www.explorelearning.com/index.cfm?method=cReso urce.dspView&ResourceID=411 Lunar Lander: investigate how different gravity effects how objects fall https://phet.colorado.edu/en/simulation/legacy/lunar- lander Universal Gravitation Reading (Discovery Education) Learn about how gravity was "discovered" Discovery Textbook: Gravitation Force	Model force fields for gravity by calculating the force of gravity at different points above the Earth. Model force fields for electrostatics by using iron filing to visualize the fields. Compare and contrast the findings. Crossword puzzle based off reading Gizmos Labs as Authentic Assessments

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# Blocks	STUDENT LEARNING OBJECTIVES	CORRESPONDING Pes and DCIs	CURRICULAR & SUPPLEMENTAL RESOURCES	ASSESSMENT
1	Communicate scientific and technical information about why the molecular- level structure is important in the functioning of designed materials. 1. Describe out the electric and nuclear forces determine which materials are better for conducting electricity or how hard it is to separate.	HS-PS2-6	Coulomb Force (static) Gizmo: Students will investigate the relationship between distance and static force. https://www.explorelearning.com/index.cfm?method=cReso urce.dspView&ResourceID=456 Discovery Textbook: Fundamental Forces https://app.discoveryeducation.com/techbook2:unit/view/u nitGuid/BDCF9CCA-34C2-493E-BDD1-100EA841555B	Write up for egg drop where students explain why they picked their material and about the process of development and the design and performance of a proposed process or system orally, graphically, textually, and mathematically Gizmos Lab as Authentic Assessments unless tangible materials can be found.
1	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. 1. Describe how fusion and fission are different and what radioactivity can be used for	HS-PS1-8	Nuclear Decay Gizmo: Students will investigate how the weak nuclear force works inside an atom. https://www.explorelearning.com/index.cfm?method=cReso urce.dspView&ResourceID=490 Nuclear Reactions: Video explaining nuclear reactions to better teach the subject according to NGSS. http://www.bozemanscience.com/nuclear-reactions Radiation and Radioactive Decay: Video explaining nuclear reactions to better teach the subject according to NGSS. http://www.bozemanscience.com/nuclear-reactions Radiocarbon Dating: Video explaining nuclear reactions to better teach the subject according to NGSS. http://www.bozemanscience.com/nuclear-reactions Radiocarbon Dating: Video explaining nuclear reactions to better teach the subject according to NGSS. http://www.bozemanscience.com/radiocarbon-dating	Nuclear power plant debate on whether or not the United Stated to eliminate its nuclear power in the form of energy and as weapons. Create a policy that allows humans to use nuclear energy efficiently and safely. Gizmos Labs as Authentic Assessments.

ORANGE PUBLIC SCHOOLS PHYSICS ORANGE HIGH SCHOOL UNIT #: 1 UNIT NAME: FORCES Teacher Resource for content http://www.bozemanscience.com/ngs-ps1c-nuclearprocesses **Discovery Textbook** https://google.discoveryeducation.com/learn/techbook/unit s/BDCF9CCA-34C2-493E-BDD1-100EA841555B/concepts/00A81AAA-FBDE-43D5-9ACC-67BE89A0B96F 1 Analyze data to support HS-PS2-1 Fan Cart Physics Gizmo: Students can see the effect of forces Draw free body diagrams of the claim that Newton's acting on a cart. various situations like a second law of motion https://www.explorelearning.com/index.cfm?method=cReso textbook on a table stationary urce.dspView&ResourceID=403 describes the and sliding, leaning against a mathematical relationship wall, or an object hanging Newton's Three Laws of Motion: Video explaining nuclear among the net force on a from a string. macroscopic object, its reactions to better teach the subject according to NGSS. Or mass, and its acceleration. classroom clip. Force lab or Gizmos as http://www.bozemanscience.com/newtons-three-laws-of-Authentic Assessments unless tangible materials can be motion found. Free Body Diagram: Video explaining nuclear reactions to better teach the subject according to NGSS. Or classroom Create a representation for clip. each of Newton's Laws. http://www.bozemanscience.com/free-body-diagrams Calculate the acceleration based off the force. Rube Goldberg Machine: Project outline. https://media.rubegoldberg.com/site/wpcontent/uploads/2016/06/RG-Challenge-2016-17.pdf One paragraph persuasive essay: Which comes first, **Discovery Textbook** force or acceleration? https://google.discoveryeducation.com/learn/techbook/unit s/BDCF9CCA-34C2-493E-BDD1-Design a Rube Goldberg

100EA841555B/concepts/24560D00-4CD8-47A5-945B-

apparatus to demonstrate

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		<u>40035C520C9B</u>	Newton's Laws
1 Develop and us illustrate that of macroscopic so accounted for combination of associated with motions of par (objects) and e associated with relative position particles (object)	se models to energy at the ale can be as a f energy n the ticles nergy n the ons of cts).	Potential Energy of Shelves Gizmo: Students can compare the energy at different distances from the ground. https://www.explorelearning.com/index.cfm?method=cReso urce.dspDetail&ResourceID=399Inclined Plane- Sliding Objects Gizmo: Students investigate the energy in the top and bottom of an inclined plane. https://www.explorelearning.com/index.cfm?method=cReso urce.dspDetail&ResourceID=27Energy, Work, and Power: Video explaining nuclear reactions to better teach the subject according to NGSS. Or classroom clip. http://www.bozemanscience.com/energy-work-powerPotential and Kinetic Energy: Video explaining nuclear reactions to better teach the subject according to NGSS. Or classroom clip. http://www.bozemanscience.com/potential-kinetic-energyDiscovery Textbook https://google.discoveryeducation.com/learn/techbook/unit s/BDCF9CCA-34C2-493E-BDD1- 100EA841555B/concepts/DC97221C-C184-4F6C-AD72- D9164CEC9C3A	Use the Gizmo to create bar graphs to represent the distribution of energy at given points Gizmos Labs as Authentic Assessments unless tangible materials can be found. Work lab where students walk or run up stair and use the height and their body work to calculate their work against gravity. Students can do the same thing with lifting weights, push-ups, sit ups, or jumping. If students measure the time it takes them, they can also calculate power.

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English Language Arts	Mathematics
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or	Reason abstractly and quantitatively. (HS-PS2-1),(HS-PS2-2),(HS-ETS1-1),(HS-ETS1-3),(HS-ETS1-4) MP.2
inconsistencies in the account. (HS-PS2-1) RST.11-12.1 Integrate and evaluate multiple sources of information presented in diverse	Model with mathematics. (HS-PS2-1),(HS-PS2-2),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4) MP.4
formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-PS2-1) RST.11-12.7	Use units as a way to understand problems and to guide the solution of multi- step problems; choose and interpret units consistently in formulas; choose and
Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging	interpret the scale and the origin in graphs and data displays. (HS-PS2-1),(HS-PS2-2) HSN.Q.A.1
conclusions with other sources of information. (HS-ETS1-3) RST.11-12.8 Synthesize information from a range of sources (e.g., texts, experiments,	Define appropriate quantities for the purpose of descriptive modeling. (HS-PS2-1),(HS-PS2-2) HSN.Q.A.2
simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-ETS1-3) RST.11 -	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS2-1),(HS-PS2-2) HSN.Q.A.3
12.9 Conduct short as well as more sustained research projects to answer a question	Interpret expressions that represent a quantity in terms of its context. (HS-PS2-1) HSA.SSE.A.1
(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.(HS-PS2-3),(HS	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. HSA.SSE.B.3 (HS-PS2-1)
Draw evidence from informational texts to support analysis, reflection, and	Create equations and inequalities in one variable and use them to solve problems. (HS-PS2-1),(HS-PS2-2) HSA.CED.A.1
Tesedicii. (h5-r52-1) Wh31.11-12.9	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (HS-PS2-1),(HS-PS2-2) HSA.CED.A.2
	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (HS-PS2-1),(HS-PS2-2) HSA.CED.A.4
	Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases. (HS-PS2-1) HSF-IF.C.7
	Represent data with plots on the real number line (dot plots, histograms, and box plots). (HS-PS2-1) HSS-IS.A.1

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	Modifications
Те	acher Note: Teachers identify the modifications that they will use in the unit. The unneeded modifications can then be deleted from the list.
•	Restructure lesson using UDL principals (<u>http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA</u>)
•	Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
•	Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
•	Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
•	Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
•	Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
•	Use project-based science learning to connect science with observable phenomena.
•	Structure the learning around explaining or solving a social or community-based issue.
•	Provide ELL students with multiple literacy strategies.

• Collaborate with after-school programs or clubs to extend learning opportunities.