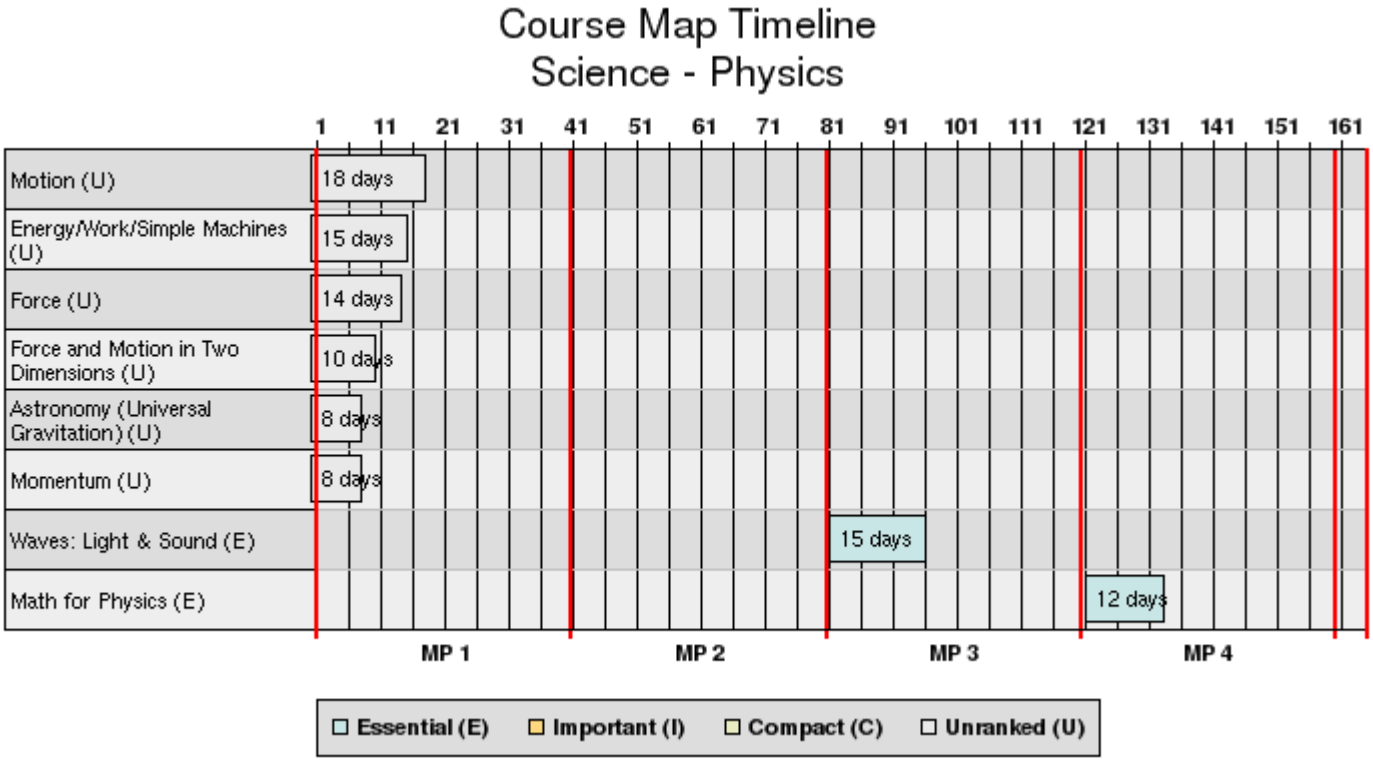
Folder: Science

Group/District: PENNSYLVANIA



Curriculum: COLUMBIA BOROUGH SD Curriculum

PENNSYLVANIA

Course: Science - Physics

Date: January 23, 2014 ET

Topic: Astronomy (Universal Gravitation)

Days: 8

Subject(s): Science

Grade(s): 12th

Key Learning:

Newton's Laws of Universal Gravitation can be used to explain the movement of the solar system.

Unit Essential Question(s):

Why do we believe the Earth circles the Sun when visually it appears to be the other way around?

Concept:	Concept:	Concept:
Kepler's Laws of Planetary Motion S11.D.3.1.1 Develop and used the Theory as it applies to any two objects.	**Newton's Laws of Universal Gravitation** S11.D.3.1.1 Review history of early beliefs of the solar system and how modern concepts were arrived at. May venture into dark matter to show not all is confidently understood.	**Applying Laws of Gravitation** S11.D.3.1.1
Lesson Essential Question(s): What laws did Kepler believe governed the universe? (A)	**Lesson Essential Question(s):** What laws did Kepler propose governed the movement of the universe? (A)	**Lesson Essential Question(s):** How can we apply math to the concept of universal gravitation? (A)
Vocabulary: Kepler's Laws of Planetary Motion	**Vocabulary:** , Gravitational Force, Law of Universal Gravitation	**Vocabulary:** Inertial Mass, Gravitational Mass

Additional Information:

Attached Document(s):

Vocab Report for Topic: Astronomy (Universal Gravitation) Days: 8
Subject(s): Science Grade(s): 12th

Concept:

Kepler's Laws of Planetary Motion

Kepler's Laws of Planetary Motion -

Concept:

Newton's Laws of Universal Gravitation

-
Gravitational Force -
Law of Universal Gravitation -

Concept: Applying Laws of Gravitation

Inertial Mass -
Gravitational Mass -

Topic: Energy/Work/Simple Machines Days: 15
Subject(s): Science Grade(s): 12th

Key Learning:
Energy is not always conserved and machines do not produce more energy than is required.

Unit Essential Question(s):
If I exert energy, apply force, am I really doing any work?

Concept: **Energy**	Concept: **Work**	Concept: **Machines**
What types of energy are there and when is energy conserved?	Work is the change in (mechanical) energy	Machines only transfer energy - do not create it - and Efficiencies are always less than 100%
Lesson Essential Question(s): When is Energy conserved? (A)	Lesson Essential Question(s): I pushed on the wall - it didn't move - did I do any work? (A)	Lesson Essential Question(s): Do machines do work? (A)
Vocabulary: Energy, Kinetic Energy, Work-Energy Theorem, Joule	Vocabulary: Power, Watt	Vocabulary: Effort Force, Resistance Force, Mechanical Advantage, Ideal Mechanical Advantage, Efficiency, Compound Machine

Concept: **Kinetic Energy**	Concept: **Potential Energy**	Concept: **Conservation of Energy**
Lesson Essential Question(s): What are examples of kinetic energy? (A)	Lesson Essential Question(s): What are examples of potential energy (A)	Lesson Essential Question(s): How do we solve problems using the Law of Conservation of Energy? (A)
Vocabulary: Kinetic Energy	Vocabulary: Gravitational Potential Energy, Reference Level, Elastic Potential Energy	Vocabulary: Law of Conservation of Energy, Mechanical Energy, Elastic Collision, Inelastic Collision

Topic: Energy/Work/Simple Machines Days: 15
Subject(s): Science Grade(s): 12th

Additional Information:

Attached Document(s):

Vocab Report for Topic: Energy/Work/Simple Machines Days: 15
Subject(s): Science Grade(s): 12th

Concept:

Energy

Energy -
Kinetic Energy -
Work-Energy Theorem -
Joule -

Concept:

Work

Power -
Watt -

Concept:

Machines

Effort Force -
Resistance Force -
Mechanical Advantage -
Ideal Mechanical Advantage -
Efficiency -
Compound Machine -

Concept: Kinetic Energy

Kinetic Energy -

Concept: Potential Energy

Gravitational Potential Energy -
Reference Level -
Elastic Potential Energy -

Concept: Conservation of Energy

Law of Conservation of Energy -
Mechanical Energy -
Elastic Collision -
Inelastic Collision -

Curriculum: COLUMBIA BOROUGH SD Curriculum

PENNSYLVANIA

Course: Science - Physics

Date: January 23, 2014 ET

Topic: Force and Motion in Two Dimensions

Days: 10

Subject(s): Science

Grade(s): 11th, 12th

Key Learning: **The movement of everyday objects can be explained in terms of Newton's Laws.**

Unit Essential Question(s): **How can Newton's Laws be applied to movement in two dimensions?**

Concept: **Equilibrium**	Concept: **Motion on an Inclined Plane**	Concept: **Projectile Motion**
S11.C.3.1.3, S11.C.3.1.2	S11.C.3.1.2, S11.C.3.1.3	S11.C.3.1.2, S11.C.3.1.3
Solve and understand trajectory problems by resolving initial conditions into vertical and horizontal components	Calculate velocities and radii given uniform circular motion and the relationship to the acceleration of the system	Determine the input and resultant forces of a lever by applying the laws governing torques.
Lesson Essential Question(s): What factors must be present for an object to achieve a position of equilibrium? (A)	Lesson Essential Question(s): Where should I sit on the tetter-totter so my fat brother doesn't launch me in the air? (A)	Lesson Essential Question(s): What angle should I throw a ball so that it goes the furthest distance? (A)
Vocabulary: Equilabrant,	Vocabulary: Inclined Plane	Vocabulary: Maximum Height, Range, Flight Time

Concept: **Circular Motion**

S11.C.3.1.3, S11.C.3.1.2

Lesson Essential Question(s): How do Newton's Laws apply to objects moving in a circle? (A)

Vocabulary: Uniform Circular Motion, Centripetal Acceleration, Centripetal Force, Rigid Rotating Object, Lever Arm, Torque

Additional Information:

Attached Document(s):

Vocab Report for Topic: Force and Motion in Two Dimensions Days: 10
Subject(s): Science Grade(s): 11th, 12th

Concept:

Equilibrium

Equilabrant -
-

Concept:

Motion on an Inclined Plane

Inclined Plane -

Concept:

Projectile Motion

Maximum Height -
Range -
Flight Time -

Concept: Circular Motion

Uniform Circular Motion -
Centripetal Acceleration -
Centripetal Force -
Rigid Rotating Object -
Lever Arm -
Torque -

Topic: Force
Days: 14
Subject(s): Science
Grade(s): 11th, 12th

Key Learning: Newton's Three Laws of Motion can be used to understand and explain the motion of any object.

Unit Essential Question(s):

How can we understand motion with Newton's Laws?

Concept: Newton's Second Law of Motion	Concept: Newton's First Law of Motion	Concept: Using Newton's Laws
S11.C.3.1.2, S11.C.3.1.3	S11.C.3.1.2, S11.C.3.1.3	S11.C.3.1.2, S11.C.3.1.3
Students can apply the law to various bodies and determine the forces involved by resolving acceleration vectors.	Calculate the Forces due to gravity and the resolving of the 'g' into normal and other forces.	
Lesson Essential Question(s): What does Newton's Second Law of Motion tell us about how things move? (A)	Lesson Essential Question(s): What does Newton's First Law of Motion tell us about how things move? (A)	Lesson Essential Question(s): How can we solve problems using Newton's Laws of Motion? (A)
Vocabulary: Contact Force, Long-Range Force, Force of Gravity, Agent, Free-Body Diagram, Net Force, Newton's Second Force	Vocabulary: Newton's First Law, Inertia, Equilibrium	Vocabulary: Apparent Weight, Weightlessness

Concept: Friction	Concept: Simple Harmonic Motion	Concept: Newton's Third Law
S11.C.3.1.2, S11.C.3.1.3	S11.C.3.1.2, S11.C.3.1.3	S11.C.3.1.2, S11.C.3.1.3
Lesson Essential Question(s): What factors influence friction? (A)	Lesson Essential Question(s): What factors influence simple harmonic motion? (A)	Lesson Essential Question(s): What does Newton's Third Law of Motion tell us about how things move? (A)
Vocabulary: Static Friction Force, Kinetic Friction Force, Terminal Velocity	Vocabulary: Simple Harmonic Motion, Period, Amplitude, Mechanical Resonance	Vocabulary: Interaction Pair, Newton's Third Law

Topic: Force
Days: 14
Subject(s): Science
Grade(s): 11th, 12th

Concept:
Ropes and Springs

Lesson Essential Question(s):
How is the movement of an object attached to a rope or a spring unique? (A)

Vocabulary:
Tension

Additional Information:

Attached Document(s):

Vocab Report for Topic: Force Days: 14
Subject(s): Science Grade(s): 11th, 12th

Concept:

Newton's Second Law of Motion

Contact Force -
Long-Range Force -
Force of Gravity -
Agent -
Free-Body Diagram -
Net Force -
Newton's Second Force -

Concept:

Newton's First Law of Motion

Newton's First Law -
Inertia -
Equilibrium -

Concept: Using Newton's Laws

Apparent Weight -
Weightlessness -

Concept: Friction

Static Friction Force -
Kinetic Friction Force -
Terminal Velocity -

Concept: Simple Harmonic Motion

Simple Harmonic Motion -
Period -
Amplitude -
Mechanical Resonance -

Concept: Newton's Third Law

Interaction Pair -
Newton's Third Law -

Concept: Ropes and Springs

Vocab Report for Topic: Force Days: 14
Subject(s): Science Grade(s): 11th, 12th

Tension -

Curriculum: COLUMBIA BOROUGH SD Curriculum

PENNSYLVANIA

Course: Science - Physics

Date: January 23, 2014 ET

Topic: Math for Physics

Days: 12

Subject(s): Science

Grade(s): 12th

Key Learning:

A basic understanding of mathematics is useful not only in the laboratory but also at the shopping mall, on the highway, in the kitchen, and on the playing field.

Unit Essential Question(s):

What skills do I need in my mathematical tool kit to be successful this year?

Concept:	Concept:	Concept:
Algebra Review- Exponents, Scientific, Metric System, SI Notation, Notation, Polynomial Equations S11.A.1.3.1	**Mathematical Uncertainties** S11.A.1.3.1	**Graphing Data** S11.A.1.3.1
Lesson Essential Question(s): What tools do I need to place in my toolkit from previous Algebra classes? (A)	**Lesson Essential Question(s):** Are measurements ever exact? (A) What is the difference between accuracy and precision? (A)	**Lesson Essential Question(s):** How do I put my laboratory data into graphical form? (A)
Vocabulary: Exponents, Scientific notation, Decimal Notation, Metric System , SI, Base Units, Meter, Second, Kilogram, Derived Units	**Vocabulary:** Precision, Accuracy, Parallax, Significant Digits	**Vocabulary:** Linear Relationship, Slope, y-intercept, Quadratic Relationship, Inverse Relationship

Topic: Math for Physics
Days: 12
Subject(s): Science
Grade(s): 12th

Concept: Properties of Vectors	Concept: Components of Vectors
Lesson Essential Question(s): What is a vector and why should I care? (A)	Lesson Essential Question(s): How can I use math to calculate where I am? (A)
Vocabulary: Graphical Representation, Algebraic Representation, Resultant Vector	Vocabulary: Vector Resolution, Components

Additional Information:

Attached Document(s):

Vocab Report for Topic: Math for Physics Days: 12
Subject(s): Science Grade(s): 12th

Concept:

Algebra Review- Exponents, Scientific, Metric System, SI Notation, Notation, Polynomial Equations

Exponents -
Scientific notation -
Decimal Notation -
Metric System
-
SI -
Base Units -
Meter -
Second -
Kilogram -
Derived Units -

Concept:

Mathematical Uncertainties

Precision -
Accuracy -
Parallax -
Significant Digits -

Concept:

Graphing Data

Linear Relationship -
Slope -
y-intercept -
Quadratic Relationship -
Inverse Relationship -

Concept: Properties of Vectors

Graphical Representation -
Algebraic Representation -
Resultant Vector -

Concept: Components of Vectors

Vector Resolution -
Components -

Curriculum: COLUMBIA BOROUGH SD Curriculum

PENNSYLVANIA

Course: Science - Physics

Date: January 23, 2014 ET

Topic: Momentum

Days: 8

Subject(s): Science

Grade(s): 12th

Key Learning: **Momentum is conserved in all situations and applications.**

Unit Essential Question(s): **How do air bags help reduce injuries and save lives in a car crash?**

Concept: **Impulse - Momentum Theorem**	Concept: **Momentum Conservation**	Concept: **Momentum in Two Dimensional Collisions**
S11.C.3.1.1, S11.C.3.1.2	S11.C.3.1.1, S11.C.3.1.2	S11.C.3.1.1, S11.C.3.1.2
Develop the Theorem mathematically and graphically	Show that Momentum is conserved in 1-dimensional elastic collisions	Show conservation of Momentum when an elastic collision between two billiard balls is not 'dead on'
Lesson Essential Question(s): What does Newton's 'equal and opposite' law mean? (A)	**Lesson Essential Question(s):** If a billiard ball strikes a second ball straight on, what happens? (A)	**Lesson Essential Question(s):** How can momentum be conserved when a ball hits another such that they both continue to travel in different directions? (A)
Vocabulary: Momentum, Impulse, Impulse-Momentum Theorem, Angular Momentum	**Vocabulary:** Closed System, Internal Forces, External Forces, Isolated System, Law of Conservation of Momentum	**Vocabulary:** Net Momentum

Additional Information:

See attachments Phywk(27-29)

Attached Document(s):

Vocab Report for Topic: Momentum Days: 8
Subject(s): Science Grade(s): 12th

Concept:

Impulse - Momentum Theorem

Momentum -
Impulse -
Impulse-Momentum Theorem -
Angular Momentum -

Concept:

Momentum Conservation

Closed System -
Internal Forces -
External Forces -
Isolated System -
Law of Conservation of Momentum -

Concept:

Momentum in Two Dimensional Collisions

Net Momentum -

Topic: Motion
Days: 18
Subject(s): Science
Grade(s): 12th

Key Learning:
The motion of an object can be described both graphically and mathematically.

Unit Essential Question(s):
How do I describe the motion of an object?

Concept: Motion Graphically	Concept: Velocity	Concept: Acceleration
S11.C.3.1.3, S11.C.3.1.2	S11.C.3.1.3, S11.C.3.1.2	S11.C.3.1.3, S11.C.3.1.2
Diffferentiate between distance and displacement and how displacement is graphically represented.	understand velocity (vector) vs Speed (scalar) and (Instant vs Average) Velocity	Just a velocity is the rate change of displacement (vs time); Acceleration is the rate change of Velocity (vs time)
Lesson Essential Question(s): How many ways can motion in a straight line be represented? (A)	**Lesson Essential Question(s):** What does it mean to be motionless? (A)	**Lesson Essential Question(s):** Can velocity, displacement, and acceleration be used to define an object's motion completely? (A)
Vocabulary: Motion Diagram, Operational Diagram, Particle Model, Coordinate System, Origin, Position Vector, Scalar Quantity, Vector Quantity, Displacement, Time Interval, Distance	**Vocabulary:** Average Velocity, Average Speed, Instantaneous Velocity	**Vocabulary:** Average Acceleration

Concept: Graphing Motion and Velocity	Concept: Solving Motion Problems	Concept: Free Fall Motion
S11.C.3.1.3, S11.C.3.1.2	S11.C.3.1.3, S11.C.3.1.2	S11.C.3.1.3, S11.C.3.1.2
Lesson Essential Question(s): How do I represent velocity and motion on a graph? (A)	**Lesson Essential Question(s):** How do I mathematically solve problems involving velocity and acceleration? (A)	**Lesson Essential Question(s):** How is the motion of an object different when it is in free fall? (A)
Vocabulary: Uniform Motion	**Vocabulary:** Constant Acceleration, Instantaneous Acceleration	**Vocabulary:** Acceleration Due to Gravity

Topic: Motion Days: 18
Subject(s): Science Grade(s): 12th

Additional Information:

Attached Document(s):

Vocab Report for Topic: Motion Days: 18
Subject(s): Science Grade(s): 12th

Concept: Motion Graphically

Motion Diagram -
Operational Diagram -
Particle Model -
Coordinate System -
Origin -
Position Vector -
Scalar Quantity -
Vector Quantity -
Displacement -
Time Interval -
Distance -

Concept:

Velocity

Average Velocity -
Average Speed -
Instantaneous Velocity -

Concept:

Acceleration

Average Acceleration -

Concept: Graphing Motion and Velocity

Uniform Motion -

Concept: Solving Motion Problems

Constant Acceleration -
Instantaneous Acceleration -

Concept: Free Fall Motion

Acceleration Due to Gravity -

Topic: Waves: Light & Sound
Days: 15
Subject(s): Science
Grade(s): 12th

Key Learning:
Waves behave predictably based on the characteristics of the wave and the medium through which it travels.

Unit Essential Question(s): How can we describe and predict the behavior of light and sound?

Concept: Wave Mechanics S11.C.2.1.1	Concept: Sound S11.C.2.1.1	Concept: Nature of Light S11.C.2.1.1
Lesson Essential Question(s): What are the similarities and differences between the various types of waves? (A) How do waves interfere with one another? (A)	**Lesson Essential Question(s):** How does sound behave? (A) How do we interpret the various properties of sound? (A)	**Lesson Essential Question(s):** How do we interpret the various properties of light? (A)
Vocabulary: wavelength, frequency, period, amplitude, trough, peak, constructive/destructive interference, node, antinode, standing wave, resonance, superposition, boundary, medium, reflection, refraction	**Vocabulary:** Decibel (dB), pitch, echo, doppler, harmonics, open/closed pipe resonator, octave	**Vocabulary:** wavelength, frequency, amplitude, Transverse / longitudinal, Hertz / Frequency, Boundary, primary and secondary colors

Topic: Waves: Light & Sound
Days: 15
Subject(s): Science
Grade(s): 12th

Concept: Mirrors	Concept: Lenses	Concept: Gratings
S11.C.2.1.1	S11.C.2.1.1	S11.C.2.1.1 Light diffracts when it passes through narrow slitssplitting the light into distint patterns of positive and negative interference.
Lesson Essential Question(s): How does light behave at boundaries? (A) How does the reflected beam compare with the initial light wave? (A)	Lesson Essential Question(s): What are the properties of images formed by concave and convex lense? (A) How do images form when light is passed through lenses? (A)	Lesson Essential Question(s): How is a grating different than a prism? (A)
Vocabulary: Normal, Image, Convex / Concave, Magnification, Virtual, medium, reflection, refraction, diffraction, polarization	Vocabulary: Magnification, convex, concave, real/virtual image, focus, focal point, radius of curvature, Total Internal Reflection / Critical Angle	Vocabulary: Diffraction, Young's interference Experiment (Interferometer)

Additional Information:

Attached Document(s):

Vocab Report for Topic: Waves: Light & Sound Days: 15
Subject(s): Science Grade(s): 12th

Concept: Wave Mechanics

wavelength -
frequency -
period -
amplitude -
trough -
peak -
constructive/destructive interference -
node -
antinode -
standing wave -
resonance -
superposition -
boundary -
medium -
reflection -
refraction -

Concept: Sound

Decibel (dB) -
pitch -
echo -
doppler -
harmonics -
open/closed pipe resonator -
octave -

Concept: Nature of Light

wavelength -
frequency -
amplitude -
Transverse / longitudinal -
Hertz / Frequency -
Boundary -
primary and secondary colors -

Concept:

Mirrors

Normal -
Image -
Convex / Concave -
Magnification -
Virtual -

Vocab Report for Topic: Waves: Light & Sound Days: 15
Subject(s): Science Grade(s): 12th

medium -
reflection -
refraction -
diffraction -
polarization -

Concept:

Lenses

Magnification -
convex -
concave -
real/virtual image -
focus -
focal point -
radius of curvature -
Total Internal Reflection / Critical Angle -

Concept:

Gratings

Diffraction -
Young's interference Experiment (Interferometer) -