Curriculum: Chambersburg Area SD Curriculum #2

Course: Science Physics 10-12

PENNSYLVANIA

Date: July 21, 2014 ET

Topic: Dynamics

Days: 24

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

Motion of objects can be explained using concepts of force.

Unit Essential Question(s):

How is force used to predict motion?

Concept: Newton's Laws of Motion 3.4.12.C	Concept: Gravitation 3.7.12.C	Concept: Momentum and Collisions 3.4.12.C
Lesson Essential Question(s): How does the 1st Law relate to the description of motion? (A) How does the 2nd Law mathematically predict motion? (A) How are the quantities described by the 2nd Law related? (ET) How does the 3rd Law describe interactions between objects? (A)	**Lesson Essential Question(s):** How is the attractive force between two objects related to their masses? (A) How is the force of attraction between two objects related to their distance of separation? (ET)	**Lesson Essential Question(s):** How does force cause a change in momentum? (A) How does the conservation of momentum help to predict results of collisions and interactions? (ET)
Vocabulary: force, inertia, friction, mass, weight, pressure	**Vocabulary:** universal gravitation	**Vocabulary:** momentum, impulse, elastic collision, inelastic collision

Additional Information:

No change KE for collision calculations

Attached Document(s):

Vocab Report for Topic: Dynamics Days: 24
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Newton's Laws of Motion

force -

a push or pull acting on object

inertia -

tendency of an object to maintain its state of motion

friction -

a force that opposes applied force or motion

mass -

the amount of matter in an object

weight -

force of gravity acting on an object

pressure -

force on surface divided by surface area

Concept: Gravitation

universal gravitation -

all objects exert an attractive force on each other

Concept: Momentum and Collisions

momentum -

product of object's mass and velocity; inertia in motion

impulse -

product of net force acting on object and time interval over which the force acts

Vocab Report for Topic: Dynamics
Days: 24
Subject(s): Science
Grade(s): 10th, 11th, 12th

elastic collision -

type of collision in which kinetic energy and total momentum are conserved

inelastic collision -

type of collision in which kinetic energy is lost; total momentum is conserved

Curriculum: Chambersburg Area SD Curriculum #2 PENNSYLVANIA

Course: Science Physics 10-12 Date: July 21, 2014 ET

Topic: Electricity and Magnetism Days: 10

Subject(s): Science Grade(s): 10th, 11th, 12th

Key Learning:

Describe electricity and magnetism as two aspects of a single electromagnetic force.

Unit Essential Question(s):

How are electricity and magnetism described as a single force to predict the motion of charges?

Concept: **Electrostatics** 3.4.12.A, 3.4.12.C	Concept: **Current** 3.4.12.C	Concept: **Magnetism** 3.4.12.C
Lesson Essential Question(s): How are bodies charged electrically? (A) What factors determine electric force? (A) What are the relationships between electric force, distance, and charge? (ET)	Lesson Essential Question(s): How is current related to charge? (A) What is the relationship between current voltage, and resistance? (ET) How is electric power related to voltage and current? (ET) How is power transmitted to reduce energy flow? (ET)	Lesson Essential Question(s): How is magnetism a result of the alignment of many magnetic domains in a metal? (A)
Vocabulary: Electrostatics, Coulomb's Law, , induction	Vocabulary: conductor, insulator, current, voltage, resistance,	Vocabulary: magnetic field, magnetic pole

Additional Information:

Attached Document(s):

Vocab Report for Topic: Electricity and Magnetism Days: 10
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Electrostatics

Electrostatics -

the study of electric charges at rest

Coulomb's Law -

relationship between electrical force, charges and distance

-
induction -

the charging of an object without direct contact

Concept: Current

conductor -

material through which electric charge can flow

insulator -

material that is a poor conductor of electricity

current -

the flow of electric charge; measured in amperes

voltage -

electric potential

resistance -

property that determines how much current will flow; equal to voltage divided by current

-

Concept: Magnetism

Vocab Report for Topic: Electricity and Magnetism
Days: 10
Subject(s): Science
Grade(s): 10th, 11th, 12th

magnetic field -

a force field that fills the space around every magnet or current-carrying wire

magnetic pole -

one of the regions on a magnet that produces magnetic forces

Curriculum: Chambersburg Area SD Curriculum #2 PENNSYLVANIA

Course: Science Physics 10-12 Date: July 21, 2014 ET

Topic: Kinematics (1 Dimensional) Days: 29

Subject(s): Science Grade(s): 10th, 11th, 12th

Key Learning:

One dimensional motion of objects can be described in mathematical relationships.

Unit Essential Question(s):

How can we use mathematical relationships between the specific descriptions of motion to predict one dimensional motion?

Concept: Translational Motion 3.4.12.C	Concept: Graphical Analysis	Concept: Vector 3.4.12.C
Lesson Essential Question(s): How are the descriptions of translational motion mathematically manipulated to predict motion? (A) What are the characteristics of an object's motion in freefall? (A) What quantities and their units are needed to describe motion? (A)	Lesson Essential Question(s): How is the motion of an object determined from a position versus time graph? (A) How is the motion of an object determined from a velocity versus time graph? (A)	Lesson Essential Question(s): How is direction important in predicting motion? (A) How are vector quantities different from scalar quantities? (A) How is the magnitude of perpendicular vectors found? (A)
Vocabulary: distance, displacement, speed, velocity, acceleration, freefall, rate, relative	Vocabulary: directly proportional, inverse relationship	Vocabulary: vector, scalar, magnitude, resultant, component, perpendicular

Additional Information:

Attached Document(s):

Vocab Report for Topic: Kinematics (1 Dimensional) Days: 29
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Translational Motion

distance -

how far an object has traveled

displacement -

change in position of an object, including direction

speed -

distance traveled per unit of time; rate of change of position

velocity -

the speed and direction an object is moving measured relative to a reference point

acceleration -

change in velocity during a time interval

freefall -

motion of body when air resistance is negligible and action is due to gravity alone

rate -

how fast something happens

relative -

regarded in relation to something else, frame of reference

Concept: Graphical Analysis

directly proportional -

one variable is dependent on another variable

inverse relationship -

Vocab Report for Topic: Kinematics (1 Dimensional) Days: 29
Subject(s): Science Grade(s): 10th, 11th, 12th

one variable depends on the inverse of the other variable

Concept: Vector

vector -

quantity that has magnitude and direction

scalar -

quantity that has magnitude only

magnitude -

size

resultant -

sum of two or more vectors

component -

part of vector

perpendicular -

seperated by an angle of 90 degrees

Curriculum: Chambersburg Area SD Curriculum #2 PENNSYLVANIA

Course: Science Physics 10-12 Date: July 21, 2014 ET

Topic: Kinematics (2 Dimensional) Days: 14

Subject(s): Science Grade(s): 10th, 11th, 12th

Key Learning:

Two dimensional motion of objects can be described in mathematical relationships.

Unit Essential Question(s):

How are concepts from one dimensional motion applied to two dimensional motion?

Concept:	Concept:
Projectiles 3.4.12.C	**Circular Motion** 3.4.12.C
Lesson Essential Question(s): How is the vertical motion of a projectile different from its horizontal motion? (A) How do you use kinematic equations to predict projectile motion? (ET)	Lesson Essential Question(s): How is circular motion described in terms of acceleration and force? (A) How are descriptions of circular motion mathematically manipulated to predict motion? (ET)
Vocabulary: trajectory, projectile	Vocabulary: rotation, revolution, linear speed, tangential speed, tangent, centripetal force, centripetal acceleration, radius, circumference, period, frequency

Additional Information:

Minimize rearrangement of equations

Ground to ground and cliff to ground projectiles only

Eliminate angle of impact

Attached Document(s):

Vocab Report for Topic: Kinematics (2 Dimensional) Days: 14
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Projectiles

trajectory -

path of a projectile

projectile -

object shot through the air

Concept: Circular Motion

rotation -

spinning motion that takes place when object turns around an internal axis

revolution -

motion of object turning around external axis

linear speed -

the speed of an object moving along a circular path

tangential speed -

the speed of an object mvoing along a circular path; same as linear speed

tangent -

touches the circle at a single point

centripetal force -

a force directed towards the center of circular path and cause objects to follow a circular path

centripetal acceleration -

change in velocity of an object moving in a circular path

radius -

Vocab Report for Topic: Kinematics (2 Dimensional)
Days: 14
Subject(s): Science
Grade(s): 10th, 11th, 12th

distance from axis

circumference -

distance around circular path

period -

time interval of one complete cycle of motion

frequency -

number of cycles that occur in a given time interval

Curriculum: Chambersburg Area SD Curriculum #2

PENNSYLVANIA

Course: Science Physics 10-12

Date: July 21, 2014 ET

Topic: Light

Days: 20

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

A knowledge of the wave nature of light can be used to explain the formation of images and fringes.

Unit Essential Question(s):

How are images and fringes formed by light?

Concept:	Concept:
Images of Reflection 3.4.12.C	Images of Refraction 3.4.12.C
Lesson Essential Question(s): How are images formed by reflection plane mirrors? (A) How are images formed by reflection in curved mirrors? (A)	Lesson Essential Question(s): How are images formed by concave lenses? (A) How are images formed by convex lenses? (A)
Vocabulary: reflection	Vocabulary: refraction, concave lens, convex lens

Additional Information:

Attached Document(s):

Vocab Report for Topic: Light Days: 20
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Images of Reflection

reflection -

the bouncing back of a particle or wave that strikes a boundary between two media

Concept: Images of Refraction

refraction -

the change in direction of a wave as it crosses the boundary between two media in which the wave travels at different speeds

concave lens -

lens that is thinnest in the middle and causes parallel rays of light to diverge

convex lens -

lens that is thickest in the middle and causes parallel rays of light to converge or focus

Curriculum: Chambersburg Area SD Curriculum #2 PENNSYLVANIA

Course: Science Physics 10-12 Date: July 21, 2014 ET

Topic: Measurement and Methods I Days: 13

Subject(s): Science Grade(s): 10th, 11th, 12th

Key Learning:

A knowledge of various methods of scientific measurement and deata analysis used with physical systems.

Unit Essential Question(s):

Why are precision, accuracy, and units important in physics?

Concept:	Concept:	Concept:
Units of Measurement 3.1.12.A, 3.2.12.D	**Measuring Instruments** 3.7.12.B	**Data Analysis** 3.2.12.B, 3.1.12.C
Lesson Essential Question(s): What are SI fundamental units in mechanics? (A) How do you distinguish between SI fundamental units and derived units? (A) What are the values of the prefixes from micro to mega? (A) How is the factor label method used to make unit conversions? (A)	Lesson Essential Question(s): What degree of precision is used with each instrument? (A) What are possible sources of error in taking measurements? (ET)	Lesson Essential Question(s): What are the rules for applying significant figures and rounding during calculations? (A) What is the scientific reasoning for using significant figures? (ET) What is the meaning of accuracy and precision as applied to a data set? (A) How are mathematical relationships determined from graphs? (ET)
Vocabulary: fundamental unit, derived unit	Vocabulary: precision, accuracy	Vocabulary: theory, significant digit

Additional Information:

Attached Document(s):

Vocab Report for Topic: Measurement and Methods I Days: 13
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Units of Measurement

fundamental unit -
derived unit -

a unit derived froma combination of fundamental units

Concept: Measuring Instruments

precision -

the degree of exactness of a measurement

accuracy -

how well the results of a measurement agree with the "real" value

Concept: Data Analysis

theory -

explanation based on many observations supported by experimental results

significant digit -

valid digits in a measurement

Curriculum: Chambersburg Area SD Curriculum #2 PENNSYLVANIA

Course: Science Physics 10-12 Date: July 21, 2014 ET

Topic: Vibrations and Waves Days: 20

Subject(s): Science Grade(s): 10th, 11th, 12th

Key Learning:

Waves are a method of transferring energy.

Unit Essential Question(s):

In what ways does the transfer of energy by waves differ from particles?

Concept:	Concept:
Electromagnetic Wave Properties 3.4.12.C	**Mechanical Wave Properties** 3.4.12.C
Lesson Essential Question(s): How are electromagnetic waves distinguished from mechanical waves? (A)	Lesson Essential Question(s): What are the descriptions of periodic motion? (A) How is simple harmonic motion related to wave motion? (A) How is the motion of a wave described? (A) What are the characteristics of a mechanical wave, including sound? (A)
Vocabulary: photon, electromagnetic wave, infrared, ultraviolet, transparent, opaque	Vocabulary: simple harmonic motion, wave, medium, crest, trough, amplitude, wavelength, transverse wave, longitudinal wave, constructive interference, destructive interference, standing wave, node, antinode, Doppler effect, pitch, infrasonic, ultrasonic, resonance, beats

Additional Information:

Attached Document(s):

Vocab Report for Topic: Vibrations and Waves Days: 20
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Electromagnetic Wave Properties

photon -

a bundle of radiation that travels at the speed of light has zero mass and has energy and momentum

electromagnetic wave -

a wave that is partly electric and partly magnetic and carries energy

infrared -

electromagnetic waves of frequencies lower than the red of visible light

ultraviolet -

electromagnetic waves of frequencies higher than the violet of visible light

transparent -

term applied to materials that allow light to pass through them in straight lines

opaque -

term applied to materials that absorb light without re emission; do not allow light to pass through

Concept: Mechanical Wave Properties

simple harmonic motion -

motion that results when restoring force is proportional to displacement

wave -

disturbance that carries energy through matter or space

medium -

material through which waves travel

crest -

Vocab Report for Topic: Vibrations and Waves Days: 20
Subject(s): Science Grade(s): 10th, 11th, 12th

highest point of a wave

trough -

lowest point of a wave

amplitude -

maximum distance object/particle moves from equilibrium

wavelength -

distance between points where wave pattern repeats

transverse wave -

a wave that vibrates perpendicular to the direction of the wave's motion

longitudinal wave -

a wave that vibrates parallel to the direction of the wave motion

constructive interference -

addition of two or more waves when wave crests overlap to produce a resulting wave of increased amplitude

destructive interference -

addition of waves resulting in decreased overall amplitude

standing wave -

a wave that appears to be standing still produced by interference of two traveling waves moving in opposite directions

node -

stationary point where two equal wave pulses meet and completely cancel each other

antinode -

point with the largest displacement when two wave pulses meet

Vocab Report for Topic: Vibrations and Waves Days: 20
Subject(s): Science Grade(s): 10th, 11th, 12th

Doppler effect -

change in the frequency of sound caused by the movement of either the source, detector or both

pitch -

how we perceive frequency of sound- highness or lowness

infrasonic -

sound waves with frequency less than 20 hertz

ultrasonic -

sound waves with frequency above 20,000 hertz

resonance -

the amplification of a wave that occurs when small forces are applied at regular intervals to a vibrating object

beats -

the oscillation of wave amplitude that results from the superposition of two sound waves with almost identical frequencies

Curriculum: Chambersburg Area SD Curriculum #2

PENNSYLVANIA

Course: Science Physics 10-12

Date: July 21, 2014 ET

Topic: Work and Energy

Days: 17

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

Work is the process by which energy is transformed. Understanding the energy of an object is useful in predicting its motion.

Unit Essential Question(s):

How does work transfer energy and how does this enable the prediction of the motion?

Concept: **Work** 3.4.12.B	Concept: **Energy** 3.4.12.B	Concept: **Power** 3.4.12.B
Lesson Essential Question(s): What is the relationship between force, work, and displacement? (A) Under what conditions is work performed? (A)	Lesson Essential Question(s): How do you distinguish between kinetic and potential energy? (A) How does work bring about a transfer of energy? (ET) How can conservation of energy be used to predict the motion of an object influenced only by gravity? (A)	Lesson Essential Question(s): How is power defined in terms of work and energy transfers? (A) How is power related to time? (A)
Vocabulary: work	Vocabulary: kinetic energy, gravitational potential energy, elastic potential energy	Vocabulary: power, machine, efficiency

Additional Information:

Two days will be used for the Bungee Egg

Attached Document(s):

Vocab Report for Topic: Work and Energy Days: 17
Subject(s): Science Grade(s): 10th, 11th, 12th

Concept:

Work

work -

the transfer of energy by mechanical means and the product of force and distance

Concept: Energy

kinetic energy -

energy of an object due to its motions

gravitational potential energy -

energy of an object due to its position above a reference point on a gravitational source

elastic potential energy -

energy stored in an object as a result of its change in shape

Concept: Power

power -

rate at which work is done

machine -

a tool that makes work easier by changing the magnitude or direction of force exerted to do work

efficiency -

ratio of work output to work input