

Topic: Dynamics
 Subject(s): Science

Days: 45
 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:
Free Body Diagrams
[3.4.12.C](#)

Concept:
Inclined Planes
[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? (ET)
 How are the quantities described by the 2nd Law related? (A)
 How does the 3rd Law describe interactions between objects? (A)

Lesson Essential Question(s):
 How do you illustrate the forces acting on a body with a free body diagram? (A)
 How is the motion of a body predicted when multiple forces are applied? (ET)

Lesson Essential Question(s):
 How do you determine the components of gravity acting on a body placed on an incline? (A)
 How is the motion of the body on an incline affected by the components of gravity? (A)



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Concept:

Gravitation3.7.12.C

Concept:

Momentum and Collisions

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? (A)

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 interaction? (ET)

How do you distinguish between elastic and inelastic collisions using conservation of kinetic energy? (A)



Vocabulary:

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Additional Information:

Attached Document(s):

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.C](#), [3.4.12.A](#)

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? (A)

How is electric power related to voltage and current? (ET)

How is power transmitted to reduce energy flow? (A)

Lesson Essential Question(s):

How is magnetism a result of the alignment of many magnetic domains in a metal? (A)

How is a current induced by moving a magnetic field through a conductor? (A)

How do electric and magnetic fields interact? (A)



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Additional Information:

Attached Document(s):

Topic: Kinematics- 1 Dimensional
 Subject(s): Science

Days: 29
 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:

Vectors (1 Dimensional)

3.4.12.C



Lesson Essential Question(s):

What quantities and their units are needed to describe motion? (A)

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)

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 are perpendicular vectors added? (A)

How are non-perpendicular vectors added? (A)



Vocabulary:

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Additional Information:

Motion sensor lab is included in this topic.

Attached Document(s):

Topic: Kinematics- 2 Dimensional

Days: 25

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:

Vectors (2 Dimensional)[3.4.12.C](#)

Concept:

Projectiles[3.4.12.C](#)

Concept:

Circular Motion[3.4.12.C](#)

Lesson Essential Question(s):

How are perpendicular vectors added? (A)

How are non-perpendicular vectors added? (A)

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 of force? (A)

How are descriptions of circular motion mathematically manipulated to predict motion? (ET)



Vocabulary:

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Additional Information:

Attached Document(s):

Topic: Light
Subject(s): Science

Days: 20
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:

Images of Reflection

[3.4.12.C](#)

Concept:

Images of Refraction

[3.4.12.C](#)

Concept:

Interferences

[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)

Lesson Essential Question(s):

How are constructive and destructive interference related to shifts in wavelength? (ET)



Vocabulary:

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Additional Information:

Attached Document(s):

Topic: Measurement and Methods I
 Subject(s): Science

Days: 13
 Grade(s): 10th, 11th, 12th

Key Learning:

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



Unit Essential Question(s):

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



Concept:

Units of Measurement

3.1.12.A, 3.2.12.D

Concept:

Measuring Instruments

3.7.12.B

Concept:

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? (ET)

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? (ET)

How are mathematical relationships determined from graphs? (A)

How is percent error calculated and what is its meaning? (A)



Vocabulary:

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Additional Information:

Attached Document(s):

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:

Electromagnetic Wave Properties

[3.4.12.C](#)

Concept:

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:

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Additional Information:

Attached Document(s):

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:

Work3.4.12.B

Concept:

Energy3.4.12.B

Concept:

Power3.4.12.B

Lesson Essential Question(s):

What is the relationship between force, work, and displacement? (A)

Under what conditions is work performed? (A)

How does the angle of the force applied affect the work performed? (ET)

Lesson Essential Question(s):

How do you distinguish between kinetic and potential energy? (A)

How does work bring about a transfer of energy? (A)

How can conservation of energy be used to predict the motion of an object? (ET)

Lesson Essential Question(s):

How is power defined in terms of work and energy transfers? (A)

How is power related to time? (A)



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Additional Information:

Two days of this topic are devoted to the Bungee Egg.

Attached Document(s):

