Elizabethtown Area School District

Physics

Course Number:	332	Length of Course:	1 semester – 18 weeks
Grade Level:	11-12 Elective	Total Clock Hours:	120 hours
Length of Period:	80 minutes	Date Written:	June 11, 2007
Periods/Week:	5 periods/week	Written By:	David Cherry
Credits (if app.):	1.0	Weighting: 1.0	

Prerequisite: Algebra II

Course Description:

This course is a conceptually oriented class designed for students with differing backgrounds, skills, and career plans. It is designed for students who will attend college, but do not plan to major in the physical sciences or engineering. Topics of study include mechanics, electricity, thermodynamics, waves and optics, sound and light. The emphasis is on looking at each topic from a mathematical and laboratory approach applying what is learned to real world applications.

Elizabethtown Area School District

I. Overall Course/Grade Level Standards

Students will know and be able to do the following as a result of taking this course.

A. Discuss the meaning and significance of the basic principles of physics.

B. Analyze technical problems, organize technical information, create a labeled sketch, develop a logical approach to problem solving, arrive at a solution, and ascertain the reasonableness of the solution.

C. Interpret graphs (graphs constructed on paper and Microsoft Excel), and be able to correctly present laboratory and classroom data in a graphical format.

D. Synthesize new approaches to problems by considering skills, knowledge, and experiences gained in prior units of study or other courses.

E. Collect, analyze, and interpret data taken from computers, mechanical, or electrical equipment in the laboratory, as well as prepare written results detailing important points of the lab and the significance of the results.

F. Recognize the role of the computer as a data collection and analysis instrument in the modern laboratory setting.

G. Analyze and make predictions concerning the position, speed, and acceleration of objects, particularly the special case of constant acceleration and objects in free fall (motion in one dimension).

H. Analyze the motion of objects in two dimensions (projectile motion, uniform circular motion, simple harmonic motion).

I. Resolve vectors and perform vector addition.

J. Determine forces in physical systems and construct free body diagrams.

K. Apply Newton's laws of motion to friction and non-friction situations, use the law of universal gravitation, and apply the impulse momentum theorem.

L. Apply conservation principles (conservation of energy, conservation of mechanical energy, and conservation of momentum).

M. Calculate, work, power, kinetic energy, and potential energy, understand the relationship between work and energy (work-kinetic energy theorem).

N. Analyze basic electrical circuits.

O. Use Ohm's laws, and calculate equivalent resistances for basic resistive circuits as well as draw and interpret basic schematic diagrams.

P. Know the properties of sound waves and mechanical waves.

Q. Know the properties of light waves and the electromagnetic spectrum, including the nature of color and the dual nature of light.

R. Know the basic characteristics of optical systems, reflection, and refraction and be able to predict image characteristics mathematically, or through construction of ray diagrams.

S. Know and recognize the basic vocabulary of each physics discipline, including fundamental SI units, variables, and equations.

Elizabethtown Area School District

II. Content

Major Areas of Study

Unit	Estimated Time	Materials
1. Newtonian Mechanics	12 weeks	Textbook, Prepared Notes, PASCO Science Workshop 750 Computer Interfaces and Probes, Computers, Prepared Problems, Mechanics Lab Equipment
2. Electricity	4 weeks	Textbook, Prepared Notes, PASCO Science Workshop 750 Computer Interfaces and Probes, Computers, Prepared Problems, Electricity Lab Equipment and Supplies
3. Waves and Geometric Optics	2 weeks	Textbook, Prepared Notes, PASCO Science Workshop 750 Computer Interfaces and Probes, Computers, Prepared Problems, Waves and Optics Lab Equipment

Elizabethtown Area School District

Name of Course: Physics
Name of Unit: Newtonian Mechanics
Essential Question: How does the universe, and everything in it, move?

Unit Objectives	Priority	Aligned to Course Standard	Aligned to PA Standard
A. Kinematics **1.** Vectors **a)** Students will be able to identify all quantities in Newtonian mechanics as either a vector or a scalar quantity. **b)** Students will be able to resolve a displacement, velocity, or acceleration vector into its vector components. **c)** Students will be able to perform vector addition (graphically and mathematically). **2.** Motion in One Dimension **a)** Students will be able to understand the mathematical relationships among position, velocity, and acceleration for an object (treated as a point particle) moving in a straight line. **b)** Students will be able to understand the graphical interrelationship between a position vs. time graph, velocity vs. time graph, and an acceleration vs. time graph for constant acceleration. Students will be able to identify the slope of a tangent line on a position vs. time graph as instantaneous velocity, slope of a line on a velocity vs. time graph as acceleration. Students will be able to sketch each graph. **c)** Students will be able to utilize the three equations for constant acceleration to solve free response problems (X and Y directions). **d)** Students will be able to describe qualitatively, with the aid of graphs, the acceleration, velocity, and displacement of an object when it is released from rest or is projected vertically upward or downward with a specified initial velocity. **3.** Motion in Two Dimensions **a)** Students will gain a full understanding of independence of motion in the X and Y directions. **b)** Students will be able to identify the horizontal acceleration of a projectile to be zero, and the vertical acceleration of a projectile to be 9.8 m/s^2 downward. **c)** Students will be able to utilize equations from motion in one dimension to solve problems in motion in two dimensions. **d)** Students will be able to use expressions for range, total time in air, and maximum height of a projectile (horizontal and angled projection). **e)** Students will be able to identify and sketch graphs of position vs. time, velocity vs. time, and acceleration vs. time for projectile motion (both X and Y directions).	E	V I H G F E D C B A	3.1.12B 3.1.12C 3.1.12D 3.2.12A 3.2.12B 3.2.12C 3.2.12D 3.4.12C 3.4.10C 3.7.12B
B) Newton's Laws **1.** First Law (Law of Inertia) **a)** Students will be able to analyze situations in which a particle remains at rest (static equilibrium), or moves with a constant velocity in a straight line,	E	V K J F	3.1.12B 3.1.12D 3.2.12A 3.2.12B

under the influence of several forces. **b)** Students will understand the idea of an inertial frame of reference and a non-inertial frame of reference. **2.** Second Law (**F** = m**A**) **a)** Students will be able to calculate, for a body moving in one direction, the velocity change that results when a constant force acts over a specified time interval. **b)** Students will be able to utilize Newton's Second Law in the impulse momentum form. **(1)** Students will be able to relate impulse to the change in linear momentum and the average force acting on a body. **(2)** Students will be able to identify the quantity FΔt as the impulse. **c)** Students will be able to analyze situations in which an object moves with a specified acceleration under the influence of one or more forces so they can determine the magnitude and direction of the net force, or one of the forces that makes up the net force in situations such as: **(1)** Motion in the X and Y-direction with constant acceleration. **(2)** Motion in a horizontal circle. **d)** Students will be able to draw complete free-body diagrams for objects that are in static equilibrium and objects that are accelerating. **(1)** Students will be able to draw and accurately label a free-body diagram showing all real forces that act on the object. **(2)** From an accurately labeled free-body diagram students will be able to write down vector summation equations along appropriate coordinate axes (X, Y, or rotated). **e)** Students will be able to apply Newton's Second Law to objects that are undergoing terminal velocity. **3.** Static and Kinetic Frictional Considerations **a)** Students should have an understanding of the relative magnitude of coefficients of friction and understand their significance. **b)** Students will be able to write down a relationship between the normal and frictional forces on a surface (horizontal or on a ramp). **c)** Students will be able to analyze situations in which a body slides down a rough inclined plane or is pulled or pushed across a rough surface. **d)** Students will be able to analyze static friction situations to determine under what circumstances a body will undergo slippage, or to calculate the magnitude of the force of static friction. **4.** Third Law (Law of Action/Reaction) **a)** Students should understand how to apply Newton's Third Law so that, for a given force, they can identify the body on which the reaction force acts and state the magnitude and direction of this reaction force. **b)** Students will understand that action and reaction forces will not produce identical accelerations unless the bodies are of equal mass. **5.** Systems of Two or More Bodies (Coupled Systems) **a)** Students should be able to apply Newton's Laws in analyzing the force between the two bodies that accelerate together along a horizontal or vertical line, or objects coupled on a ramp. **b)** Students will be able to analyze the motion of a system of two bodies coupled together with a string.		E D C B A	3.2.12C 3.2.12D 3.4.12C 3.4.10C 3.7.12B
C. Work, Energy, and Power **1.** Work **a)** Students will be able to calculate the work done by a constant force on an object that undergoes a specified displacement.	I	V M L F	3.1.12B 3.1.12D 3.1.12E 3.2.12A

b) Students will know that work done by a variable force is not calculated the same as the work done by a constant force. **2.** Kinetic Energy, Work-Kinetic Energy Theorem **a)** Students will be able to calculate the kinetic energy of an object. **b)** Students will be able to use the work-kinetic energy theorem to calculate the change in kinetic energy or speed that results from performing a specified amount of work on an object. **c)** Students will be able to calculate the work performed by the net force on a body that undergoes a specified change in speed or kinetic energy. **d)** Students will be able to determine the change in a body's kinetic energy and speed that results from the application of specified forces, or to determine the force that is required in order to bring an object to rest in a specified distance. **3.** Conservative Forces and Potential Energy **a)** Students should be able to identify forces as either conservative or non-conservative (mainly frictional forces). **b)** Students will be able to calculate the gravitational potential energy of an object in a uniform gravitational field. **c)** Students will understand that work done by a conservative force is equal to the negative of the change in potential energy. **d)** Students will be able to calculate elastic potential energy. **e)** Students should be able to express the gravitational potential energy of a rigid body in terms of the position of its center of mass. **4.** Conservation of Mechanical Energy, Conservation of Energy **a)** Students will be able to apply conservation of mechanical energy to situations where only conservative forces are present. **b)** Students will be able to identify situations in which mechanical energy is converted from one form to another (example: GPE converted to KE) and identify situations in which mechanical energy is, or is not conserved. **c)** Students will be able to amend a conservation of mechanical energy equation to include frictional considerations. **d)** Students will be able to apply conservation of energy principles in their analysis of bodies that are moving in a gravitational field. **5.** Power **a)** Students will be able to calculate the power required to maintain the motion of a body with constant acceleration such as a body moving on a level surface, a body raised at a constant rate, or a body that is overcoming friction. **b)** Students will be able to calculate the work performed by a force that supplies constant power, or the average power supplied by a force that performs a specified amount of work.		E D C B A	3.2.12B 3.2.12C 3.2.12D 3.4.12A 3.4.12C 3.4.10B 3.4.10C 3.7.12B
D. Linear Momentum, Conservation of Linear Momentum, Collisions **1.** Students will be able to calculate the linear momentum of an object. **2.** Students will be able to set up and solve conservation of momentum statements for collisions in one-dimension. **3.** Students will be able to apply conservation of linear momentum to determine the final velocity of one of the objects when two objects that are moving in one or two dimensions collide. **4.** Students will be able to identify a collision as elastic, inelastic, or perfectly inelastic and apply conservation of momentum. Students should be able to give examples of each type of collision. **5.** If a collision is proven to be inelastic, students should be able to calculate the amount of kinetic energy lost as a result of the collision.	I	V L F E D C B A	3.1.12B 3.1.12D 3.2.12A 3.2.12B 3.2.12C 3.2.12D 3.4.12C 3.4.10B 3.4.10C 3.7.12B
E. Circular Motion and Rotational Systems **1.** Uniform Circular Motion	C	V N	3.1.12B 3.1.12D

a) Students will be able to relate the radius of a circle and the speed or rate of revolution of a particle to the magnitude of its centripetal acceleration. **b)** Students will be able to describe the direction of a particle's velocity, force, and acceleration at any instant during the objects motion. **c)** Students will be able to determine the components of the velocity, force and acceleration vectors at any instant. **2.** Torque and Rotational Statics **a)** Students should be able to calculate torque as the product of the force and lever arm. **b)** Students will be able to identify the conditions for translational and rotational equilibrium of a rigid body. **c)** Students will understand and apply the sign conventions for torque.		H D C B A	3.2.12A 3.2.12B 3.2.12C 3.2.12D 3.4.12C 3.7.12B
F. Oscillatory Motion **1.** General Skills **a)** Students will be able to mathematically analyze spring mass, simple pendulum, physical pendulum, and conical pendulum oscillatory systems. **b)** Students will be able to sketch or identify a graph of displacement vs. time and determine from such a graph the amplitude, period, and frequency of oscillatory motion. **c)** Students will be able to write down and describe each term of the displacement function in the form of $x(t) = A\cos(\omega t + \phi)$. **d)** Students will be able to identify points in the motion where velocity, acceleration, and displacement are zero or achieve maximum positive and negative values for each type of oscillatory motion. **e)** Students will be able to understand and apply the relationship between frequency and period. **2.** Spring Mass **a)** Students will be able to predict an expression for the period of oscillation of the spring mass system. **b)** Students will be able to apply the expression for the period of oscillation of the spring mass system. **3.** Simple Pendulum **a)** Students will be able to predict an expression for the period of oscillation of the simple pendulum. **b)** Students will be able to apply the expression for the period of oscillation of the simple pendulum system. **c)** Students will know that mass has no effect on the period of a simple pendulum. **4.** Physical Pendulum **a)** Students will be able to predict the expression for the period of oscillation of the physical pendulum system. **b)** Students will be able to apply the expression for the period of oscillation of the physical pendulum system.	E	V H F E D C B A	3.1.12B 3.1.12C 3.1.12D 3.2.12A 3.2.12B 3.2.12C 3.2.12D 3.4.12C 3.7.12B
G. Gravitation **1.** Students will be able to use the law of universal gravitation to determine the force that one spherically symmetric mass exerts on another. **2.** Students will be able to determine the proper conditions under which the law of universal gravitation is relevant. **3.** Students will be able to determine the strength of the gravitational field at a point outside a spherically symmetric mass.	C	V K D C B A	3.1.12C 3.2.12A 3.2.12D 3.4.12C

Elizabethtown Area School District

III. Vocabulary and Unit Essential/Key Questions

Unit: Newtonian Mechanics

Unit Essential Question: How does the universe, and everything in it, move?

Unit Key Questions:

1. How do vector quantities relate to concepts within Newtonian mechanics?
2. What two qualities are necessary for a complete description of a vector quantity?
3. What is a resultant vector?
4. Can an object travel at a constant speed and still accelerate?
5. How does the concept of independence of motion apply to projectile motion?
6. What direction is acceleration directed for objects that move in a circle?
7. How can an object move if there is no net force acting on it?
8. What causes objects to accelerate?
9. Do Newton's Laws apply in a non-inertial frame of reference?
10. Will objects in motion continue in motion?
11. What is a direct measure of an object's inertia?
12. Does the length of a simple pendulum have any effect on its period?
13. Does pendulum-bob mass have any effect upon the period of a simple pendulum?
14. What constants have a role in the period of a spring mass system?
15. How does distance from axis of rotation influence the period of a physical pendulum?
16. How does mass distribution affect rotational inertia?
17. How do conservation of energy principles apply to different collision types?
18. If friction is present, is overall energy conserved?
19. How does friction affect the motion of objects?
20. Will all objects in free-fall accelerate at a rate of 9.8 m/s^2?
21. What factors affect the terminal velocity of an object in free fall?
22. What forces act on astronomical bodies?
23. How is momentum conserved in different collision types?
24. What are the conditions for static equilibrium?
25. What effect does increasing lever arm have on torque?
26. Do the major conservation principles in mechanics apply to rotational dynamics?
27. What does the slope of a line on a position vs. time graph represent?
28. What does the slope of a line on a velocity vs. time graph represent?
29. What does the "area under the curve" on a velocity vs. time graph represent?
30. What does the "area under the curve" on an acceleration vs. time graph represent?
31. What is the time rate of work?
32. What type of energy is associated with an object's state or position?
33. What type of energy is associated with the motion of objects?
34. Do action and reaction forces produce identical accelerations?
35. What direction is the velocity directed for an object undergoing uniform circular motion?

Critical Vocabulary: acceleration, amplitude, center of mass, centripetal, centripetal force, crest, delta, displacement, dynamic, elastic collision, energy, equilibrium condition, force, frequency, gravitational field, Hooke's law, impulse, inelastic collision, inertia, inertial frame of reference, Joule, kinematics, kinetic energy, kinetic friction, lever arm, mass, momentum, net, Newton, normal force, oscillation, perfectly inelastic collision, period, phase, potential energy, power, projectile, rate, reaction force, resonance, resultant, scalar, speed, static friction, static's, tangential velocity, terminal velocity, torque, trough, vector, velocity, watt, weight, work

Elizabethtown Area School District

Name of Course: Physics
Name of Unit: Electricity
Essential Question: How are the basic principles of electricity and magnetism incorporated into products we use in our everyday lives?

Unit Objectives	Priority	Aligned to Course Standard	Aligned to PA Standard
A) Electric Circuits **1.** Current, Resistance, Voltage, Power **a)** Students should understand that the convention universally adopted for current flow is the movement of positive charges. **b)** Students should understand the definition of electric current. **c)** Students will be able to define resistance. **d)** Students will be able to use Ohm's Law to relate current and voltage for a resistor. **2.** Steady-State Direct Current Circuits with Voltage Sources and Resistors Only **a)** Students should be able to identify on a circuit diagram whether a circuit is a series circuit, a parallel circuit, or a series-parallel circuit. **b)** Students will be able to find equivalent resistances of series circuits, parallel circuits, and series-parallel circuits. **c)** Students will be able to determine the ratio of the voltages across resistors connected in series, parallel, or series-parallel. **d)** Students will be able to calculate the voltage, current, and power dissipated for any resistor in a network connected to a voltage source. **e)** Students will be able to design series-parallel circuits that produce a given current and voltage for one specified component, and draw a diagram for the circuit using conventional circuit symbols. **f)** Students will be able to demonstrate correct methods of connecting meters in order to measure voltage or current.	E	W V P O F E D C B A	3.1.12B 3.1.12D 3.1.12E 3.2.12A 3.2.12B 3.2.12C 3.2.12D 3.4.12A 3.4.10B 3.4.10C 3.7.12B

Elizabethtown Area School District

Unit: Electricity

Unit Essential Question: How are the basic principles of electricity and magnetism incorporated into products we use in our everyday lives?

Unit Key Questions:

1. What is the algebraic relationship between voltage, current, and resistance?
2. What is the flow of charge?
3. What is EMF?
4. What device offers resistance to the flow of electrons?
5. How is power calculated in a resistive network?
6. What characterizes a series circuit?
7. What characterizes a parallel circuit?
8. What characterizes a series/parallel circuit?
9. How do resistive devices combine in a series circuit?
10. How do resistive devices combine in a parallel circuit?
11. How do resistive devices combine in a series/parallel circuit?
12. How does current behave in a series circuit?
13. How does current behave in a parallel circuit?
14. How does voltage across resistive devices behave in a series circuit?
15. How does voltage across resistive devices behave in a parallel circuit?
16. How do we break a resistive network down into an equivalent resistance?
17. How is electricity generated and sent to our homes?
18. What are the main types of electric power production in the United States?
19. What type of electricity comes into our homes?
20. What are the two types of electronic circuits?
21. What are the two main branches of study in electronics?
22. What type of circuitry do most of our modern electronic devices use?
23. What is an integrated circuit?
24. What are the three basic building blocks of digital electronic circuitry?
25. What are the four categories we can classify materials into with regard to their electrical properties?

Critical Vocabulary: alternating current, ampere, analog circuitry, branch, charge, circuit, conductor, coulomb, digital circuitry, direct current, EMF, electron, electric field, electric potential, electrodynamics, electrostatics, equivalent resistance, generator, insulator, integrated circuit, magnetic field, node, Ohm's law, Ohm, parallel circuit, potential, potential difference, power, resistor, semiconductor, series circuit, superconductor, transformer, volt, voltage, watt

Elizabethtown Area School District

Name of Course: Physics
Name of Unit: Waves and Geometric Optics
Essential Question: How has mankind's curiosity about our solar system and the distant stars lead to developments and advancements in the field of optics?

Unit Objectives	Priority	Aligned to Course Standard	Aligned to PA Standard
A) Waves **1.** Traveling Waves **a)** Students will be able to sketch and identify graphs that represent traveling waves and determine the amplitude, wavelength, and frequency of a wave from such a graph. **b)** Students will be able to state and apply the relationship among wavelength, frequency, and velocity of a wave. **b)** Students will be able to determine what factors influence the speed of sound in air, solids, and liquids. **2.** Doppler Effect **a)** Students will be able to explain the mechanism that gives rise to a frequency shift in both the moving-source and moving observer, and derive an expression for the frequency heard by an observer. **b)** Students will be able to write and apply the equations (with appropriate sign conventions) that describe the moving-source and moving-observer Doppler effect.	I	V R F E D C B A	3.1.12C 3.2.12A 3.2.12C 3.2.12D 3.4.12C 3.4.10C
B) Physical Optics **1.** Chromatic Dispersion and the Electromagnetic Spectrum **a)** Students will be able to understand that chromatic dispersion takes place because index of refraction varies with wavelength. **b)** Students will understand which ray deviates the most from the normal as light passes from higher to lower index of refraction, or vice-versa. **c)** Students will know the names associated with the different portions of the electromagnetic spectrum and will be able to arrange them in order of increasing wavelength.	I	V U S R F E D C B A	3.1.12B 3.1.12C 3.1.12D 3.2.12D 3.2.12B 3.2.12C 3.2.12D 3.4.12C 3.4.10C 3.7.12B
C) Geometric Optics **1.** Reflection and Refraction **a)** Students will be able to determine how the speed and wavelength of light change when light passes from one medium into another. **b)** Students will be able to show on a diagram the directions of reflected and refracted rays as light passes from one medium to another. **c)** Students will be able to use Snell's Law to relate the directions of the incident ray and the refracted ray, and the indices of refraction of the media. **d)** Students will be able to identify conditions under which total internal reflection will occur. **2.** Plane and Spherical Mirrors **a)** Students will know the mathematical relationship between the focal point of a spherical mirror to its center of curvature.	E	V U F E D C B A	3.1.12B 3.1.12D 3.2.12A 3.2.12B 3.2.12D 3.4.12C 3.7.12B

b) Given a diagram of a mirror with the focal point shown, students will be able to perform a ray tracing diagram (using three principle rays) to locate the image of a real object to determine if the image is real or virtual, upright or inverted, enlarged or reduced in size. Students will also be able to confirm this information with proper mathematical relationships. **c)** Students will be able to locate the image formed of a real object in a plane mirror, and do a proper ray tracing to show this image. **3.** Converging and Diverging Lenses **a)** Students will be able to determine whether the focal length of a lens is increased or decreased as a result of a change in the curvature of its surfaces or in the index of refraction of the material of which the lens is made or the medium in which it is immersed. **b)** Students will be able to determine by ray tracing the location of the image of a real object located inside or outside the focal point of the lens, and state whether the resulting image is upright or inverted, real or virtual. **c)** Students will be able to use the thin lens equation to relate the object distance, image distance, and focal length for a lens, and determine the image size in terms of the object size.			

Elizabethtown Area School District

Unit: Waves and Geometric Optics

Unit Essential Question: How has mankind's curiosity about our solar system and the distant stars led to developments and advancements in the field of optics?

Unit Key Questions:

1. What is reflection?
2. How are images formed in a mirror by the process of reflection?
3. What is refraction?
4. How are images formed in lenses by the process of refraction?
5. What is interference?
6. What is chromatic dispersion?
7. Under what conditions is a real image formed in a mirror?
8. Under what conditions is a virtual image formed in a mirror?
9. What is a real image?
10. What is a virtual image?
11. Under what conditions is a real image formed in a lens?
12. Under what conditions is a virtual image formed in a lens?
13. Where does visible light fall in the electromagnetic spectrum?
14. What wavelengths of light fall in the visible spectrum?
15. What frequencies of light fall in the visible spectrum?
16. What is the vertex of a mirror or lens?
17. What is the radius of curvature of a mirror or lens?
18. What is the focal point of a mirror or lens?
19. How do we perform a ray tracing to locate images for objects in a mirror?
20. How do we perform a ray tracing to locate images for objects in a lens?
21. How do we apply Snell's Law to refracted rays as light passes from one medium to another?
22. What is the speed of light in a vacuum?
23. Does the speed of light vary from one medium to another?
24. How do we define index of refraction?
25. What is the difference between light that is chromatic and light that is monochromatic?
26. What is total internal reflection, and how does this principle apply to modern communications?

Critical Vocabulary: aberration, angle of incidence, angle of reflection, beats, coherent light, converging lens, critical angle, diffraction, diffraction grating, diffuse reflection, dispersion, diverging lens, Doppler effect, electromagnetic spectrum, electromagnetic wave, focal length, focus, frequency, hertz, incoherent light, infrared, interference, laser, lens, longitudinal wave, monochromatic, node, opaque, period, pitch, polarization, real image, reflection, refraction, spectrum, standing wave, total internal reflection, transverse wave, trough, vibration, virtual image, wavelength, white light

Elizabethtown Area School District

III. Course Assessments

Check types of assessments to be used in the teaching of the course.
(Provide examples of each type.)

__X_ Objective Tests/Quizzes
____ Constructed Responses
____ Essays
__X_ Reports
__ Projects
____ Portfolios
____ Presentations
__X_ Performance tasks
__X_ Lab Activities
____ Response Journals
____ Logs
____ Computer Simulations
____ Research Papers
__X_ Class Participation
__X_ Notetaking
__X_ Daily Assignments
____ Writing Samples
____ _____

Provide copies of common assessments that will be utilized for all students taking this course. Overall course/grade level standards will be measured by a common course assessment. Unit objectives will be measured on an ongoing basis as needed by the classroom teacher to assess learning and plan for instruction. List common assessements below and recommended date/time frame for administration (at least quarterly).

	Name of Assessment	When given?
1.	Unit Tests	At the conclusion of each major unit
2.	Final Exam	At the conclusion of the semester
3.	Lab Reports	At the conclusion of a lab
4.		

Elizabethtown Area School District

IV. Expected levels of achievement

Current grading scale:

As defined in the current grading policy outlined in the student handbook.

PA Proficiency Levels
Advanced Proficient
Basic Below Basic

A+	98-100
A	95-99
A-	92-94
B+	89-91
B	86-88
B-	83-85
C+	80-82
C	77-79
C-	74-76
D+	71-73
D	68-70
D-	65-67
F	0-64

Example of common assessment:

F

M1 **M2** **Regular Physics Force/Newton's Laws Exam**

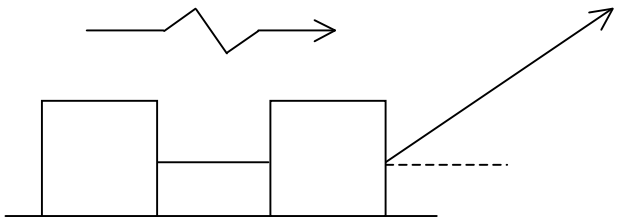
θ

1. (2 pts) **A)** According to Newton's third law, if a hammer exerts a 20 N force on a nail, then the nail must do what? **B)** Will the hammer and the nail have the same magnitude of acceleration?

2. (5 pts) An object with a mass of 50 kg slides with a constant velocity on a horizontal surface. **A)** Draw a complete free body diagram of this situation (include all forces in the X and Y directions). **B)** What is the numerical value of the normal force? **C)** What is the relationship between the two forces in the X-direction?

3. (4 pts) A 500 kg elevator, attached to a cable, is accelerating downward at 2.5 m/s^2 (it is also moving downward). What is the tension in the elevator cable?

4. (8 pts) **A)** Draw a complete free body diagram for each object shown in the system below. The system is accelerating to the right (also moving to the right), and friction exists between the blocks and the surface. **B)** Set up the appropriate $\mathbf{F} = m\mathbf{A}$ equations for the X and Y directions for each object in the system ($\Sigma\mathbf{F}_x = m\mathbf{A}_x$ and $\Sigma\mathbf{F}_y = m\mathbf{A}_y$)



ϕ ϑ

5. (2 pts) What is the only thing the **coefficient** of static friction (μ_s), and the **coefficient** of kinetic friction (μ_k) depend upon?

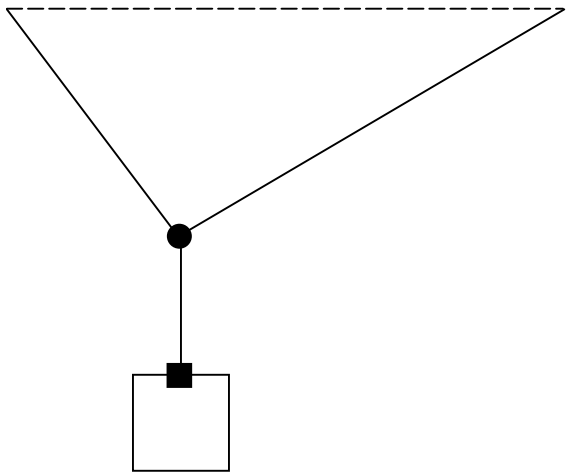
6. (2 pts) Is your weight the same on the moon as it is on earth?

7. (2 pts) An object is being pushed with a force of 75 N along a rough horizontal floor at a <u>constant velocity</u>. The kinetic frictional force opposing the motion of the object is?

A) greater than 75 N B) equal to 75 N C) less than 75 N

M

8. (6 pts) **A)** At the location of the dot where the wires intersect and the location where the mass M connects to the string (the square), draw a complete free body diagram for each location (system is at rest). **B)** Set up the appropriate $\mathbf{F} = m\mathbf{A}$ equations in the X and Y directions for each location in the system ($\Sigma\mathbf{F}_x = m\mathbf{A}_x$ and $\Sigma\mathbf{F}_y = m\mathbf{A}_y$)



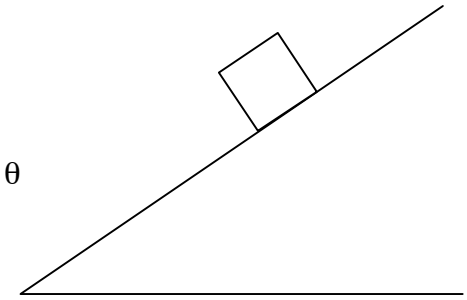
9. (2 pts) A falling object has reached its terminal velocity. What is the acceleration of the object?

10. (2 pts) Object one has a mass of 10 kg. Object two has a mass of 20 kg. Which object has more inertia?

11. (3 pts) What force is necessary to accelerate an object, which has a mass of 1500 kg, from 20 m/s to 50 m/s in 15 seconds?

12. (5 pts) We apply a 40 N force to <u>slide</u> a crate of mass M across a rough horizontal floor at a <u>constant velocity</u> (no acceleration). If the coefficient of kinetic friction (μ_k) is .3, what is the numerical value of M?

13. (4 pts) **A)** Draw a complete free body diagram showing all forces and components of forces parallel (X-direction) and perpendicular (Y-direction) to the ramp for an object <u>at rest</u> on an incline at an angle of θ degrees with the horizontal (incline is not frictionless).



B) (2 pts) Based on your free body diagram above, sum the forces in the Y-direction (Y-direction is perpendicular to the ramp). What is the summation of the forces equal to?

C) (2 pts) Based on your free body diagram above, sum the forces in the X-direction (X-direction is parallel to the ramp) What is the summation of the forces equal to?

14. (5 pts) A 0.20 kg ball is coming towards a bat with an initial velocity $V_i = 55$ m/s. The ball is bunted, and travels <u>in the opposite direction</u> off the bat with a speed $V_f = 25$ m/s. The impact time for the ball/bat collision is 1.8×10^{-3} seconds. What average force acted on the ball? (be careful of your signs for velocity)

15. (5 pts) What is the gravitational force that exists between two objects $M_1 = 500$ kg and $M_2 = 1500$ kg separated by a distance of 25 m?

16. (5 pts) Two objects of equal mass are 25 meters apart. If the gravitational force between the two objects is 2.8×10^{-7} N, what is the mass of each object?