YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014

Unit Title: UNIT # 1: "SAFETY/SCIENTIFIC METHOD/MEASUREMENTS" **Timeframe: Quarter 1: weeks 1-4**

Cluster of Standards	Literacy Standards
I. SAFETY A. The Students will demonstrate the proper use and identification of laboratory equipment. B. The students will learn and demonstrate the proper use of safety equipment such as fire extinguishers, eye wash station, and first aid kit. C. The students will demonstrate the proper first aid procedures for lab accidents (e.g. cuts, burns, and chemicals in the eyes). D. The students will demonstrate the proper safety procedures for fires, waste disposal, and broken glass. E. The students will learn and demonstrate the proper procedures for using the equipment in the chemistry lab. **II. SCIENTIFIC METHOD** A. The students will identify questions and concepts that guide scientific investigations. B. The students will design and conduct scientific investigation. C. The students will use technology and mathematics to improve investigations and communications. D. The students will formulate and revise explanations and models using logic and evidence (critical thinking skills). E. The students will recognize and analyze explanations and models. F. The students will communicate and support their scientific arguments. **III. MEASUREMENTS** A. The students will demonstrate their knowledge of scientific protocols for quantifying the properties of matter accurately and precisely are studied. 1. Deriving and interpreting data from mathematical relationships using graphs, charts, and tables. 2. Applying advanced mathematical concepts in problem solving (e.g. geometry, trigonometry, and logarithms). B. The students will learn and demonstrate the proper use of metric measuring systems, significant digits or figures, scientific notation, error analysis and dimensional analysis are vital to scientific communication.	**RST.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.2** Determine the central ideas or conclusions of a text, summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **RST.8** Evaluate the hypothesis, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **WHST.4** Product clean and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **WHST.10** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014	
Unit Title: UNIT # 1: "SAFETY/SCIENTIFIC METHOD/MEASUREMENTS"	**Timeframe: Quarter 1: weeks 1-4**
Cluster of Standards	**Literacy Standards**
1. Demonstrating the difference between precision and accuracy. 2. Understanding the rules of significant digits and using correct units of measurement. 3. Mathematically determine metric and temperature conversions. 4. Experimentally determine the density of a specific substance.	

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014	
Unit Title: UNIT # 2: "INTRODUCTION OF MOTION"	**Timeframe: Quarter 1: weeks 5-10**
Cluster of Standards	**Literacy Standards**

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014	
Unit Title: UNIT # 2: "INTRODUCTION OF MOTION"	**Timeframe: Quarter 1: weeks 5-10**
Cluster of Standards	**Literacy Standards**
IV. MOTION A. The students will use and apply the laws of motion to analyze, describe, and predict the effects of forces on the motions of objects mathematically. B. The students will analyze velocity as a rate of change of position with regards to average velocity and instantaneous velocity. C. The students will compare and contrast speed, velocity, distance and displacement as scalar and vector quantities. D. The students will analyze acceleration as rate of change in velocity. E. The students will use graphical and mathematical tools to design and conduct investigations of linear motion and the relationships among position, average velocity, instantaneous velocity, acceleration, and time. F. The students will interpret graphs on position vs. time, velocity vs. time, and acceleration vs. time. G. The students will learn and calculate instantaneous velocity for an accelerating object by calculating the slope of the tangent line for some specific instant on a position vs. time graph. H. The students will interpret acceleration vs. time graphs, as well as, more complex graphs that have both positive and negative displacement values. It will involve motion that occurs in stages (e.g. an object accelerates then moves with constant velocity). Symbols representing acceleration are added to motion diagrams and mathematical analysis of motion becomes increasingly more complex. I. The students will determine the uniform acceleration including free fall (initial velocity, final velocity, time, displacement, acceleration, average velocity). J. The students will interpret graphs for average velocity, instantaneous velocity, acceleration, displacement, and change in velocity.	**RST.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. **WHST.6** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. **WHST.7** Conduct short as well as more sustained research projects to answer a question (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. **WHST.9** Draw evidence from information texts to support analysis, reflection, and research.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014	
Unit Title: UNIT #3: "LINEAR MOTION"	**Timeframe: Quarter 2: weeks 1-4**
Cluster of Standards	**Literacy Standards**
V. LINEAR MOTION A. The students will analyze and evaluate projectile motion in a defined frame of reference. B. The students will design and conduct investigations of two-dimensional motion of objects. 1. Adding vector forces 2. Motion down inclines 3. Centripetal forces and circular motion C. The students will analyze, calculate, and evaluate independence of the vector components of projectile motion. 1. Net forces will be calculated for force vectors with directions between zero and 360. D. The students will demonstrate their understanding that projectile motion is when an object has both horizontal and vertical components of motion, as in a projectile, the components act independently of each other. For a projectile in the absence of air resistance, this means that horizontally, the projectile will continue to travel at constant speed just like it would if there were no vertical motion. Likewise, vertically the object will accelerate just as it would without any horizontal motion. Problem solving will be limited to solving for the range, time, initial height, initial velocity or final velocity of horizontally launched projectiles with negligible air resistance. E. The students will demonstrate their problem solving skills involving horizontally launched projectiles F. The students will evaluate, measure, and analyze circular motion. G. The students will analyze and evaluate the nature of centripetal forces. H. The students will investigate, evaluate and analyze the relationship among centripetal force, centripetal acceleration, mass, velocity, and radius.	**RST.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **RST.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **WHST.3** students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014

Unit Title: UNIT # 4: "NEWTON'S LAWS OF MOTION"	Timeframe: Quarter 2: weeks 5-10
Cluster of Standards	**Literacy Standards**
VI. NEWTON'S LAWS OF MOTION A. The students will learn and demonstrate their knowledge of Newton's laws of motion and how they are applied to mathematically describe and predict the effects of forces on more complex systems of objects and to analyze objects in free fall that experience significant air resistance. B. The students will determine that an object will continue in its state of motion unless acted upon by a net outside force (Newton's First Law of Motion, the Law of Inertia). C. The students will assess, measure, and calculate the conditions required to maintain a body in a state of static equilibrium. D. The students will assess, measure, and calculate the relationship among the force acting on a body, the mass of the body, and the nature of the acceleration produced (Newton's Second Law of Motion, F=ma). E. The students will learn that forces from fluids will only be quantified using Newton's Second Law and force diagrams. F. The students will analyze and mathematically describe forces as interactions between bodies (Newton's Third Law of Motion). G. The students will learn that when an object pushes on the particles in a fluid, the fluid particles can push back on the object according to Newton's Third Law and causes a change in motion of the object. This is how helicopters experience lift. H. The students will assess the independence of the vector components of forces. I. The students will investigate, measure, and analyze the nature and magnitude of frictional forces. J. The students will assess and calculate the nature and magnitude of gravitational forces (Newton's Law of Universal Gravitation). K. The students will learn that gravitational interactions are very weak compared to other interactions and are difficult to observe unless one of the objects is extremely massive. L. The students will learn that the force law for gravitational interaction states that the strength of the gravitational force is proportional to the product of the two masses and inversely proportional to the square of the distance between the centers of the masses. ***Fg*** = *(G·m1·m2)/r2)*. The proportionality constant, G, is called the universal gravitational constant. Problem solving may involve calculating the net force for an object between two massive objects (e.g., Earth-moon system). M. The students will demonstrate their knowledge that gravitational forces are universal phenomenon and gravitational field strength is quantified.	**RST.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question to solve a problem. **RST.9** Synthesize information from a range of souces (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.2** Write informative / explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stand in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implication of the significance of the topic).

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014	
Unit Title: UNIT # 4: "NEWTON'S LAWS OF MOTION"	**Timeframe: Quarter 2: weeks 5-10**
Cluster of Standards	**Literacy Standards**
	See Folio on YCS website for Informational Paper

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014

Unit Title: UNIT #5: "MOMENTUM"	Timeframe: Quarter 3: weeks 1-4
Cluster of Standards	**Literacy Standards**
VII. MOMENTUM A. The students will assess the vector nature of momentum and its relation to the mass and velocity of an object. B. The students will demonstrate their knowledge of momentum, **p**, is a vector quantity that is directly proportional to the mass, **m**, and the velocity, **v**, of the object. Momentum is in the same direction the object is moving and can be mathematically represented by the equation, **p=mv.** C. The students will demonstrate their understanding of impulse, $\Delta \boldsymbol{p}$, is the total momentum transfer into or out of a system. Any momentum transfer is the result of interactions with objects outside the system and is directly proportional to both the average net external force acting on the system, $\boldsymbol{F_{avg}}$, and the time interval of the interaction, Δt. It can mathematically be represented by $\Delta \boldsymbol{p} = \boldsymbol{pf} - \boldsymbol{pi} = \boldsymbol{F_{avg}} \Delta t$. D. The students will analyze the factors required to produce a change in momentum. E. The students will demonstrate their understanding of the conservation of linear momentum that states that the total (net) momentum before an interaction in a closed system is equal to the total momentum after the interaction. In a closed system, linear momentum is always conserved for elastic, inelastic and totally inelastic collisions. F. The students will analyze one-dimensional interactions between objects and recognize that the total momentum is conserved in both collision and recoil situations. G. The students will assess real world applications of the impulse and momentum, including but not limited to, sports and transportation. H. The students will demonstrate their understanding of vector properties of momentum and impulse as introduced and used to analyze elastic and inelastic collisions between objects. I. The students will analyze experimental data collected in laboratory investigations. **VIII. ELASTIC FORCES** A. The students will demonstrate their knowledge of how elastic materials stretch or compress in proportion to the load they support. The mathematical model for the force that a linearly elastic object exerts on another object is $\boldsymbol{Felastic} = k\Delta x$, where Δx is the displacement of the object from its relaxed position. The direction of the elastic force is always toward the relaxed position of the elastic object. The constant of proportionality, k, is the same for compression and extension and depends on the "stiffness" of the elastic object. **IX. FRICTION FORCES** A. The students will demonstrate their knowledge of the amount of kinetic friction between two objects is dependent on the electric forces between the atoms of the two surfaces sliding past each other. It also is dependent on the magnitude of the normal force that pushes the two surfaces together. This can be represented mathematically as $\boldsymbol{Fk} = \mu k \boldsymbol{FN}$, where μk is the coefficient of kinetic friction that depends upon the materials of which the two surfaces are made. B. The students will learn that static friction can prevent objects from sliding past each other, even when an external force is applied parallel to the two surfaces that are in contact. C. The students will learn that the mathematical equation for static friction is $\boldsymbol{Fs} \leq \mu s \boldsymbol{FN}$. D. The students will demonstrate their knowledge of the maximum amount of static friction possible depends on the types of materials that make up the two surfaces and the magnitude of the normal force pushing the objects together, $\boldsymbol{Fsmax} = \mu s \boldsymbol{FN}$. E. The students will gain an understanding that the external net force exceeds the maximum static friction force for the object, the objects will move relative to each other and the friction between them will no longer be static friction, but will be kinetic friction. F. The students will gain an understanding that liquids have more drag than gases like air.	**RST.5** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **WHST.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014

Unit Title: UNIT #6: "ENERGY" **Timeframe: Quarter 3: weeks 5-10**

Cluster of Standards	Literacy Standards
X. ENERGY A. The students will investigate and analyze energy storage and transfer mechanisms: 1. Gravitational potential energy: Only the system of attracting masses can have gravitational potential energy. 2. Elastic potential energy: Energy is a spring, ΔE *elastic* = ½ $k\,\Delta x^2$ where Δx is the distance the elastic object is stretched or compressed from its relaxed length. 3. Thermal energy 4. Kinetic energy B. The students will analyze, evaluate, and apply the principle of the conservation of energy. C. The students will demonstrate their knowledge of the law of the conservation of energy and how it applies to any defined system and time interval within a situation or event in which there are no nuclear changes that involve mass-energy equivalency. D. The students will analyze, evaluate and measure the transfer of energy by a force. 1. Work a. Calculate the amount of work done using the equation, $W = \boldsymbol{F\Delta x}(\cos\theta)$ where W is the work, $\boldsymbol{F}$ is the force, $\boldsymbol{\Delta x}$ is the displacement, and θ is the angle between the force and the displacement. 2. Power a. The rate of energy change or transfer b. Calculate the amount of work done using the equation $P = \Delta E / \Delta t$ or $P = W / \Delta t$. Power is a scalar property. c. The unit of power is the watt (W), which is equivalent to one Joule of energy transferred in one second (J/s). E. The students will design and conduct investigations of mechanical energy and power. F. The students will analyze, evaluate and apply the principles of Nuclear energy. 1. Properties of alpha, beta, gamma and positron emission and how they change the nucleus of an atom. 2. The prediction of the identity of new elements through Alpha and beta decays. G. The students will mathematically determine the transfer of energy out of a system using the equation, $E = mc^2$, which is known as the equation for mass-energy equivalence. H. The students will learn about the nuclear processes such as nuclear decay, fission and fusion, the mass of the product is less than the mass of the original nuclei. The missing mass appears as energy. I. The students will calculate the energy produced from fission and fusion reactions.	**RST.6** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. **WHST.7** Conduct short as well as more sustained research projects to answer a question (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.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014

Unit Title: UNIT #7: "WAVE MOTION, SOUND AND LIGHT" **Timeframe: Quarter 4: weeks 1-3**

Cluster of Standards	Literacy Standards
XI. WAVE MOTION A. The students will gain an understanding of wave properties. 1. Conservation of energy 2. Reflection 3. Refraction 4. Interference 5. Diffraction B. The students will describe the electromagnetic spectrum The students will analyze, investigate, and evaluate the relationship among the characteristics of waves. 1. Wavelength 2. Frequency 3. Period 4. Amplitude C. The students will describe the behavior of waves in various media. D. The students will describe and design representations of light waves by ray diagrams. E. The students will describe the visible light spectrum. F. The students will describe light phenomena as it pertains to 1. Ray diagrams (propagation of light) 2. Law of reflection (equal angles) 3. Snell's law a. $n1\sin\theta1 = n2\sin\theta2$, quantifies refraction in which n is the index of refraction of the medium and θ is the angle the wave enters or leaves the medium, when measured from the normal line. 4. Diffraction patterns 5. Wave – particle duality of light 6. Visible spectrum and color G. The students will describe and design representations of light waves by ray diagrams. H. The students will describe the photon model of light energy transfer and the electromagnetic wave model of light energy transfer. I. The students will describe the index of refraction of a material and how it is calculated by the equation, $n = c/v$, where n is the index of refraction of a material, v is the speed of light through the material, and c is the speed of light in a vacuum. J. The students will analyze the behavior of waves at boundaries between media: 1. Reflection, including the Law of Reflection 2. Refraction, including Snell's Law K. The students will analyze the relationship between the phenomena of interference and the principle of superposition. L. The students will analyze the frequency and wavelength of sound produced by a moving source (the Doppler Effect). M. The students will demonstrate their knowledge of waves through laboratory experiments.	**RST.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014 (THIS UNIT NEEDS TO BE DEVELOPED)

Unit Title: UNIT #8: "ELECTRICITY" **Timeframe: Quarter 4: weeks 6-9**

Cluster of Standards	Literacy Standards
XII. ELECTRICITY A. The students will analyze the nature of electrical charges. B. The students will demonstrate their knowledge of charging objects (friction, contact, and induction). C. The students will investigate the electrical charging of objects due to transfer of charge. D. The students will demonstrate their knowledge of electric fields and electric potential energy. E. The students will learn that the equation, ***E = Fe / q***, can be used to calculate the electric field strength, the electric force or the electric charge. F. The students will learn that the superposition of charge states that the electric field caused by a collection of charges is equal to the vector sum of the electric fields caused by the individual charges. G. The students will investigate the law of the conservation of electric charge. H. The students will investigate Coulomb's law which states that two charge objects, which are small compared to the distance between them, can be modeled as point charges. The forces between point charges are proportional to the product of the charges and inversely proportional to the square of the distance between the point charges, [*Fe = ke q1 q2) / r2*]. I. The students will analyze the relationship among force, charge and distance summarized in Coulomb's law. J. The students will learn about DC circuits: -Ohm's law -Applying conservation of charge and energy (junction and loop rules). K. The students will analyze and measure the relationship among potential difference, current, and resistance in a direct current circuit. L. The students will learn how resistance is measured in ohms and has different cumulative effects when added to series and parallel circuits. M. The students will learn that the potential difference, or voltage, (*ΔV*), Across an energy source is the potential energy difference, (*ΔE*), supplied by the energy source per unit charge, (*q*) (*ΔV = ΔE/q*). N. The students will learn that the electric potential difference across a resistor is the product of the current and the resistance (*ΔV = I R*). O. The students will learn that the junction rule states in a closed system such as a circuit, the current flowing into a branch point junction must equal the total current flowing out of the junction. P. The students will learn that the loop rule states that energy is conserved for any closed loop, the energy put into the system by the battery must equal the energy that is transformed by the resistors. For circuits with resistors in series, this means that *ΔVbattery = ΔV1 + ΔV2 + ΔV3 +….* Q. The students will learn that the rate of energy transfer (power) across each resistor is equal to the product of the current through and the voltage drop across each resistor (*P= ΔV I*) and *Pbattery = I ΔV1 + ΔV2 + I ΔV3 +…= IΔVbattery.* R. The students will analyze and measure the relationship among current, voltage, and resistance in circuits. S. The students will investigate series, parallel and series-parallel combination circuits. T. The students will investigate magnetic fields and energy.	**WHST.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **RST.10** By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: PHYSICS 2013-2014 (THIS UNIT NEEDS TO BE DEVELOPED)	
Unit Title: UNIT #8: "ELECTRICITY"	**Timeframe: Quarter 4: weeks 6-9**
Cluster of Standards	**Literacy Standards**
U. The students will demonstrate their knowledge of magnetic potential energy that states when two attracting or repelling magnetic poles interact, the kinetic energies of both objects change but neither is acting as the energy source or the receiver. Instead, the energy is transferred into or out of the magnetic field around the system as magnetic potential energy. V. The students will investigate electromagnetic interactions. W. The students will demonstrate their knowledge of the flow of charged particles that creates a magnetic field around the moving particles or the current carrying wire. X. The students will analyze and measure the nature of power in an electrical circuit. Y. The students will show the interactions between electricity and magnetism must be explored in the laboratory setting. Z. The students will do experiments with the inner workings of motors, generators and electromagnets. Current technologies using these principles will be explored.	