

<b>DEPARTMENT: SCIENCE</b>	<b>Course Title: Physics of Waves – Sound, Light and Color</b> <b>Course Number: 248A</b> <b>Course Title: Physics of Waves – Sound, Light and Color Honors</b> <b>Course Number: 248B</b>
<b>GRADE(S): 10-12</b>	<b>PRE-REQUISITES (IF ANY): ALGEBRA I OR IMP 1; FOR THE HONORS OPTION, SUCCESSFUL COMPLETION OF GEOMETRY AND ALGEBRA II, OR IMP II, OR APPROVAL OF DEPARTMENT HEAD</b>

<b>UNIT</b>	<b>LENGTH</b>	<b>CONTENT</b>	<b>Skills</b>	<b>METHODS OF ASSESSMENT</b>	<b>FRAMEWORK STRAND(S) &amp; STANDARD(S)</b>	<b>EXPECTATIONS</b>
Introduction	0.5 weeks	Light and sound as forms of energy that travel through space. Energy transformed into sound and light.	Students will: Pose questions and form hypothesis based on personal observations.	Lab work/reports: Energy Transformation Activity. Formative assessment, pre-writing Class Participation.	SIS1 2.1	
Mechanical Waves	2 weeks	Period motion, vibrations. Waves: carriers of energy, examples. Wave characteristics (freq, amplitude, wavelength, peak and trough, wave speed, medium. Relationship between wave speed, frequency, period, and wavelength. Transverse and longitudinal waves. Behavior at boundaries: reflection. Superposition and Interference. Standing waves and nodes. Doppler effect, bow waves, shock waves.	Students will: Observe the world from a scientific perspective. Use language and vocabulary appropriately. Solve simple algebraic expressions. Use ratio and proportion to solve problems. Use appropriate metric units of measurement for frequency, time, speed and distance.	Lab work/reports: Slinky waves, Wave on String Simulation, Standing Waves, Wave Superposition. Formative assessment. Class participation. Textbook based homework. Notebook organization and completion. Vocabulary quiz. Unit Quiz.	SIS1, SIS4, 4.1, 4.3, 4.5, 4.6	
Sound	3 weeks	Sources of sound. Wave model of sound. Measuring sound. Perception of sound. Resonance phenomenon. Beat phenomenon. Musical sound.	Students will: Interpret and create 2-D and 3-D models of vibrating media. Relate the descriptive model of vibration to the kinesthetic and psychological aspects of hearing. Distinguish between auditory examples of acoustical echo, reverberation, and filtering. Solve problems involving transmission of sound, including examples of Doppler Shift.	Lab: Speed of Sound in Air (auditory and computer based). Lab: Tones and vowels. Lab: Musical Instruments. Class Participation. Class and Homework. Unit Quiz	SIS 2, SIS3, 4.1, 4.4, 4.5, 4.6	

UNIT	LENGTH	CONTENT	Skills	METHODS OF ASSESSMENT	FRAMEWORK STRAND(S) & STANDARD(S)	EXPECTATIONS
Light as a Wave.	2 weeks	Historical models of light. Speed of light. Sources of light (atomic model). Light as an electromagnetic wave. Interaction of light/matter: atomic model. Polarization. Interference and the double slit.	Students will: Relate the physical properties of electromagnetic radiation to the sensory perception of vision. Observe and measure the wave properties of light.	Lab: How Light Intensity Varies with Distance. Lab: Polarization of Light. Class and Homework. Class Participation. Unit Quiz	SIS 1, SIS 4, 6.1, 6.2	
Color and Optics	3 weeks	Color by reflection Color by transmission. Mixing colored light vs. pigments. Why sky is blue, sunset red. Reflection: diffusion, planar and curved mirrors. Refraction, dispersion and Snell's Law. The Rainbow. Total Internal Refraction. Lenses and image formation.	Students will: Describe image creation in mirrors. Describe and predict outcomes involving additive and subtractive color mixing. Describe subtractive processes with light, such as pigments, dispersion	Lab: Raybox Investigation of Reflection (curved mirrors), and Refraction. Lab: Real and virtual images. Lab: Camera Obscura Class Participation. Class and Homework. Unit Quiz	SIS 1, SIS 4, 6.1, 6.2	
Light as a Particle	1 week	Energy of Light. Photoelectric Effect. Wave/Particle Duality.	Students will: Use appropriate language to describe wave/particle duality. Solve problems involving Photoelectric effect.	Class and Homework. Class Participation. Final Exam or Project.	N/A	