Marietta City Schools

2023–2024 District Unit Planner

Teacher(s)	Cole Phillips & Thomas Shymala	**Subject Group and Course**	Group 4 - Physics		
Course Part and Topic	Topic 3 -Wave Behavior	**SL or HL / Year 1 or 2**	SL Year 1	**Dates**	January-April (10 weeks)
Unit Description and Texts		**DP Assessment(s) for Unit**			
Students examine the basics of motion through kinematic equations, Newton's 2nd law problems, conservation of energy, and conservation of momentum. ● Bowen-Jones, Michael, and David Homer. IB Physics. Oxford: Oxford UP, 2014. Print.		● C.1 Simple harmonic motion, C.2 Wave model, C.3 Wave phenomena, C.4 Standing waves and resonance, C.5 Doppler effect ● Test (paper 1 + paper 2)			

INQUIRY: establishing the purpose of the unit

Transfer Goals *List here one to three big, overarching, long-term goals for this unit. Transfer goals are the major goals that ask students to "transfer" or apply their knowledge, skills, and concepts at the end of the unit under new/different circumstances, and on their own without scaffolding from the teacher.*
Phenomenon: Waves might seem like they are moving matter but in reality, they are only moving energy. Statement of Inquiry:Wave motion transfers energy from one point to another, with no permanent displacement of the particles of the medium. 1. Students will use the wave equation and concepts of standing waves to determine the speed of sound in air. 2. Students will use a path difference to determine the interference pattern that results from superposition of waves.

ACTION: teaching and learning through inquiry

Content / Skills / Concepts - Essential Understandings	**Learning Process**

	Check the boxes for any pedagogical approaches used during the unit. Aim for a variety of approaches to help facilitate learning.
<u>Students will know the following content:</u> • **Simple harmonic oscillations** • **Time period, frequency, amplitude, displacement and phase difference** • **Conditions for simple harmonic motion** • **Traveling waves** • **Wavelength, frequency, period and wave speed** • **Transverse and longitudinal waves** • **The nature of electromagnetic waves** • **The nature of sound waves** • **Wavefronts and rays** • **Amplitude and intensity** • **Superposition** • **Polarization** • **Reflection and refraction** • **Snell's law, critical angle and total internal reflection** • **Diffraction through a single-slit and around objects** • **Interference patterns** • **Double-slit interference** • **Path difference** • **The nature of standing waves** • **Boundary conditions** • **Nodes and antinodes** <u>Students will develop the following skills:</u> • **Qualitatively describing the energy changes taking place during one cycle of an oscillation** • **Sketching and interpreting graphs of simple harmonic motion examples** • **Explaining the motion of particles of a medium when a wave passes through it for both transverse and longitudinal cases** • **Sketching and interpreting displacement–distance graphs and displacement–time graphs for transverse and longitudinal waves** • **Solving problems involving wave speed, frequency and wavelength** • **Investigating the speed of sound experimentally** • **Sketching and interpreting diagrams involving wavefronts and rays** • **Solving problems involving amplitude, intensity and the inverse square law** • **Sketching and interpreting the superposition of pulses and waves** • **Describing methods of polarization** • **Sketching and interpreting diagrams illustrating polarized, reflected and transmitted beams** • **Solving problems involving Malus's law**	Learning experiences and strategies/planning for self-supporting learning: ☒ Lecture □ Socratic seminar ☒ Small group/pair work ☒ PowerPoint lecture/notes ☒ Individual presentations □ Group presentations □ Student lecture/leading □ Interdisciplinary learning Details: *Students will learn through a combination of presentations, small group work, practice problems, and lab work.* ☒ Other(s): *practice problems, lab work* **Formative assessment(s):** *Paper 1 quizzes at the end of each subtopic.*

- **Sketching and interpreting incident, reflected and transmitted waves at boundaries between media**
- **Solving problems involving reflection at a plane interface**
- **Solving problems involving Snell's law, critical angle and total internal reflection**
- **Determining refractive index experimentally**
- **Qualitatively describing the diffraction pattern formed when plane waves are incident normally on a single-slit**
- **Quantitatively describing double-slit interference intensity patterns**
- **Describing the nature and formation of standing waves in terms of superposition**
- **Distinguishing between standing and traveling waves**
- **Observing, sketching and interpreting standing wave patterns in strings and pipes**
- **Solving problems involving the frequency of a harmonic, length of the standing wave and the speed of the wave**

Summative assessments:

Topic test consisting of questions from P1 and P2

Differentiation:

❏ Affirm identity - build self-esteem
✓ Value prior knowledge
✓ Scaffold learning
✓ Extend learning

Details:

- *SWD/504 – Accommodations Provided*
- *ELL – Reading & Vocabulary Support*
- *Intervention Support*
- *Extensions – Enrichment Tasks and Project*

Approaches to Learning (ATL)

Check the boxes for any explicit approaches to learning connections made during the unit. For more information on ATL, please see [the guide.]

✓ Thinking

- ❑ Social
- ✓ Communication
- ❑ Self-management
- ❑ Research

Details:

Students will be continuously challenged to develop higher-order thinking skills as they take prior knowledge, combine it with new content, and analyze the data they collected to reach a conclusion

Students will communicate their findings to their peers in the form of small-group presentations.

Language and Learning *Check the boxes for any explicit language and learning connections made during the unit. For more information on the IB's approach to language and learning, please see the guide.*	**TOK Connections** *Check the boxes for any explicit TOK connections made during the unit*	**CAS Connections** *Check the boxes for any explicit CAS connections. If you check any of the boxes, provide a brief note in the "details" section explaining how students engaged in CAS for this unit.*
✓ Activating background knowledge ❑ Scaffolding for new learning ✓ Acquisition of new learning through practice ✓ Demonstrating proficiency Details: *Students will build on knowledge gained in Honors Physics.* *Students will analyze data from a cart being accelerated by a hanging mass.* *Students will complete practice problems* *Students will produce a full scatter plot with high and low gradients as demonstration of*	❑ Personal and shared knowledge ❑ Ways of knowing ❑ Areas of knowledge ✓ The knowledge framework Details: *To what extent is scientific knowledge based on fundamental concepts such as energy? What happens to scientific knowledge when our understanding of such fundamental concepts changes or evolves?*	❑ Creativity ✓ Activity ❑ Service Details: *Students will actively be carrying out experiments involving accelerating carts.*

learning.		

Resources

List and attach (if applicable) any resources used in this unit

- Textbooks (see page 1)
- Laboratory resources
- Online notes and videos (Schoology)

REFLECTION: considering the planning, process, and impact of the inquiry

What worked well *List the portions of the unit (content, assessment, planning) that were successful*	**What didn't work well** *List the portions of the unit (content, assessment, planning) that were not as successful as hoped*	**Notes / Changes / Suggestions** *List any notes, suggestions, or considerations for the future teaching of this unit*