Lesson Plan

Grade/Class Grade 11 Physics Date/Time 4/16/2025
Topic/Unit Title Time slot 2

Lesson Outcomes / Purpose

Curriculum: Outcomes, Essential Questions, Targeted Learning and Experiences

Utilizing Manitoba curricula list all outcomes, essential questions, descriptions of targeted learning or experiences that will be presented/explored in this lesson.

Students will learn to understand and apply descriptive prefixes to name molecular compounds. The goal is for students to be able to correctly name and categorize compounds using these prefixes, reinforcing concepts related to molecular chemistry.

S3P-2-13 Outline the geometry of a two-point-source interference pattern, using the wave model.

Essential Questions:

- How does interference demonstrate the wave nature of light?
- What conditions lead to constructive and destructive interference?
- How can the interference pattern be used to calculate wavelength?

Targeted Learning and Experiences:

- Hands-on lab for light as a particle (following a lab on light as a wave)
- Application of wave equations to calculate the wavelength of light.
- Exploration of constructive and destructive interference through real-time observation.

Specific Learning Outcomes and Evidence of Learning

Expand on the targeted learning and curricular outcomes noted above. Consider referring to the supplemental resource attached to the Unit Planning Template, "*Appendices of Verbs"* and making use of sentence leads, ("The student(s) will be able…"(TSWBA) and "I can…" statements) to describe what observable evidence of learning students will engage in, and on which they may be assessed. For example:

1. Students will categorize… (Cognitive Domain, Analyze)
2. Students will design…(Affective Domain)
3. I can draw and label the parts of a tree. (Cognitive & Psychomotor Domain, Remember & Simple)
4. I can create coding to move my sphero to a 3 – 4 beat (Psychomotor Domain, Complex)

Students will be able to:

- Distinguish between constructive and destructive interference.
- Measure fringe spacing in a double-slit interference pattern.

I can statements:

- I can observe and describe an interference pattern.

- I can measure the distance between interference fringes.
- I can use my measurements to calculate the wavelength of a laser.
- I can explain how interference proves that light behaves like a wave.

Cross-Curricular/Real World Connections

Note any relevant cross-curricular outcomes, essential questions or experiences or authentic learning present in this lesson.

Cross-Curricular:
Math: Measurement, trigonometry, and algebra used in solving wave equations.

History of Science: Connection to Thomas Young's experiment demonstrating wave theory.

Real-World Connections:
Interference patterns are fundamental in technologies like diffraction gratings, holography, optical instruments, and quantum mechanics.

Used in spectroscopy, fibre optics, and precision measurement tools.

Assessment Evidence

Description (conversation, observation or product)	FOR	AS	OF
Feedback between teacher and students	x		
Students predict outcomes and record observation	x	x	
Check your understanding problems			x
Closure questions	x	x	

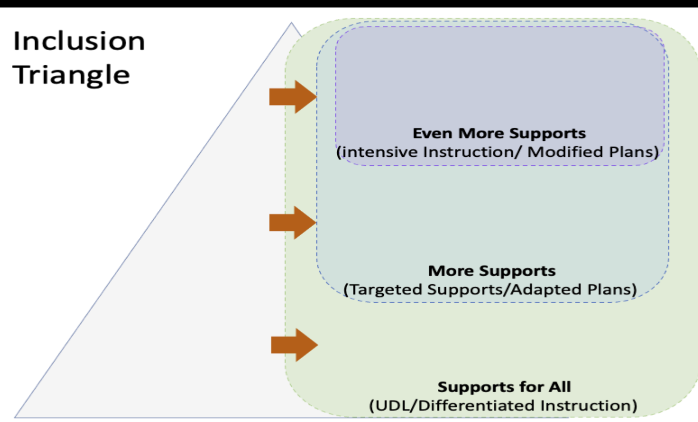
Materials (ICT considered)

Resources (referenced), handouts, ICT, equipment, etc. Include exemplars / samples

Key Words / Vocabulary

- Interference
- Constructive / Destructive
- Path difference
- Fringe spacing
- Wavelength
- Superposition

Differentiated Instruction & Student Specific Planning



Adapted from Shelley Moore, 2015

Considering students' readiness, interests, and learning profile, how will learning tasks for this lesson be differentiated?

Readiness: Allow students to work in pairs and provide extra support to those struggling with measurement or formula use.
Learning Profiles: Visual learners benefit from the clear pattern projected; kinesthetic learners benefit from hands-on measurement.

Learning Plan		
Hook **Activate**	*“What exactly is light—tiny particles flying through space or waves rippling through the air?”* As a class demonstration with double slit cups demonstrate the pattern that you would observe for particles. If light were a particle, our previous lab with a laser beam passes through a double slit and produces an interference pattern, this pattern shouldn’t happen! So what’s going on?” Prompt a short discussion: “Have you ever thought about how something can act like two completely different things at the same time?”	**Time** **5 mins**
Acquire	Begin with a short recap of wave interference using diagrams on the board or a projector. Explain how constructive interference (when wave crests meet crests) and destructive interference (when crests meet troughs) lead to patterns of bright and dark bands in light. Following this with **diffraction gratings**, which use many closely spaced slits to produce more defined and sharper interference patterns. Introduce the grating equation: dsinθ=nλd \sin \theta = n\lambdadsinθ=nλ	**40 mins**
Apply **Closure**	Students will now apply their understanding of interference by working through a set of guided practice questions—either individually, in pairs, or small groups. These questions will deepen their grasp of the relationships between slit spacing, fringe separation, wavelength, and angle, preparing them for the lab analysis and reinforcing theoretical concepts. Ask the students some conceptual questions: 1. "Why is it important that the light source is coherent in an interference experiment?" 2. "If someone said light is only a particle, how could you use today's experiment to argue against that?"	**15 mins** **5 mins**
Reflections about the lesson:		

rationale:
This lesson introduces students to the concept of interference as evidence of the wave nature of light through a hands-on double-slit experiment. It aligns with the Manitoba Grade 11 Physics curriculum by allowing students to explore wave behavior, measure fringe spacing, and apply mathematical relationships to calculate wavelength. The activity encourages scientific inquiry, critical thinking, and collaboration, while making real-world connections to technologies like holography and optical instruments. By combining visual observation with quantitative analysis, the lesson supports diverse learning styles and reinforces key physics concepts in an engaging, accessible way.