

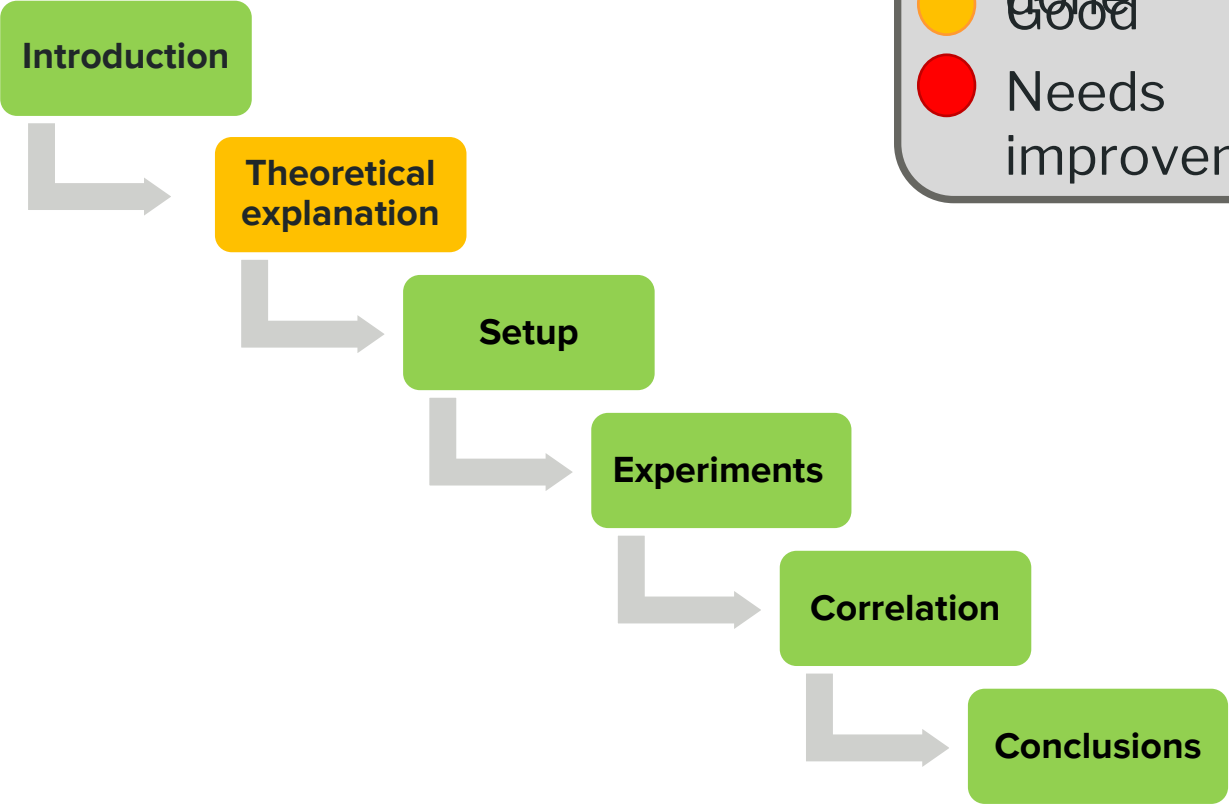
14. Wave Optics

Problem's task

- Formulate an open, thought-provoking problem that concerns a phenomenon of wave optics.
- **Use some wave optical phenomenon to measure the refractive index of a transparent material.**



Problem's task



Legend:

- Well done (Green circle)
- Needs improvement (Yellow circle)
- Needs improvement (Red circle)

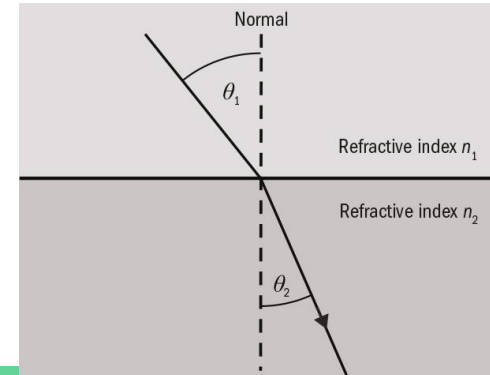
Theoretical Part

Strong points

- Strong definitions
- Expert problem solving
- Clear explanations on refraction and interference

Weak points

- Passed too fast through the optical explanation, not accentuating the most important part of the problem.
- Did not mention the purpose of the study



Experimental Part

Strong points

- Great setup
- Showed images that helped confirm the theory
- Extremely high repeatability, there was almost no human error
- Great result interpretation
- Checked results with literature

Weak points

- Did not vary the material (plastic, other types of glass)
- Did not vary the light's parameters (for example wavelength)
- Could have varied the medium

Suggestions

1. You should try to use a large sample of transparent materials, not only glass or plastic.
2. The variation of thickness could have been improved, a larger pool of sheets could have been used.
3. You should try to bring other mediums that affect the index of refraction into the experiment such as liquids.

Discussion topics

- Did you try to measure the refractive index using a refractometer? How would such an instrument affect the accuracy of the result compared to the classical method?
- Why didn't you vary the light's parameters, in what way would have the wavelength change the result?
- What other parameters do you think you could vary?
- **What about white light? What pattern would it produce?**
- Wouldn't counting with your eyes add human error?
- Wouldn't any other interferometer be better? Young's double slit experiment?

Clarifying questions:

- Why do you think the multiple glass plates were unreliable
- What made you choose these materials? Is there any scientific reason for these choices or is it just purely subjective?
- Did you find any correlation between the refraction angle and the refraction index?
- How did you choose the error bars?