

AI Project 2: The Persian Water Clock

CBE 30355 Transport Phenomena I

Due: September 23, 2025

Assignment Overview

The Persian Water Clock is an ancient way of keeping time. A bowl with a small hole in the bottom is floated in a filled bucket of water. Because of density differences, the water rushes into the hole and fills the bowl, causing it to sink lower. When the water flows over the edge of the bowl, it abruptly sinks, marking the passage of one unit of time.

In this project you will use AI to analyze the behavior of such a bowl. Specifically:

If the bowl is a copper hemisphere composed of 1/16" thick copper with outer diameter of 8", what should be the hole size necessary for the bowl to sink in exactly 20 minutes?

Project Requirements

Your report should include the following:

1. **History of the Persian Water Clock:** Provide a short history with examples and citations from reliable sources.
2. **Problem Description and Equations:** Clearly restate the problem and derive the governing equations needed to model the filling and sinking process.
3. **TikZ Diagram:** Include a labeled cross-section of the hemispherical bowl showing dimensions, water levels, and hole.
4. **Table of Properties:** Summarize material and fluid properties (density of copper, density of water, discharge coefficient, gravity, etc.) with cited sources.
5. **References:** Use `\cite` in the text and provide a properly formatted `thebibliography` section at the end.
6. **Prompting Strategy:** Append to your report the prompting strategy you used, as well as a discussion of what the AI got wrong and how you fixed it.

Rubric

- **History and Citations (10%):** Clear, concise summary with at least two reputable references.
- **Problem Restatement and Equations (30%):** Correct description of physical principles and governing equations.
- **Diagram (10%):** Clear and accurate TikZ diagram with labels.
- **Property Table (10%):** Complete, properly sourced physical property values.
- **References and Format (10%):** Proper use of `\cite` and formatted bibliography.
- **Clarity and Organization (10%):** Well-structured report, readable, minimal errors.
- **Prompting Strategy (20%):** Prompting approach clearly described and corrections to the report listed.