Name:_____ Date:_____

The Lerna Prize in Physics

2023-11

Instructions

- You must immediately fill out your name as well as the current date on the top of the page.
- You will be given 30 minutes to complete 3 questions. No extra time is allowed, and one must stop writing as soon as the time is up.
- You will have to show adequate work to prove that your answer was the result of thoughts but not guesses or anything else.
- You must explicitly indicate what your final answer is (*e.g.* circling, boxing, etc).
- All questions would be scored out of 5, and one would receive scores based on not only the right answer, but also on the attempt, logic, and thought. A mere correct answer may not necessarily earn full marks.
- Scratch paper would be provided upon request. One may not use their own scratch paper.
- You may begin as soon as the timer starts.

Questions

1. (3 points) Using dimensional analysis, find the dimensions for k (Coulomb constant), h (Planck constant), and the ϵ_0 (vacuum electric permittivity).

2. (3 points) Given that area $[A] = [k]^{\alpha}[h]^{\beta}[\epsilon_0]^{\gamma}$, find α, β, and γ.

3. (5 points) Given that $?^{\alpha} = [k]^{\beta}[h]^{\gamma}[\epsilon_0]^{\delta}$, find α, β, and γ, where $\alpha = 202311$, $\beta = 202311$, $\gamma = -202311$, and $\delta = 0$, find ?.