PH 451 **Winter 2026**

Worksheet # 18

(Friday, February 27, 2026)

Name

Questions (5 pts):

(a) Calculate the total fine-structure energy corrections (in terms of $\alpha^4 mc^2$) to the n = 1 and n = 2 energy levels of the hydrogen atom.

(b) Sketch the energy level diagram and indicate the energy corrections and corresponding states in spectroscopic notations (which include information on n, l, and j quantum numbers)

(c) **If you have time:** What are the relative contributions of H'_{rel}, H'_{SO}, and H'_{D} to the overall correction for the n = 1 level?