PH 451 /551 **Winter 2026**

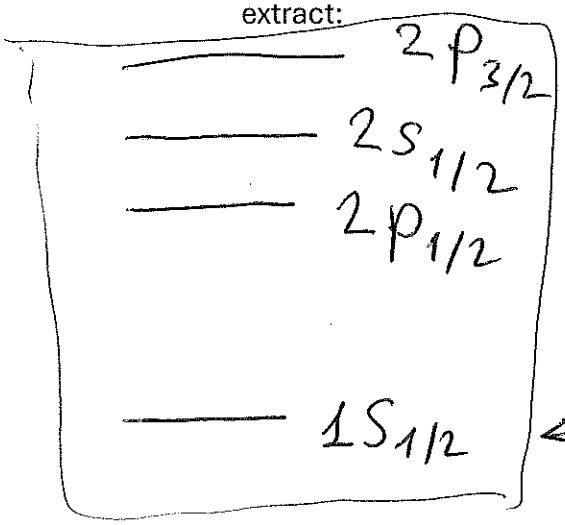
Worksheet # 17

(Monday, February 23, 2026)

Name

Questions (5 pts):

(a) Interpret the spectroscopic notations for each state of the electron in the hydrogen atom shown below (i.e. write down all quantum numbers you can extract:



$2P_{3/2} \rightarrow n=2,\ \ell=1,\ j=3/2$

$2S_{1/2} \rightarrow n=2,\ \ell=0,\ j=1/2$

$2P_{1/2} \rightarrow n=2,\ \ell=1,\ j=1/2$

$1S_{1/2} \leftarrow n=1,\ \ell=0,\ j=1/2$

(b) The ground state of silicon (Si) atom has the total spin of 1, total orbital angular momentum of 1, and total angular momentum of 0. Write down the ground state electron configuration in spectroscopic notations.

$S=1,\ L=1,\ J=0 \Rightarrow {}^{3}P_{0}$ ($2S+1$, J)

(c) If you have time: what is the ground state configuration of He atom (2 electrons)?

He $\Rightarrow$ $1s^2$ (2 1s e^-) $\Rightarrow$ total $L=0$, $S=0$ $\Rightarrow J=0$

$^{1}S_{0}$