Pb # 10.

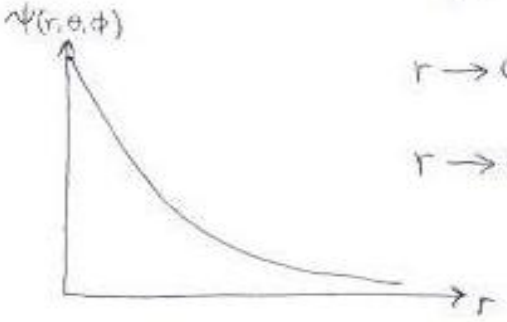
$n = 4, \quad \ell = 3 \quad \text{and} \quad m_\ell = 3$

a) $|\vec{L}| = \sqrt{\ell(\ell+1)}\,\hbar = \sqrt{12}\,\hbar = 2\sqrt{3}\,\hbar = 3.65 \times 10^{-34}\ J.s$

b) $L_z = m_\ell \hbar = 3\hbar = 3.16 \times 10^{-34}\ J.s$

Pb # 12.

$$\psi(r,\theta,\phi) = \frac{1}{\sqrt{\pi}} \left(\frac{1}{a_0}\right)^{3/2} e^{-r/a_0}$$



$r \to 0 \quad \psi \longrightarrow \frac{1}{\sqrt{\pi}} \left(\frac{1}{a_0}\right)^{3/2}$

$r \to \infty \quad \psi \longrightarrow 0$

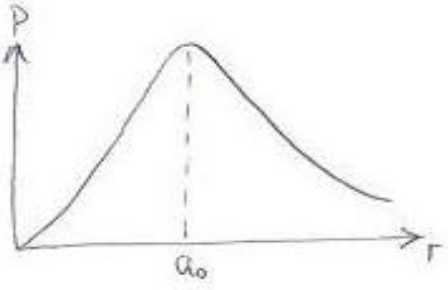
b) $P = |\psi|^2 dv \quad (3\text{-dimensions})$

Since the wave function has spherical symmetry, the volume

$dv = 4\pi r^2 dr$

$\Rightarrow P = |\psi|^2 4\pi r^2 dr$

c)



The e^- is most likely to be found at a_0 (the Bohr radius).

d) $\int |\psi|^2 dv = 4\pi \int |\psi|^2 r^2 dr \stackrel{?}{=} 1$