For the Hydrogen atom, $U(r)=-e^2/4\pi\varepsilon_0 r$. We can find solutions by writing $\psi(r,\theta,\phi)=R(r)P(\theta)F(\phi)$. Would we get the same solutions for $P(\theta)$ and $F(\phi)$ if $U(r)$ was some other function of r?

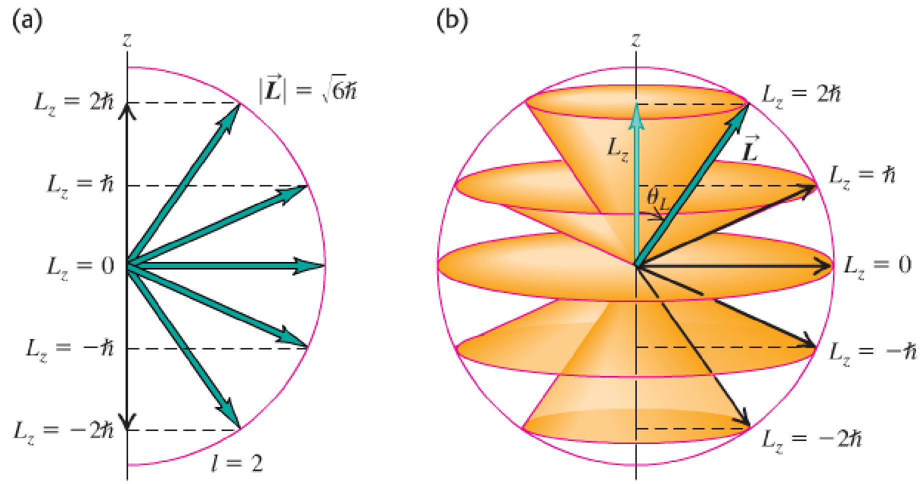
a) No

b) Yes

c) I don't understand the question.

Because we could separate into 3 differential equations, one each for $R(r)$, $P(\theta)$, and $F(\phi)$.

41.2 (a) When $l = 2$, the magnitude of $\vec{L}$ is $\sqrt{6}\hbar = 2.45\hbar$, but the direction of $\vec{L}$ is not definite. In this semiclassical vector picture, $\vec{L}$ makes an angle of 35.3° with the z-axis when the z-component has its maximum value of $2\hbar$. (b) Cones of the possible directions of $\vec{L}$.



If $L_z = L$, what would be the momentum in the z-direction, p_z?

a) Unknown

b) Zero

c) L*r

The particle would be moving in the x-y plane. By the uncertainty principle absolute knowledge of p_z ($p_z=0$) would mean the electron could be found anywhere in z. This is not physical for an electron bound to an atom.

In the Hydrogen atom, which transition would give the longest wavelength photon?

a) 3s $\rightarrow$ 2p

b) 5d $\rightarrow$ 4p

c) 2p $\rightarrow$ 1s