An electron in a hydrogen atom is in a quantum state characterized by the following quantum numbers: $n = 3$ and $l = 2$.

a) Using Schrodinger approach, determine the energy of the electron in this particular state. Does this result agree with Bohr’s model?

b) Using Schrodinger approach, determine the value of the angular momentum $L$. Does this result agree with Bohr’s model?

c) Compute all the possible values of $L_z$ of this physical situation.
d) Choose one particular value of $L_z$ (i.e., one value of $m$) and write down the complete wavefunction (as a function of the spherical coordinates $r, \theta, \phi$ and time $t$) for this quantum state of the electron in the hydrogen atom. Do not worry about normalizing your wavefunction.

e) Using the wavefunction you calculated in part d), obtain the probability density.

f) Show that the probability density depends on $r$ and may be on $\theta$ (depending on your choice of $m$), but it is independent of $\phi$ and $t$. 