The electron of the Hydrogen atom is in the (orbital) state,
$\psi(r,\theta,\phi) = A(\sqrt{3}\psi_{300} - \psi_{421} - 2i\psi_{21-1} + i\psi_{32-1})$.

a Calculate A. What physical principle do you use?

b If you measure the energy of the electron, what values can you get and with what probability.

c If you measure the magnitude of the angular momentum L^2, what values can you get and with what probability.

d Calculate the expectation values for $\hat{H}$ and $\hat{L}_z$.

e Given ψ: Tell the corresponding time-dependent wave function $\psi(r,\theta,\phi,t)$. Argue whether the expectation value for the energy is time-dependent ?