Q1: Start from Schrodinger equation in three-dimension

$$\left[\frac{-\hbar^2}{2m}\bigtriangledown^2 + V(r)\right]\Psi(\vec{r}) = E\Psi(\vec{r})$$

and use $\bigtriangledown^2$ in spherical coordinate, where

$$\bigtriangledown^2 = \frac{1}{r^2}\frac{\partial}{\partial r}(r^2\frac{\partial}{\partial r}) + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial\theta}(\sin\theta\frac{\partial}{\partial\theta}) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2}{\partial\phi^2}$$

and the variable separation

$$\psi = \frac{u(r)}{r}Y_{\ell m}(\theta, phi)$$

to rewrite the Schrodinger equation to be looks like

$$\frac{d^2u_\ell}{dr^2} + \frac{2m}{\hbar^2}\left[E - V(r) - \frac{\ell(\ell+1)}{2mr^2}\right]u_\ell(r) = 0$$

where $\ell(\ell+1)$ is the solution value of $Y_{\ell m}(\theta, phi)$

Q2: Determine the nucleus in $A = 135$ isobars that have the lowest mass (largest binding energy) using the mass parabola. (*Hint*) differentiate the mass equation ($Zm_Z + Nm_N - BE$) with respect to Z with constant A and determine the extreme value of Z then recycle it to a closest integer, then determine the nucleus. (*Answer Z=56*).