The angular part of the wavefunctions for \( l = 1 \) are as follows:

\[
Y_{\ell m} = \left( \frac{3}{4\pi} \right)^{\frac{1}{2}} \sin \theta \cos \phi \\
Y_{\ell m} = \left( \frac{3}{4\pi} \right)^{\frac{1}{2}} \sin \theta \sin \phi \\
Y_{\ell m} = \left( \frac{3}{4\pi} \right)^{\frac{1}{2}} \cos \theta
\]

In words, explain why the angular part of the 2p\(_z\) orbital depends only on \( \theta \), not \( \phi \).

The p\(_z\) orbital is pointed along the z axis. In spherical polar coordinates \( \theta \) is the angle off the z axis. Since the p\(_z\) orbital has no amplitude in the xy plane, its shape is determined entirely by \( \Theta \), and distance from the nucleus by \( r \).