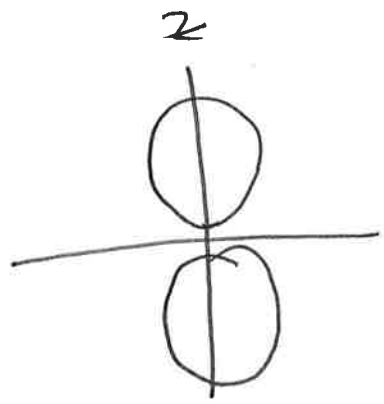
Chem 130, Eppley

KEY

In Class 5: Quantum Theory and Orbitals

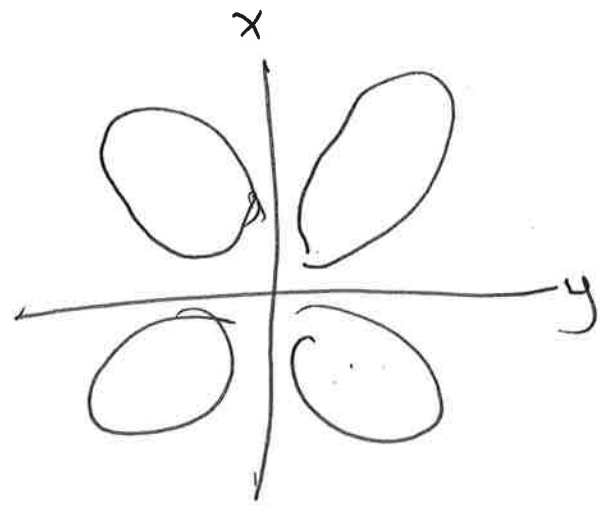
For each of the following orbitals, identify as many quantum numbers as you can. Draw them, label their axes.

$4p_z$



$n = 4$
$l = 1$
$m_l = 0, -1$ or $+1$

$4d_{xy}$



$n = 4$
$l = 2$
$m_l = -2, -1, 0, 1$ or 2

When putting electrons in atoms, we are able to put 6 electrons in p orbitals in a given quantum level, but 14 electrons in an f orbital with the same principal quantum number.

p orbitals have an angular momentum quantum # (l) of 1, so m_l can be $-1, 0,$ or $+1$, for a total of 3 orbitals. Each orbital can have one e^- w/ $m_s = +1/2$ and $-1/2$ (2 e^- each) for a total of 6 e^-. Similarly, $l = 3$ for an f orbital, so m_l can $= -3, -2, -1, 0, 1, 2$ or 3 for a total of 7 orbitals, each of which can hold 2 e^- (as above).