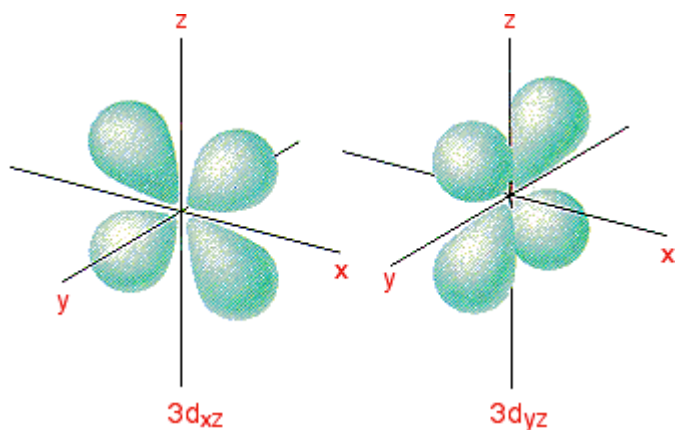


Chemguide – answers

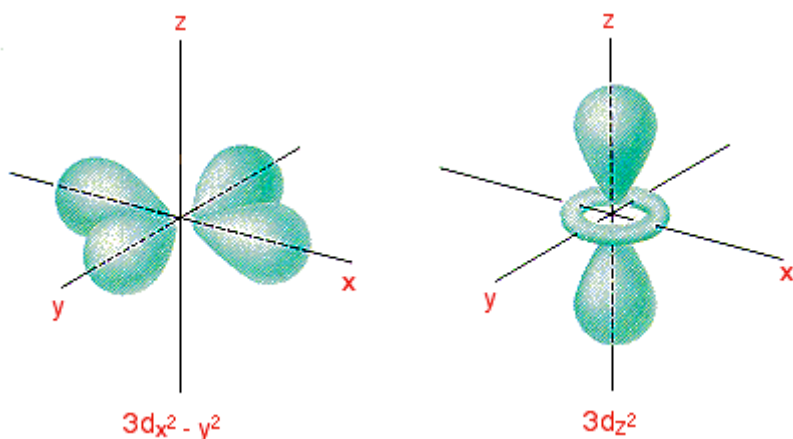
COMPLEX IONS: d-ORBITALS

1. a)



If this is on your syllabus, practice drawing these until you can do it convincingly. Make sure that your lobes are between the axes, and not pointing along them.

b)



c) They have equal energies.

2. a) Octahedral

b) The various electric fields due to the electrons in the water molecules cause repulsion of the electrons in the d orbitals, and this raises their energy.

c) There are two orbitals with the higher energy, and the other three not as high. The water molecules attach along the x, y and z axes. There will be more repulsion for the two d orbitals which have one or two lobes along those axes. The greater the repulsion, the greater the energy. The $3d_{xy}$, $3d_{xz}$ and $3d_{yz}$ orbitals don't have lobes pointing along the x, y and z axes, and so don't experience quite so much repulsion.