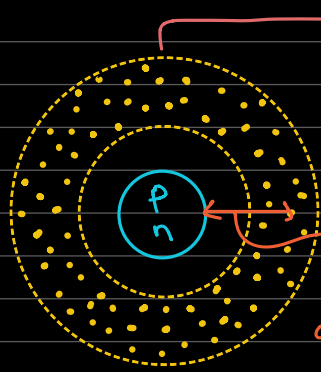


ATOMIC STRUCTURE : THE QUANTUM MECHANICAL MODEL



Orbital

An orbital is a region where the probability of finding an electron is the highest

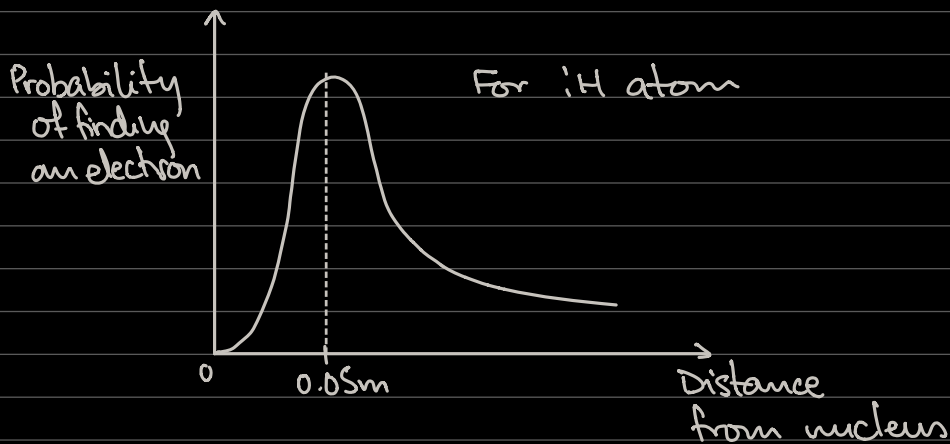
OR

An orbital is a region where an electron spends 90% of its time

Avg. distance

0.05nm (for ^1H)

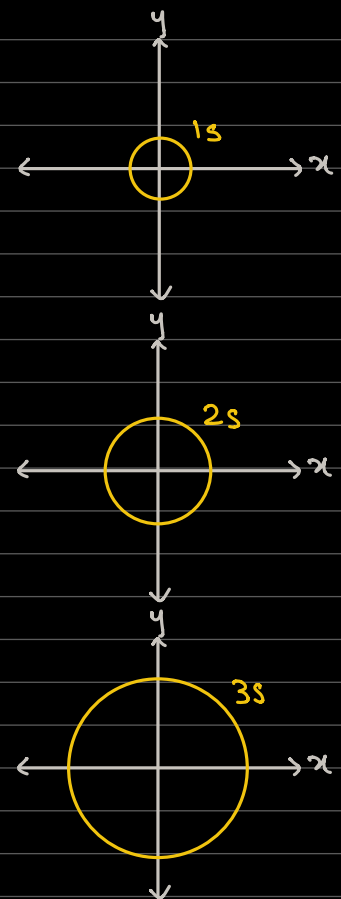
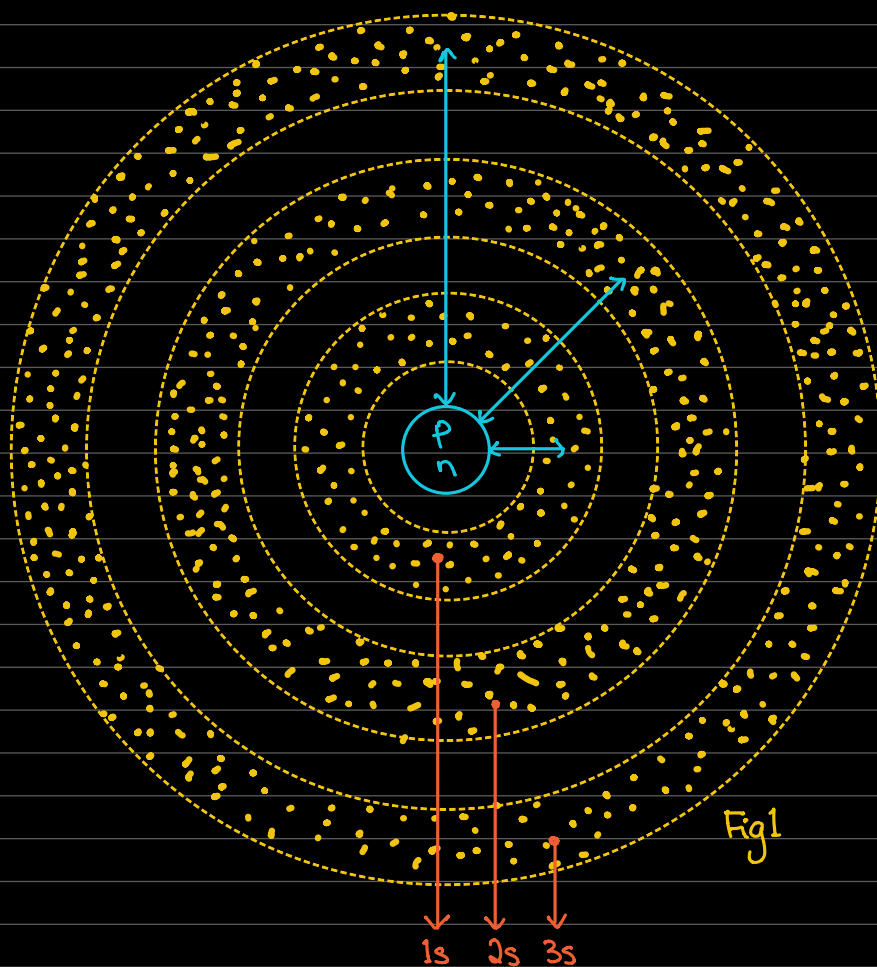
Note: It is still possible for electrons to be found very close or far outside of the orbital, however the chances are low



- The electron in a Hydrogen atom can be found almost anywhere (around the nucleus) but most of the time it stays fairly close to the nucleus, effectively surrounding it in a cloud of charge.
- The electron spends most of its time in regions where the probability of finding it is high, and the concentration of charge is high.
 - ↳ Thus, the electron density in this region (aka. orbital) is high

S-ORBITAL

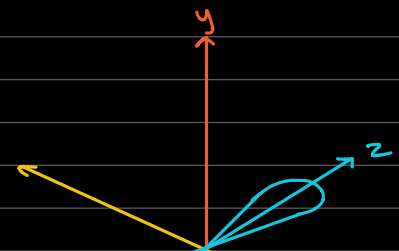
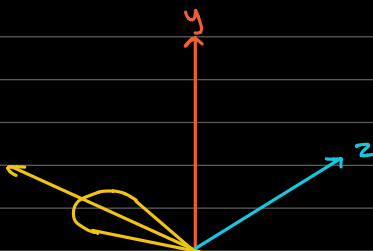
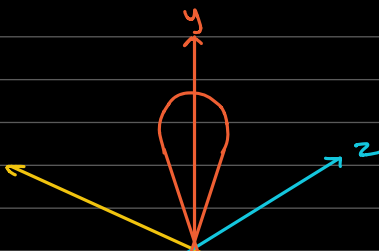
- The "s" describes the shape of the orbital
- All s-orbitals are spherical in shape but the probability of finding an electron is not equal in all parts of the sphere.
- The maximum probability is at a precisely known distance from the nucleus (i.e. 0.05nm, for ^1H) - but it is possible for the electron to exist further in or further out than this distance

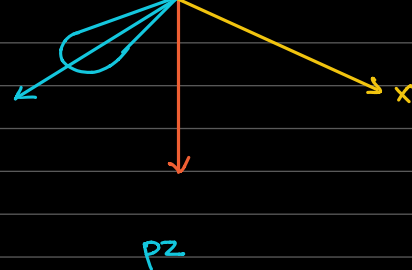
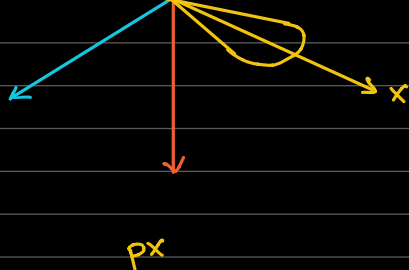
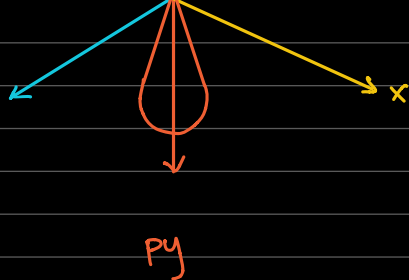


↳ These are the simplified version of fig1 and are the ones to be drawn if a question requires it

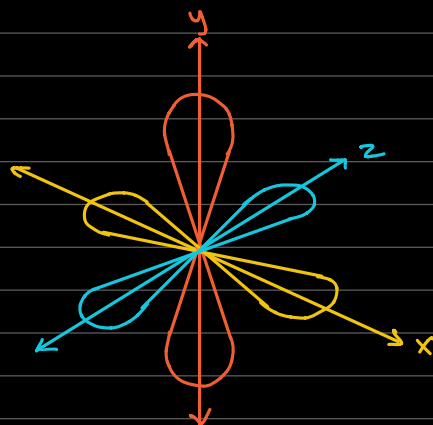
P-ORBITAL

- In a p-orbital, the electron density is not distributed in a spherically symmetrical manner, as it is in an s-orbital
- It is concentrated in particular regions along a straight line passing through the nucleus
 - ↳ Electron density occurs on both sides of the nucleus so that the electron in a p-orbital spends part of its time on each side of the atom
- All p-orbitals have definite directional properties (pointing along the x, y, or z axes)
- They are represented as lobe-shaped regions pointing in opposite directions from the nucleus





- A subshell is composed of three p -orbitals with the same shape
 - ↳ They differ from each other only in the direction in which their electron density is concentrated
 - ↳ These directions lie at right angles to each other and can be drawn on a set of x , y , and z axes.
- The three p -orbitals can be classified as p_x , p_y , and p_z .



The " p " subshell