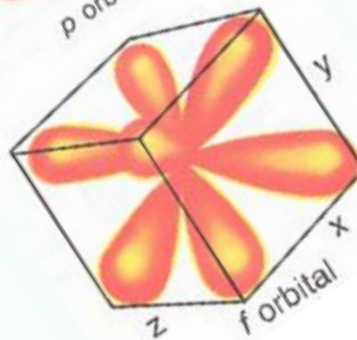
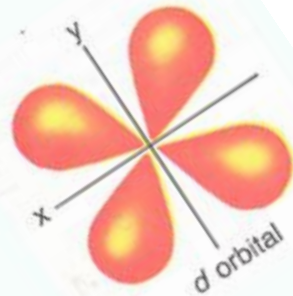
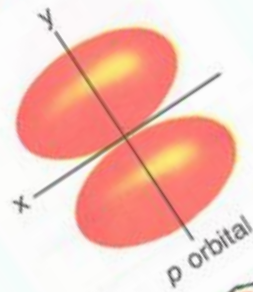
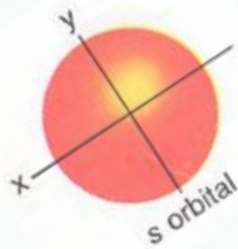


Electron Configuration

Orbitals



Atomic Orbitals

- Where electrons are most likely to be found

How do we describe orbitals?

- Energy level
- Shape
- Orientation
- How many electrons are in each orbital

Atomic Orbitals

How do we describe orbitals?

Energy level

Shape

Orientation

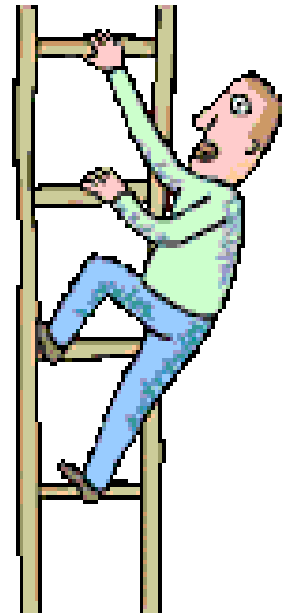
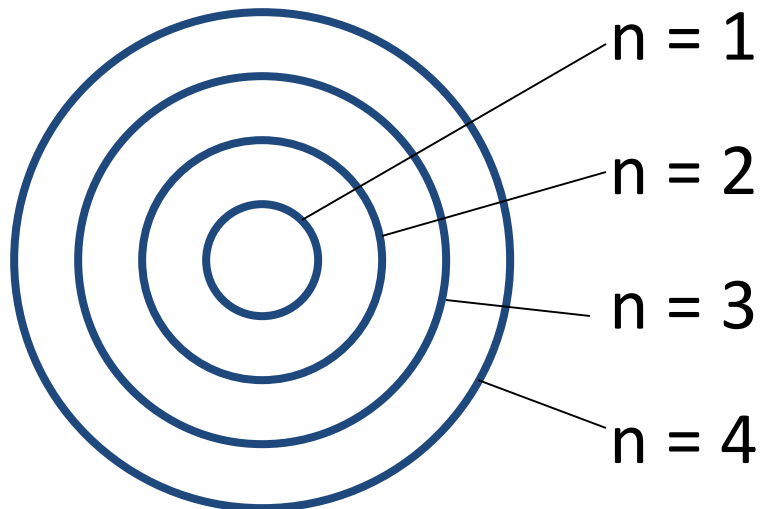
How many electrons are in each orbital

Different orbitals are in different energy levels

$n = 1, 2, 3, 4, 5, 6, 7.$

1 = lowest energy,

closest to the nucleus



Atomic Orbitals

How do we describe orbitals?

Energy level

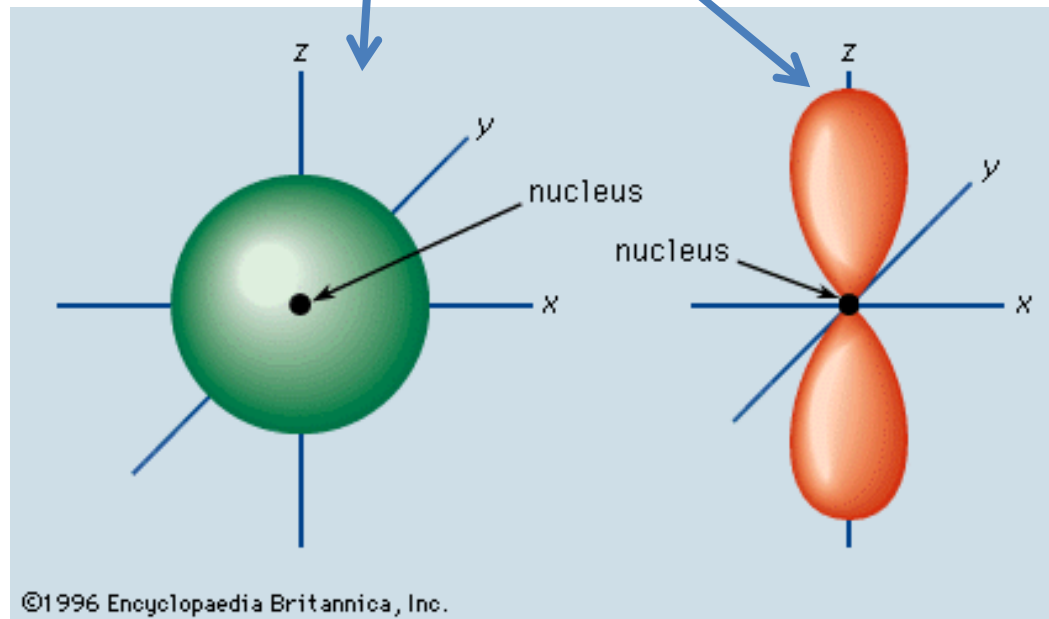
Shape

Orientation

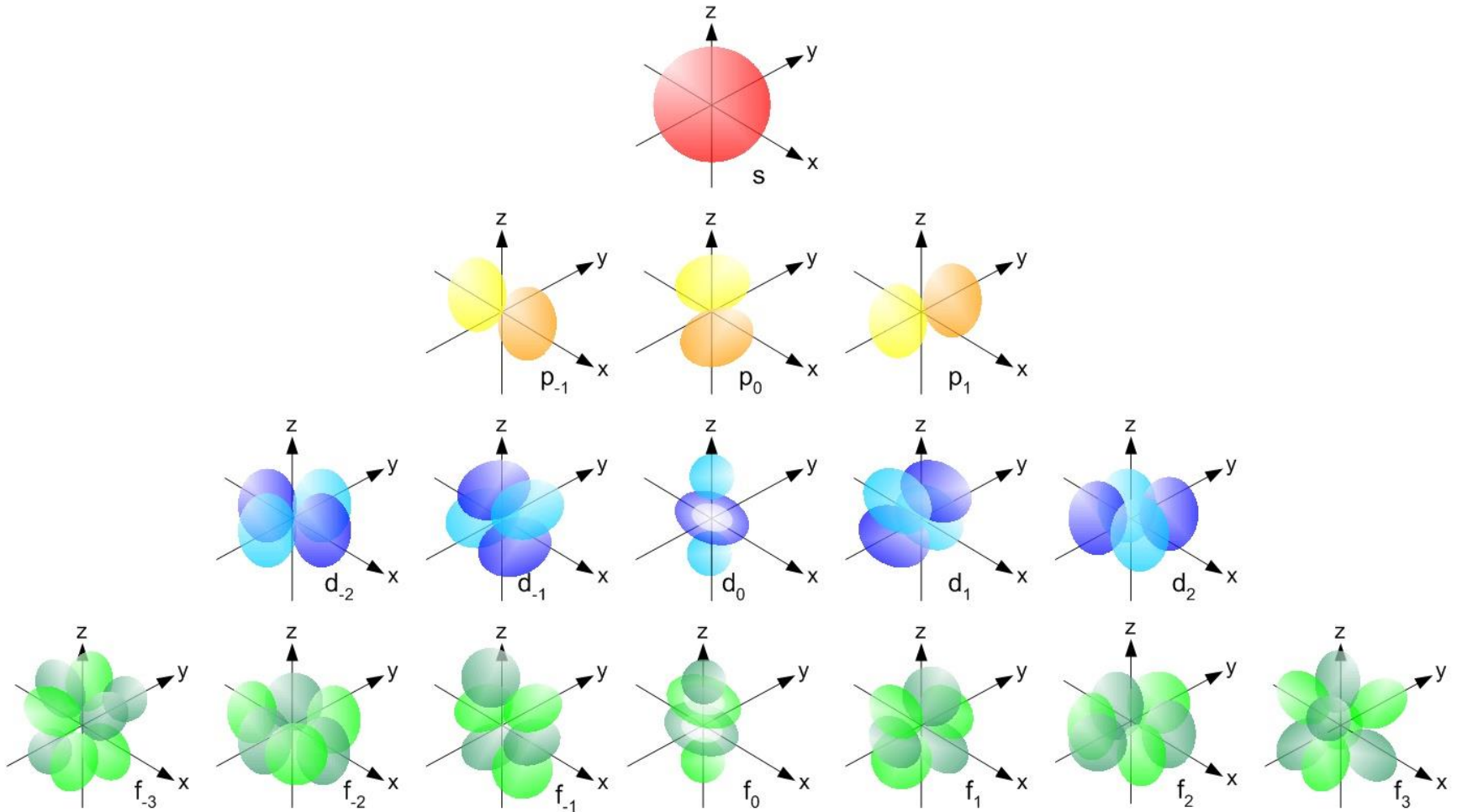
How many electrons are in each orbital

Different orbitals have different shapes

s, p, d, f



Some Orbitals Are Weird Looking!



Atomic Orbitals

How do we describe orbitals?

Energy level

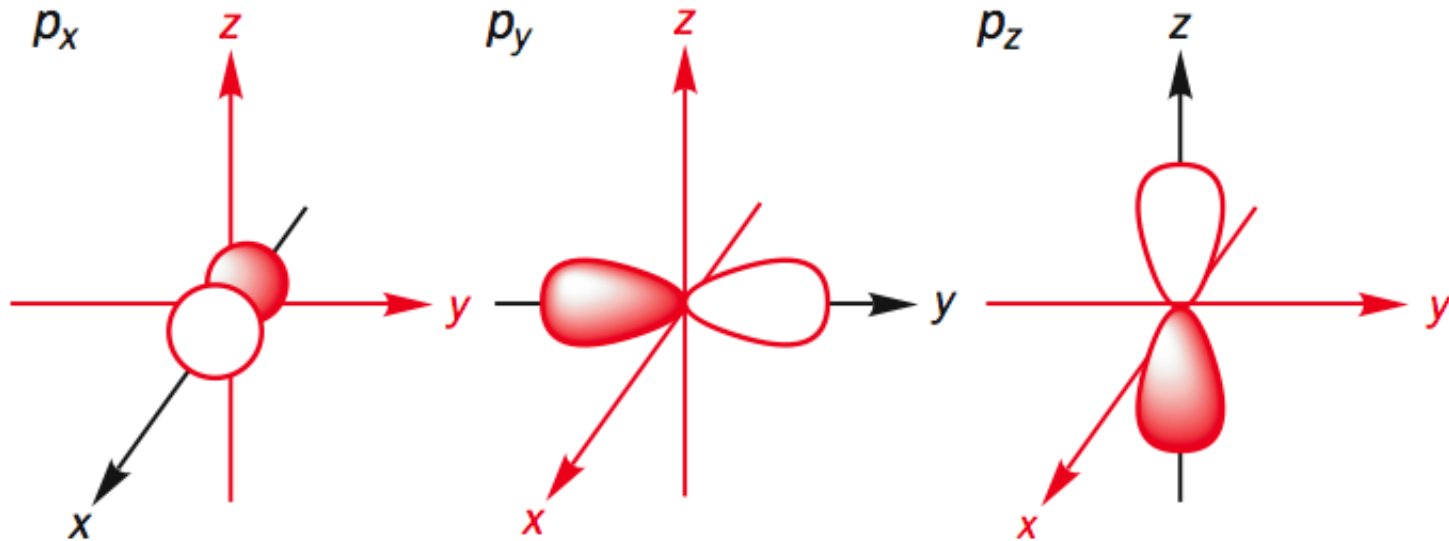
Shape

Orientation

How many electrons are in each orbital

Different orbitals have different orientations

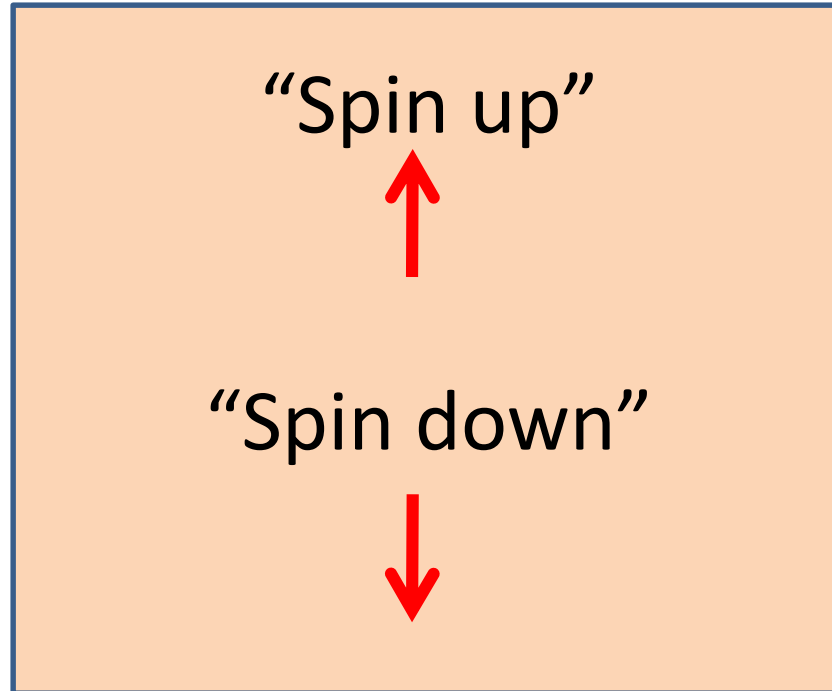
x, y, z (axis)



the three degenerate p orbitals are aligned along perpendicular axes

Electrons in Orbitals

Each orbital is only allowed to have
TWO electrons



So how do I tell
someone exactly
where an electron is???



Where do you live?

Think about where you live.

California

State

Pleasanton

City

Ferdinand Avenue

Street

#2345

House #

You can write an ADDRESS for where you live

So where do electrons live?

Energy Level

State

Type/Shape of Orbital

City

Orientation

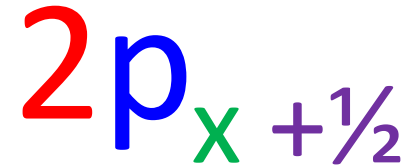
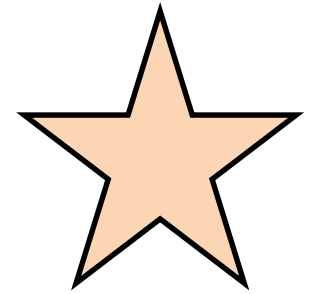
Street

Spin up or Spin down

House #

So couldn't you write an ADDRESS for where the electrons are in an atom???

Use “electron configuration” to write an address for an electron



Energy Level

Type/Shape of Orbital

Orientation

Spin up or Spin down

$+ \frac{1}{2}, - \frac{1}{2}$

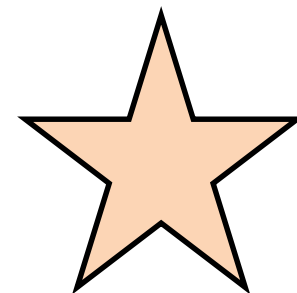
$1s_{+1/2}, 1s_{-1/2}$

$2s_{+1/2}, 2s_{-1/2}$

$2p_x_{+1/2}, 2p_x_{-1/2}, 2p_y_{+1/2}$

$2p_y_{-1/2}, 2p_z_{+1/2}, 2p_z_{-1/2}$

$1s^2 2s^2 2p^6$



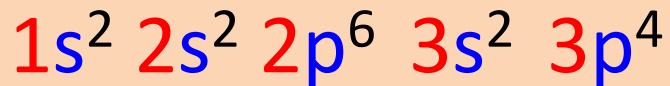
What if you wanted to describe where ALL the electrons in an atom were?

List:

Energy levels

Shapes of Orbitals

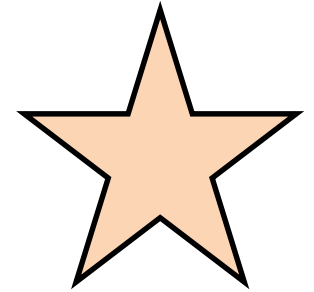
Number of electrons in each orbital



$$= 2+2+6+2+4 = 16 e^-$$

Sulfur!

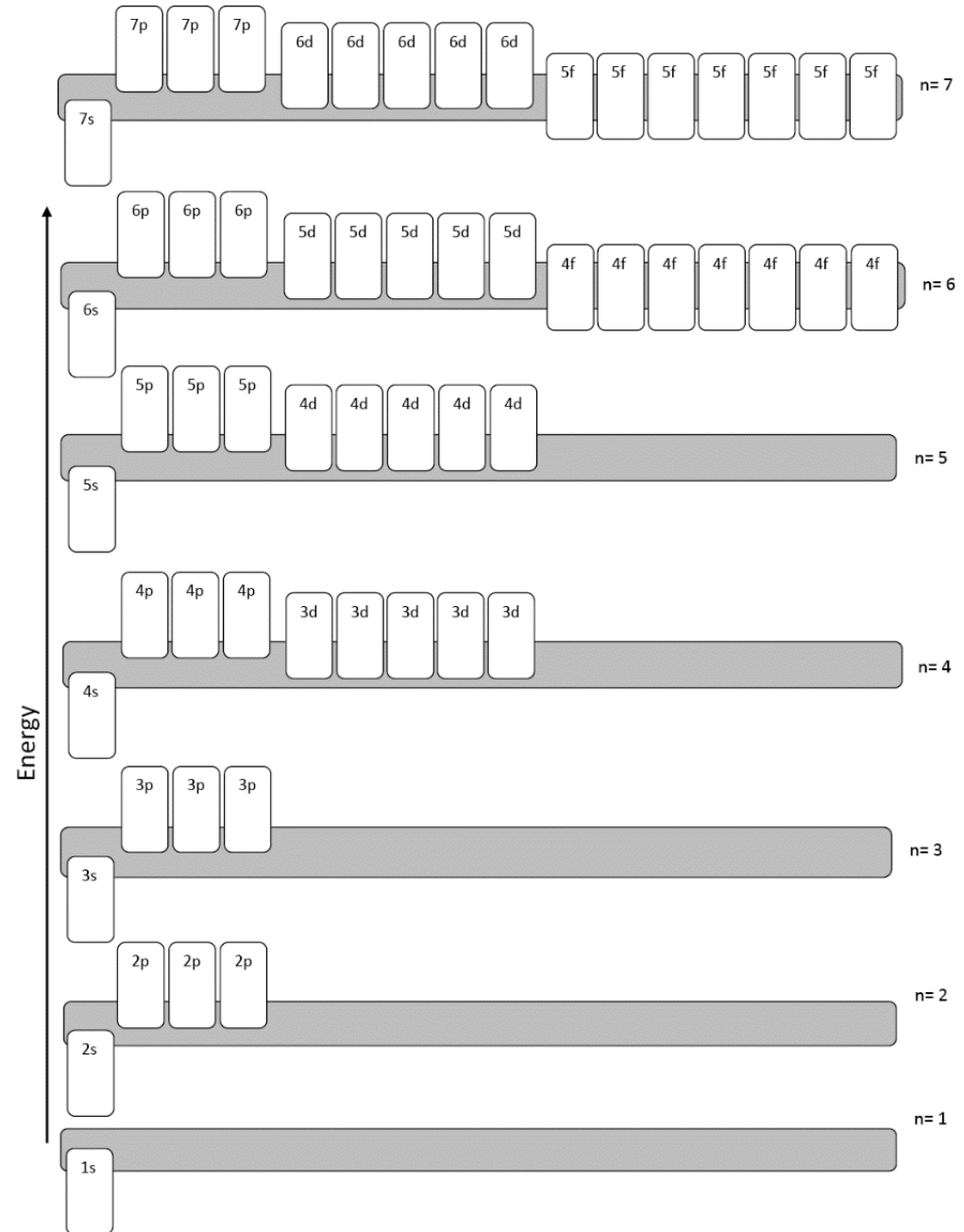
Steps to finding all the electrons



- 1) Pick an atom
- 2) Find the number of electrons it has
- 3) Start putting electrons into the orbitals
Use an ORBITAL CHART/DIAGRAM
- 4) List which orbitals you used and how many electrons in each one

Orbital Diagram

A chart that shows you the order that the orbitals go in.



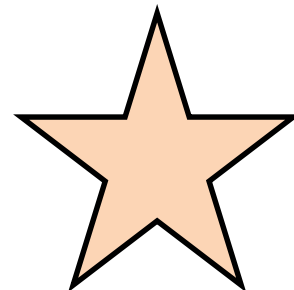
Rules for putting electrons in orbitals

Aufbau Principle

An electron occupies the lowest energy orbital that it can.

Means: Fill from the bottom up

Electrons are lazy!



Pauli Exclusion Principle

No two electrons in the same atom can have the same set of 4 quantum numbers

Means: if there are two electrons in one orbital, one must be spin up, one spin down.

They can't have exactly the same "address"

Hund's Rule

Orbitals of equal energy are each occupied by one electron before any orbital is occupied by a second electron.

Means: If there are more than one orbital at the same energy, put one electron into each orbital before pairing up

Don't share a bedroom unless you have to!