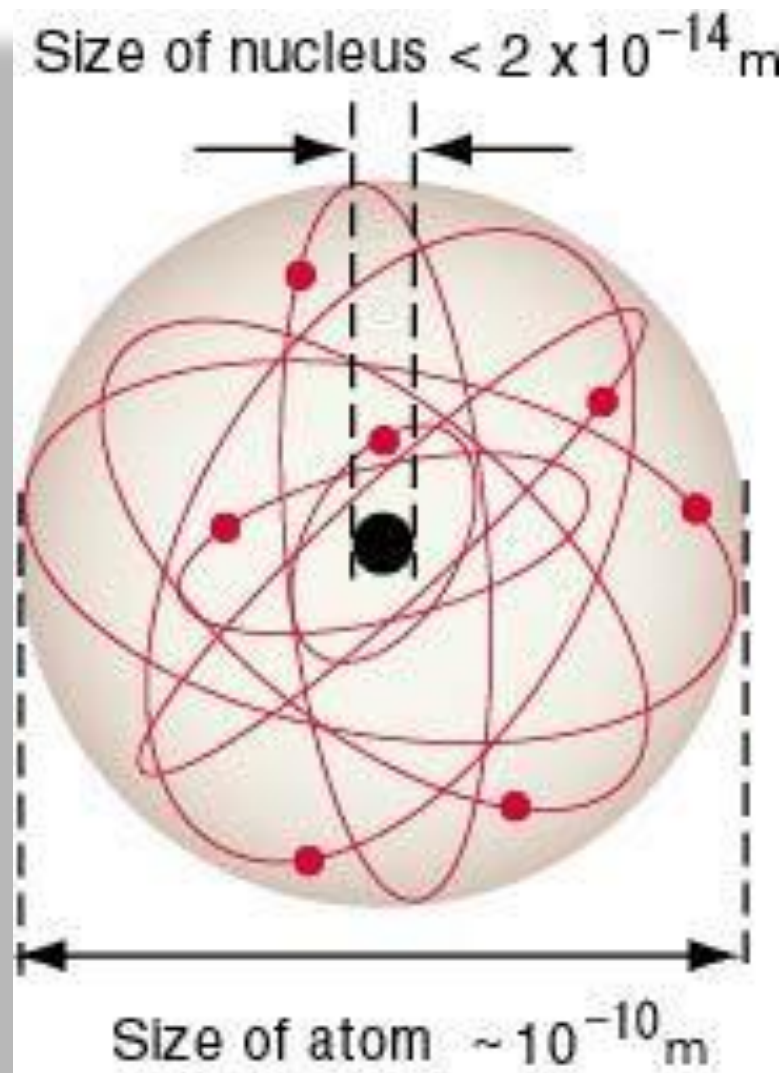
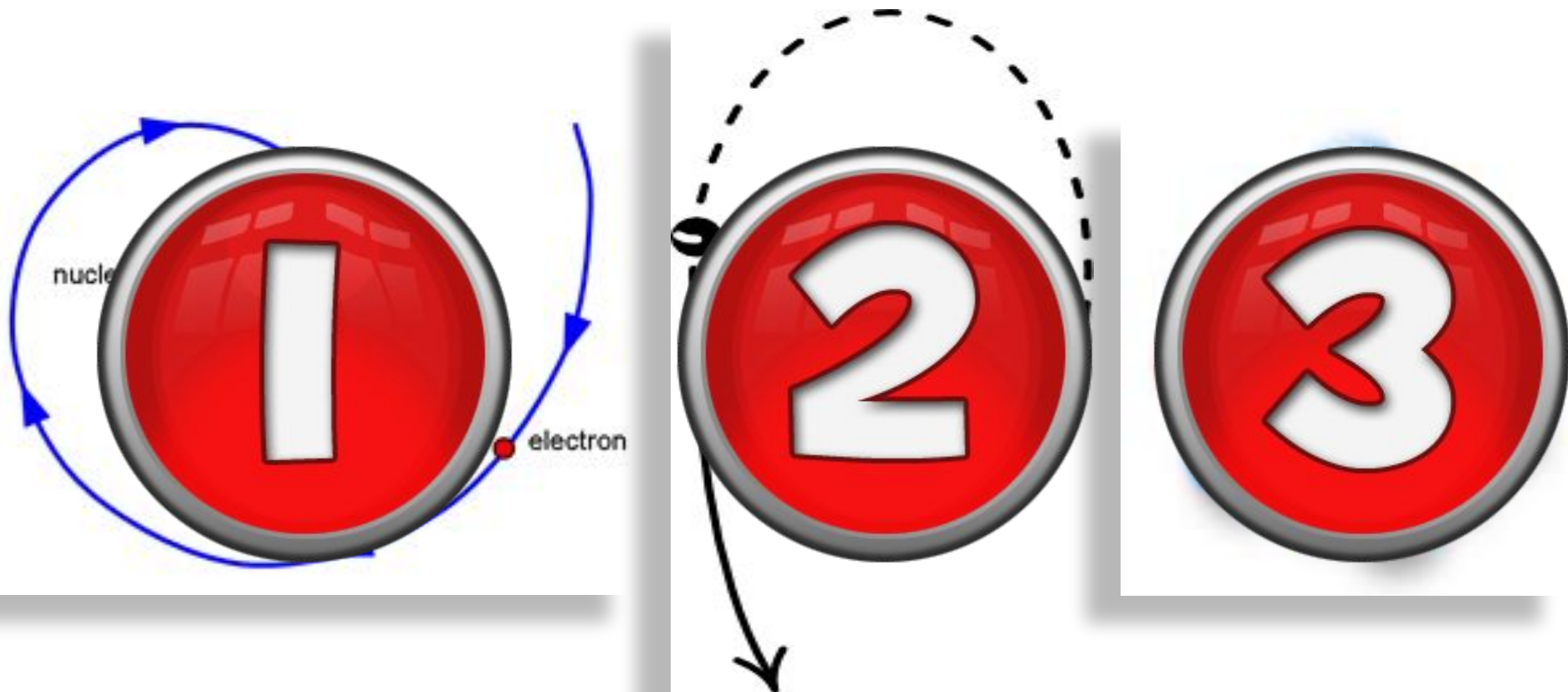


The Nuclear Atom



Nuclear Atom Limitations



Limitations

This is in words for those away. Numbers match pictures on previous slide:

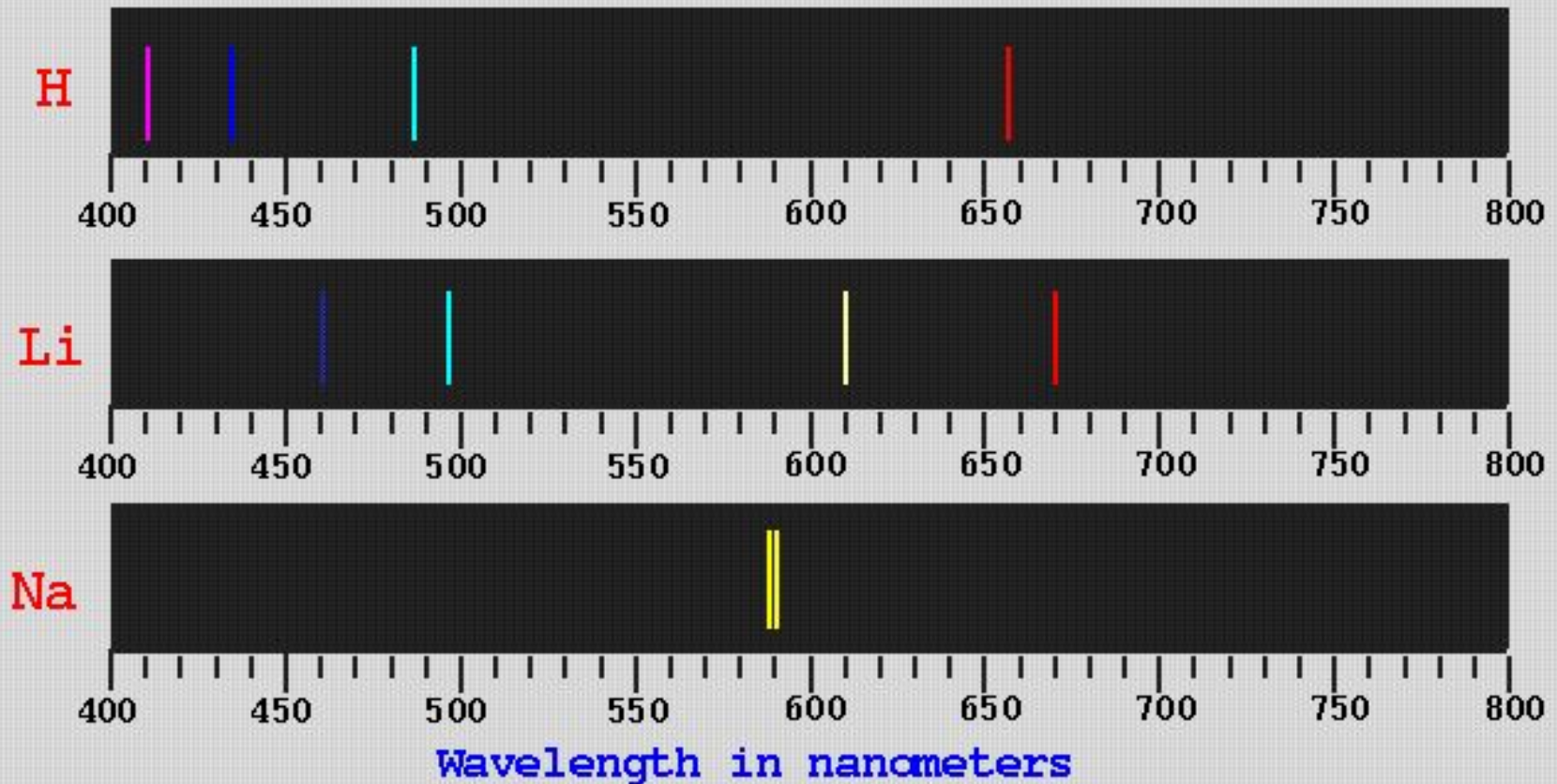
1. Because of opposite charges, under Rutherford's model, electrons should be attracted to, and collapse into, the nucleus
2. Electrons are fast moving, those far enough away should just fly off (what's holding them once attraction of nucleus is weak due to distance?)
3. What holds the nucleus together when particles all have a positive charge (and should repel)?

Bohr-Rutherford Atom

- attempts to deal with these issues
- observed heated elements produce distinct colours
- a prism reveals a unique individual colours called a **line spectrum**
- differs from continuous (full) spectrum of white light

Bohr-Rutherford Atom

Atomic Emission Spectra





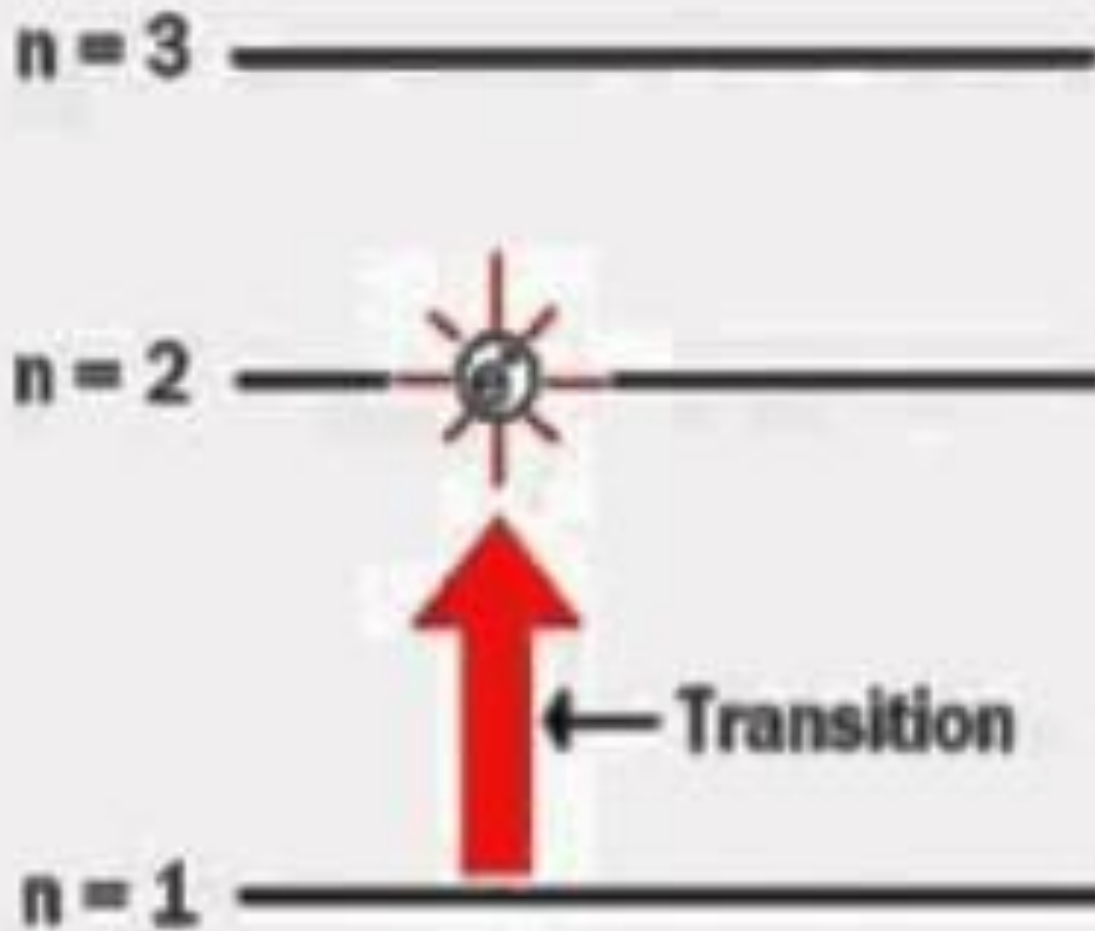
A volunteer & a chair

Bohr-Rutherford Atom

- **proposed that electrons are confined to distinct energy levels at fixed distances from the nucleus**
- **thus, electrons within a level have the same energy and electrons do not exist between levels**
- **levels increase in energy moving away from the nucleus**

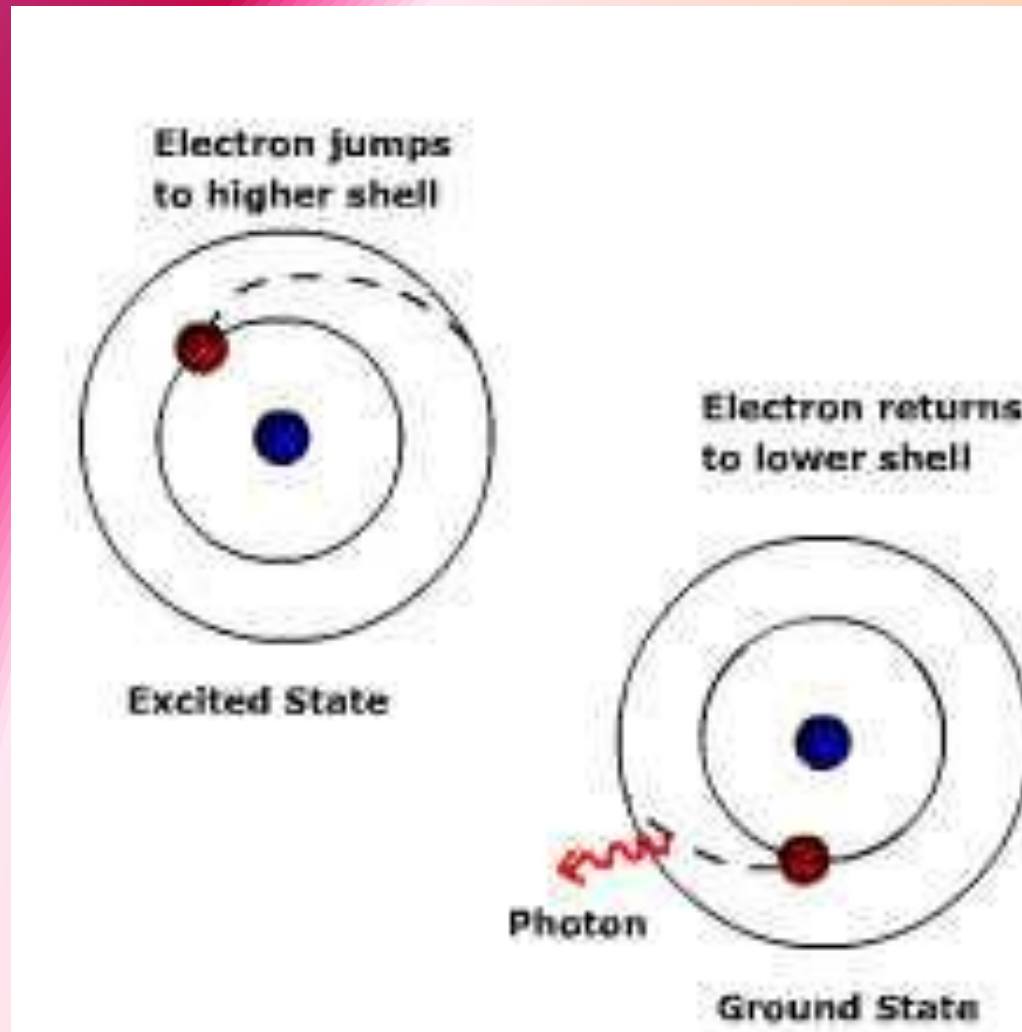
Bohr-Rutherford Atom

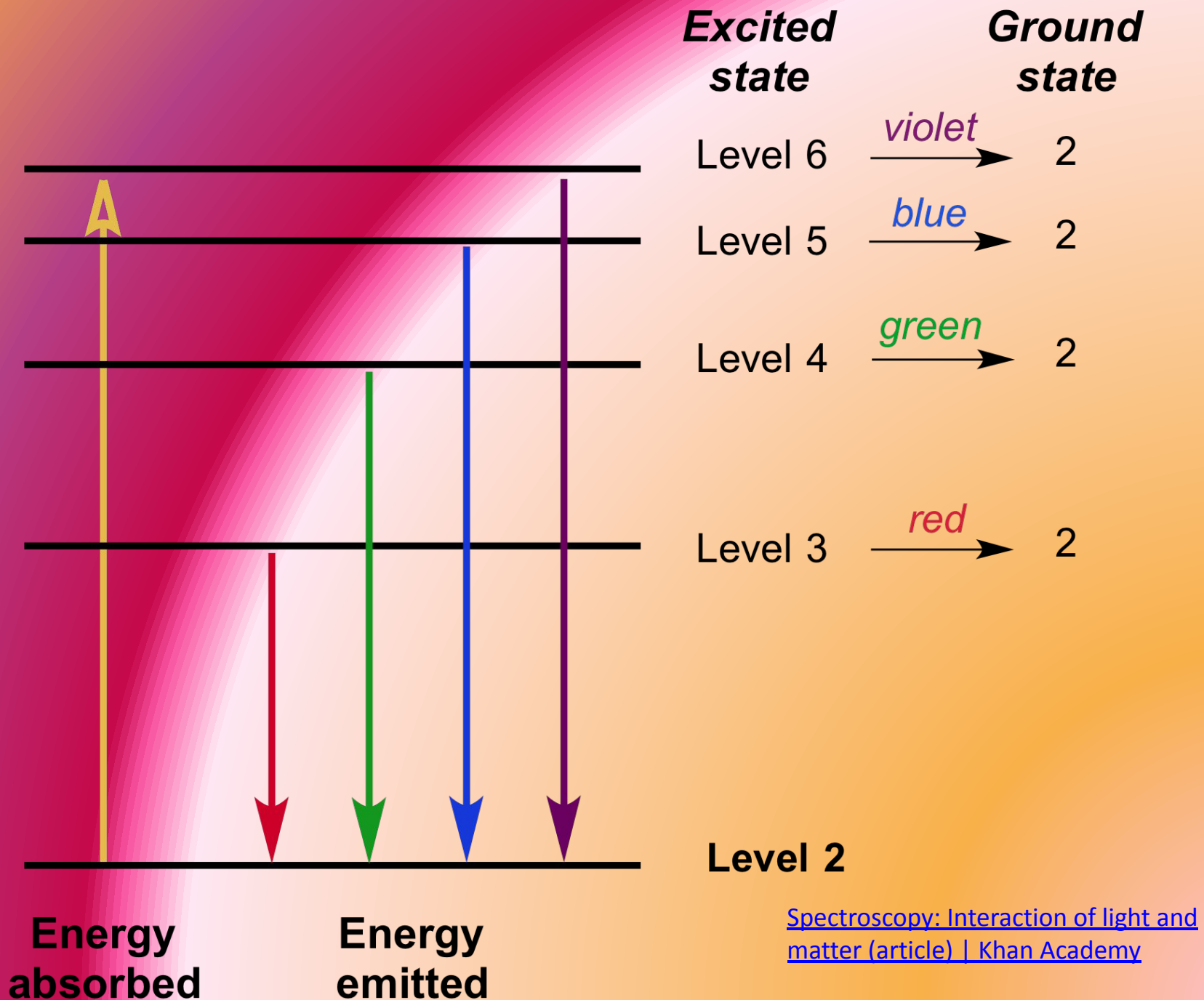
- if an electron absorbs energy, it moves to higher level (**excited state**)
- when the electron loses some energy it must move back to its original level (**ground state**)
- as a result it releases excess energy in the form of light seen as a line



NOTE: The ground state is the electron position in a neutral atom as you would draw it in Bohr. So an electron's ground state could be $n=1$, 2 , 3 , 4 , etc.

Bohr-Rutherford Atom





Bohr-Rutherford Atom

- used H atoms as their model
- found that electrons always occupy lowest possible energy level (**Aufbau principle**)
- found that maximum number of electrons for each energy level is given by $2n^2$ where n is level number so level 1 has 2 electrons, 2 has 8 electrons, 3 has 18 electrons

Bohr-Rutherford model is 3D

We draw it 2D BUT
all researchers
understood the
atom was 3D since
matter is 3D. So
Bohr's model,
Rutherford's and
the upcoming
quantum model
are all 3D!!

3D Bohr
animations

Radium 3D (move
it to get 3D
rotation of levels)

Bohr-Rutherford Atom

- draw the nucleus indicating the number of protons and neutrons present
- draw energy levels to hold electrons for that level and after each level is full draw a new level further from the nucleus

