

# ATOMIC STRUCTURE

1. The Nuclear Atom
2. Electron Orbits
3. Atomic Spectra
4. The Bohr Atom
5. Energy Level and Spectra
6. Correspondence Principle
7. Nuclear Motion
8. Atomic Excitation
9. The Laser

# ATOMIC EXCITATION

**How atoms are excited?**

- 1. Collisions.**
- 2. Photon absorption.**

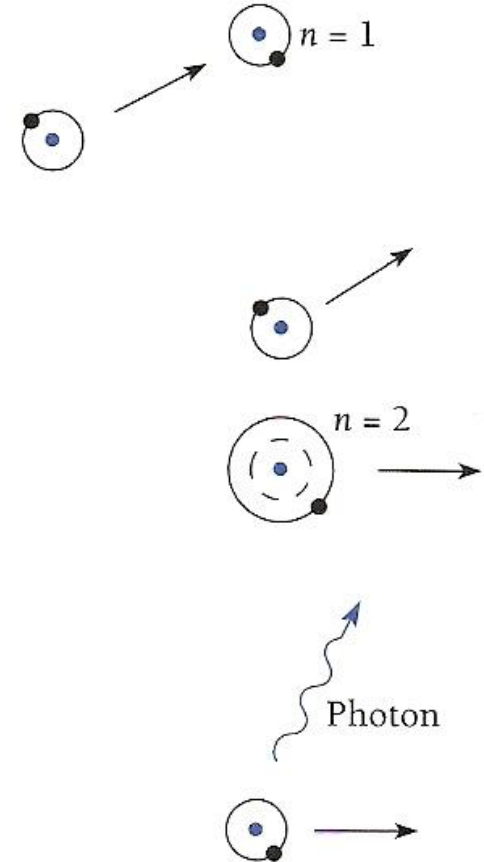


# ATOMIC EXCITATION

## How atoms are excited?

### 1. Collisions.

- Part of their joint KE is absorbed by the atom.
- The excited atom return to its ground by emitting one or more photons after on average  $10^{-8}$  s.
- Discharge in rarefied gas occurs when an electric field accelerates electrons and atomic ions until their KE are sufficient to excite atoms they collide with.

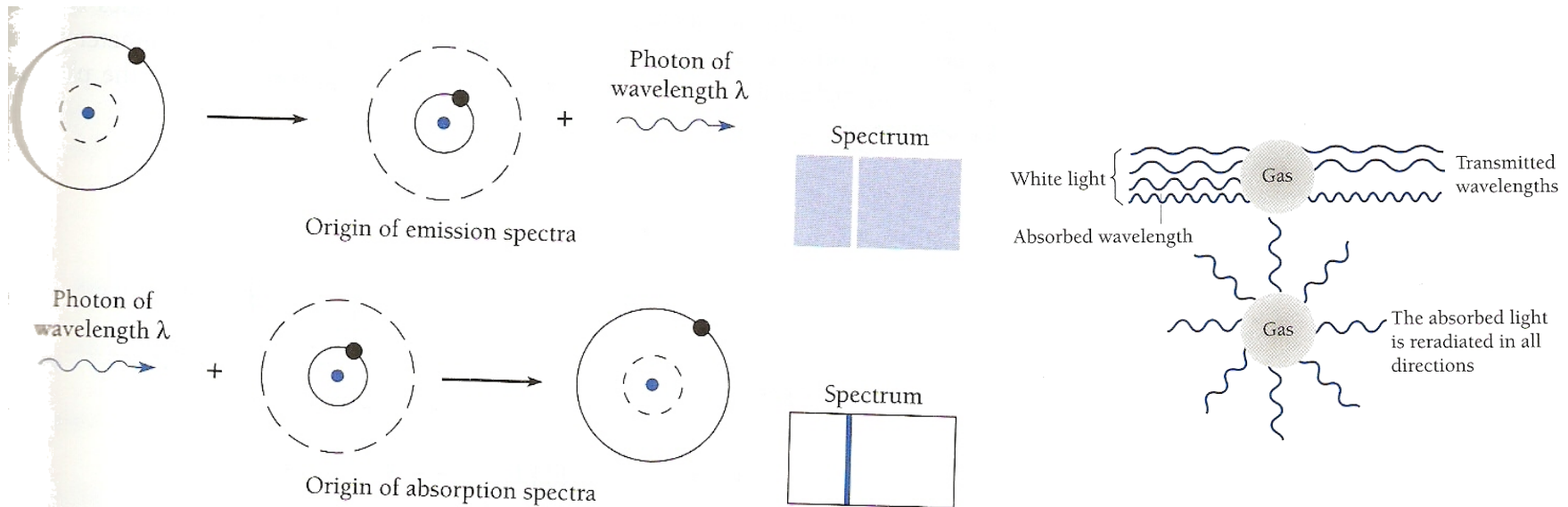


# ATOMIC EXCITATION

## How atoms are excited?

### 2. Photon absorption.

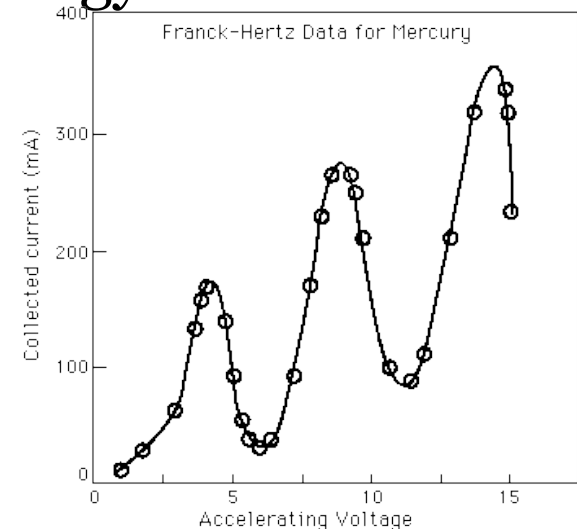
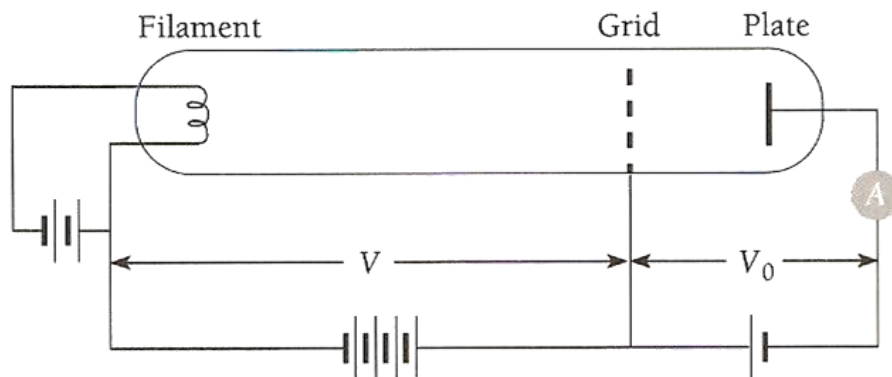
- Atoms absorb a photon of light whose energy is the right amount to raise the atom to a higher energy level.
- This process explains the origin of absorption spectra.



# ATOMIC EXCITATION

## Franck-Hertz Experiment...

- Its an experiment to investigate energy levels inside atoms.
- It demonstrated the existence of atomic energy levels.
- The plate current was measured as a function of the accelerating potential.
- Two types of collisions occurred:
  - Elastic
  - Inelastic
- Critical potentials are due to atomic energy levels.



# ATOMIC EXCITATION

**Remember...**

How atoms absorb and emit energy.

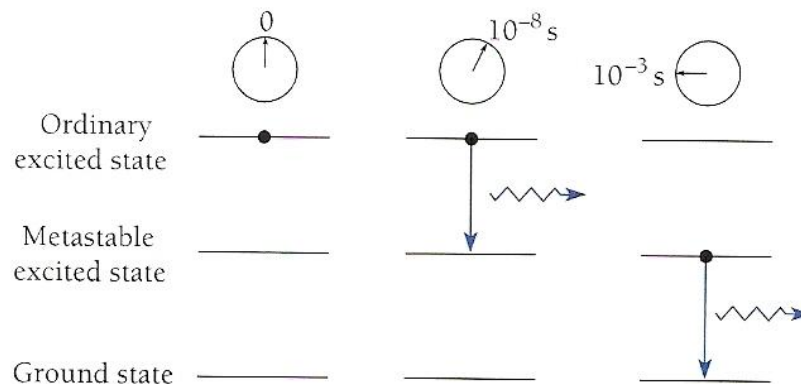
# THE LASER

A laser is a device that produces a light beam with some remarkable properties...

1. Very nearly monochromatic.
2. Coherent (all wave are in phase).
3. Collimated (hardly diverges).
4. Very intense.

Light **A**mplification by **S**timulated **E**mission of **R**adiation

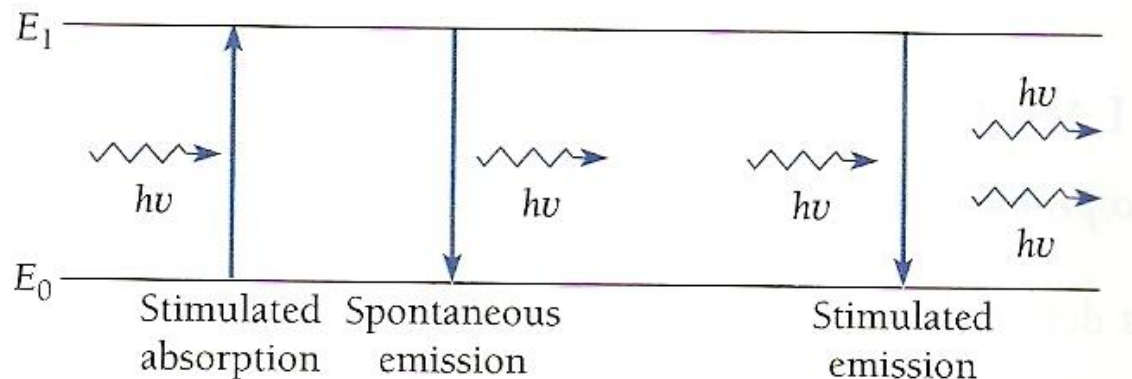
The key to the laser is the presence of a **metastable** state.



# THE LASER

What are the kinds of transitions involving EM radiation that are possible between two energy levels?

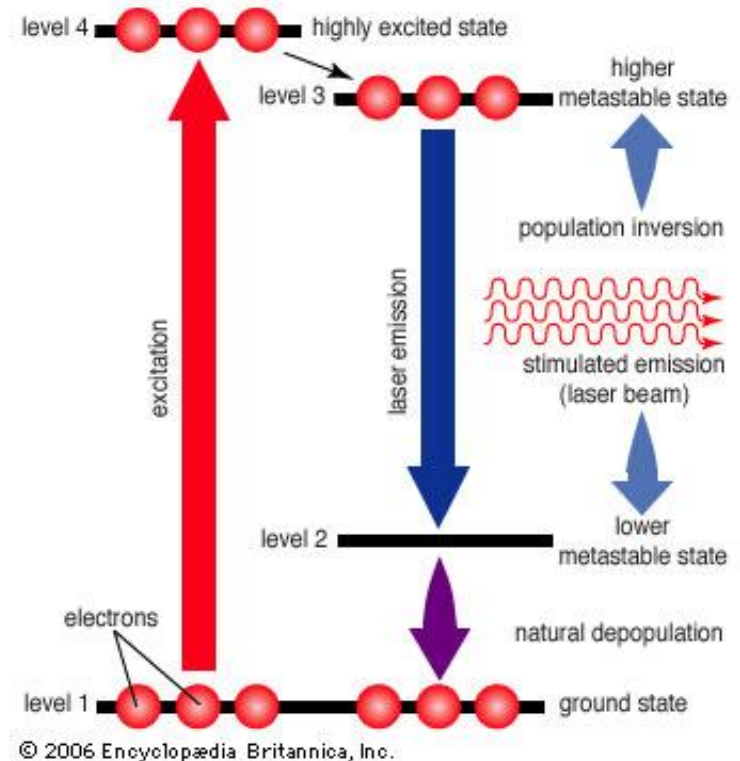
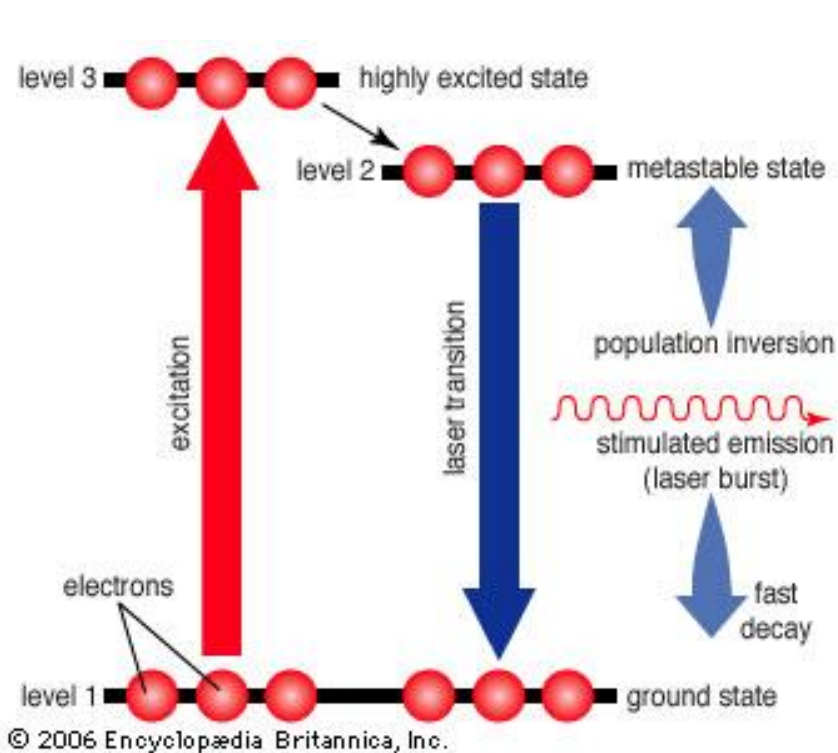
1. Stimulated absorption.
2. Spontaneous emission.
3. Stimulated emission.





# THE LASER

## Three & four level laser...



Population inversion and optical pumping.

# THE LASER

**Remember...**

Producing light waves in step.