Modern Atomic Theory

Emission of Energy by Atoms

Fireworks and Chemistry

- A fireworks display gives us a dramatic example of chemistry in action.
- Chemical reactions are used to provide the energy to propel the fireworks into the air, and other reactions are used for the explosions in the air.
- Of course, what most people remember are the beautiful and various colors that go along with the smoke and the sounds. But where do these colors come from?
- It turns out that many are due to the positively charged ions (cations) of ionic solids (salts).
- For example, sodium salts give us yellow colors, strontium salts give us red colors, and barium salts give us green colors. But why do these ions display colors at all? And why do they display different colors? The answers have to do with the unique arrangement of the electrons in a given atom.

Emission of Energy by Atoms

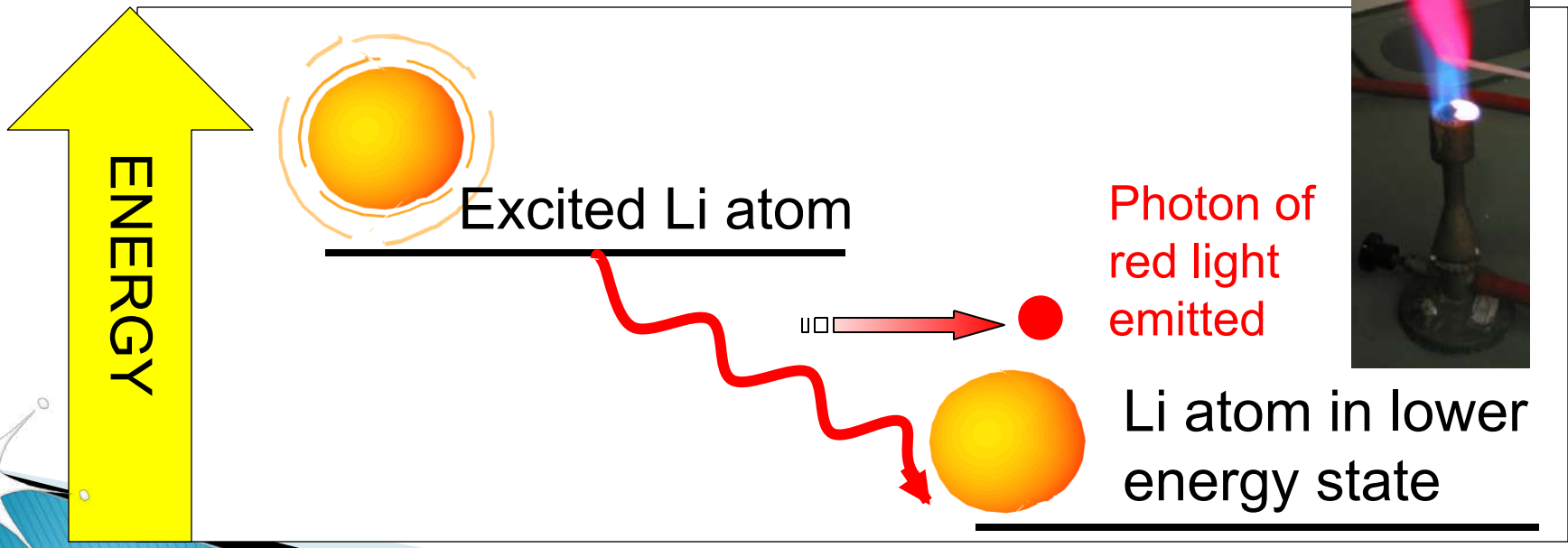
- Flames exposed to different compounds
- burn different colors.

This occurs because atoms in the solutions release energy by emitting visible light of specific wavelengths (colors).

- The heat causes the
- atoms to absorb energy and they become *excited*.

Emission of Energy by Atoms

- Some of the excess energy is released in the form of light.
- The atom moves to a lower energy state as it emits a photon of light.
- For example, Lithium:



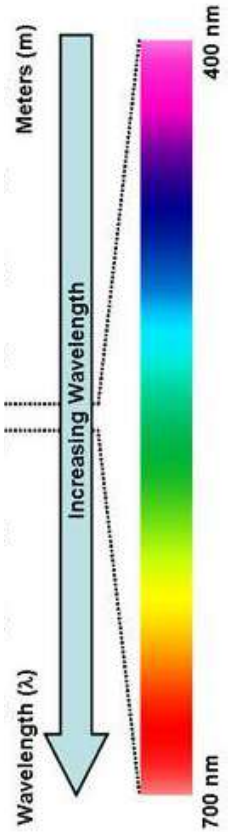
Emission of Energy by Atoms

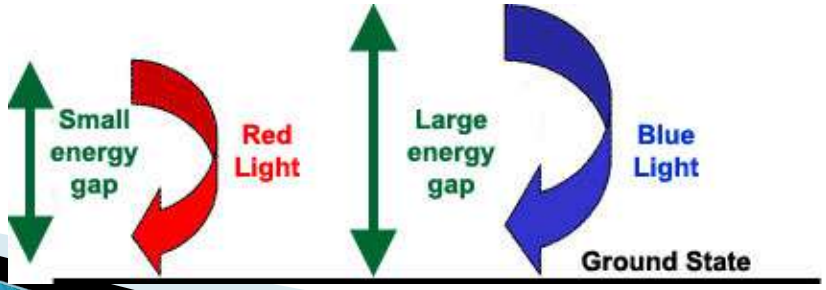
- Lithium emits red light.
- Copper emits green light.
- Sodium emits yellow-orange light.

- When atoms receive energy and become excited, they can release the energy by emitting light.
- The emitted light is carried away by a photon.

Emission of Energy by Atoms

- The energy of the photon corresponds to the energy change experienced by the atom.
  - High-energy photon = short-wavelength light
    BLUE light
  - Low-energy photon = long-wavelength light
    RED light





The end