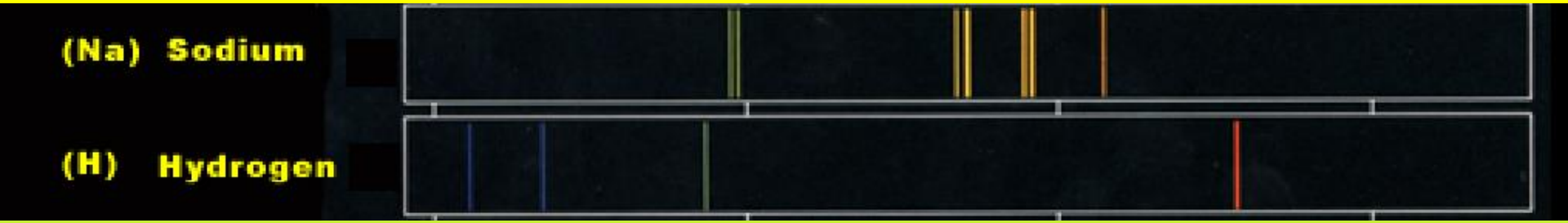
The Insight Provided by Starlight

Energy/Matter and the Formation of Elements

- There are 2 things that make up our Universe – matter and energy
- Einstein even created a formula to show how they interact
  - $E = mc^2$
  - E = energy, m = mass, and c = the speed of light
  - The interaction between matter and energy leave scientists clues as to how our universe began using a hypothesis called “The Big Bang”

Emission Spectra



- All stars give off light that is used to support the hypothesis
- Each element on the periodic table, when enough energy is applied, will give off light. This emission spectra (light given off by a stars) is unique to each individual element, like our finger prints.

Sound VS. Visible Light

- Sound and visible light are both ENERGY and move in the form of waves.
- Sound needs a medium to travel through (solid, liquid or gas) while light does not need a medium
- Waves with a higher frequency
  - Higher pitch - sound waves
  - Higher energy – visible light
- Waves with a lower Frequency
  - Lower pitch – sound waves
  - Lower energy – light waves

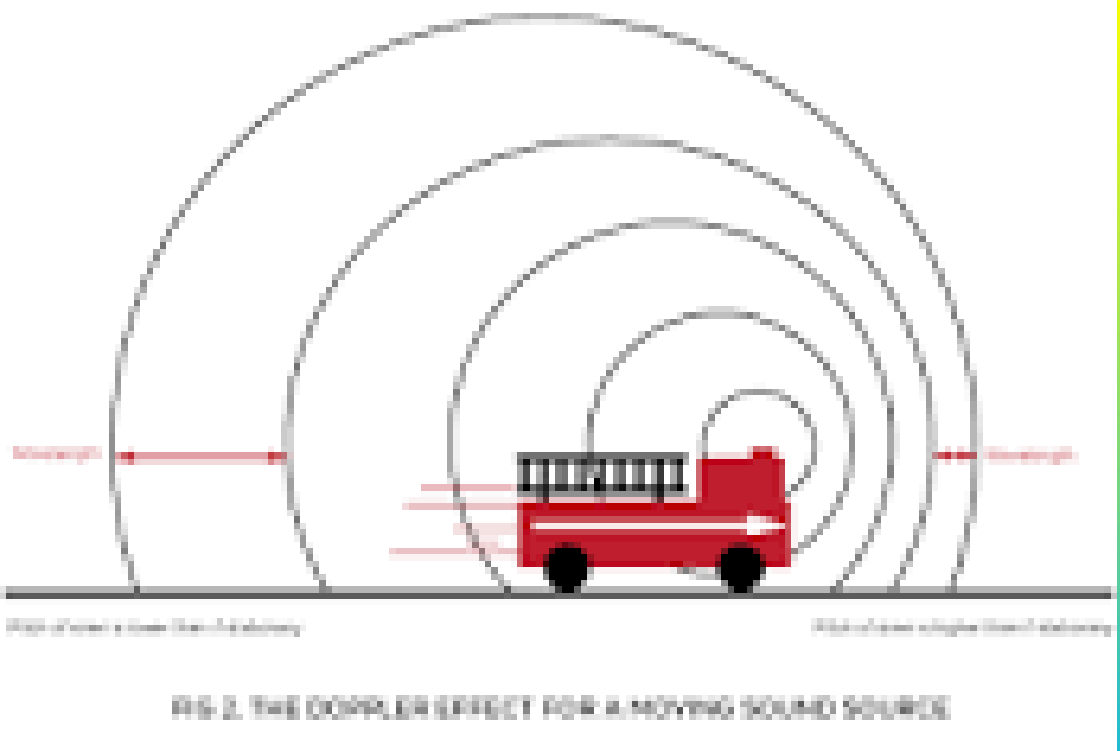
Doppler Effect

Remember this from last year?

Doppler Effect

What happens to the frequency and pitch when the fire truck is moving toward an object?

What happens to the frequency and pitch when the fire truck moves away from an object?



Redshift and Blueshift of light

- Using a stars redshift or blueshift lets astronomers know if a star is moving towards Earth or away from it.
  - Redshift – lower frequency, larger wavelength, indicates a star is moving away from an object
  - Blueshift – higher frequency, smaller wavelength indicates a star is moving toward an object.

Redshift and Blueshift of Light

Redshift and Blue Shift of Light

Notice, the emission spectra of this element, when redshifted, the pattern shifts to the red side of the spectra, and the blue side when blueshifted.