

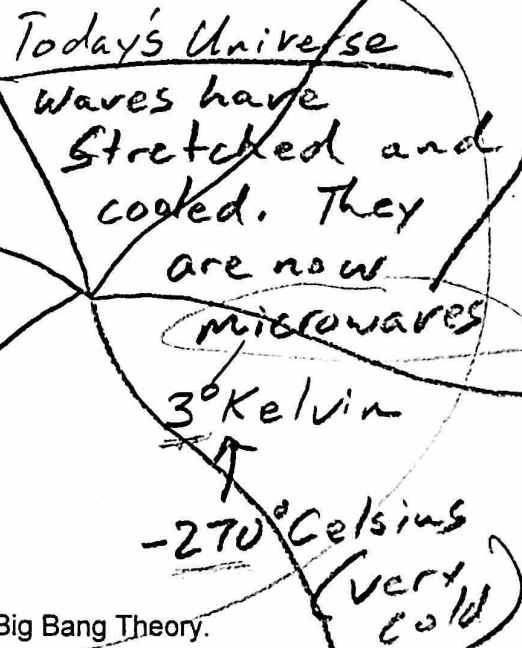
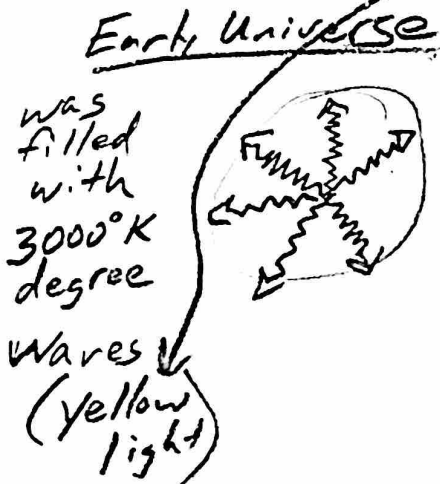
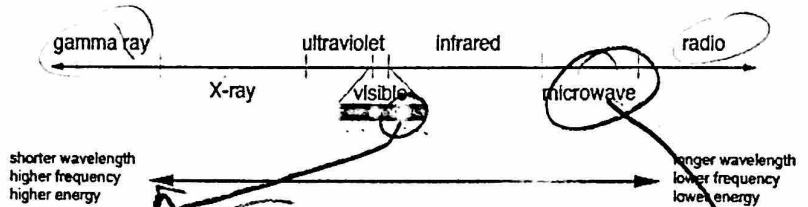
1. When did the Big Bang occur? Briefly describe the Big Bang Theory.

About 13.8 Billion Years ago...

- The Universe began as an infinitely small, infinitely dense, super-hot point of matter and energy.
- It has been expanding and cooling off ever since.

2. a. Draw a picture representing the waves of radiation that filled the early universe. Label the waves with their type of radiation.

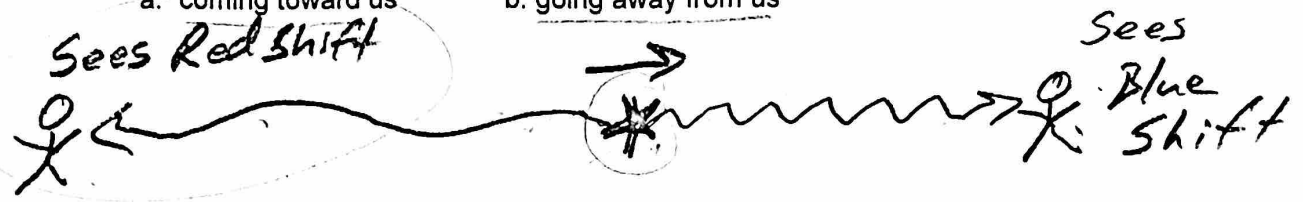
b. Then draw another picture representing those same waves today. Label the waves with their type of radiation.



3. Explain how these waves provide evidence for the Big Bang Theory.

The microwaves that we see filling the Universe today are heat from the Big Bang. They are called the Cosmic Microwave Background Radiation (CMBR)

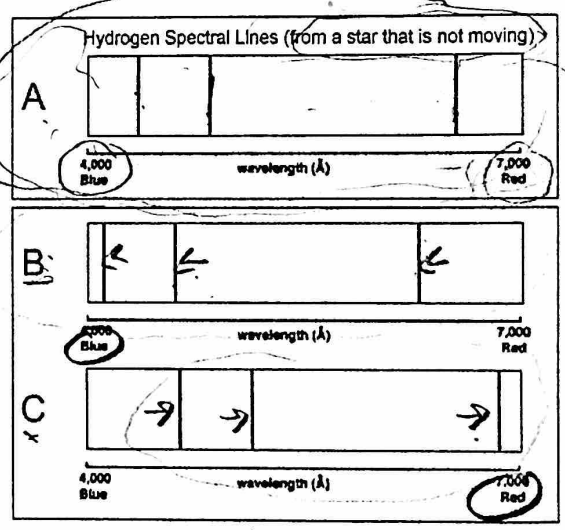
4. What does Hubble's Law say? Distant galaxies are moving away from us, so the Universe is expanding.
5. Draw a picture illustrating and describing the Doppler Effect that we would observe if a star were
 a. coming toward us b. going away from us



6. Describe what Edwin Hubble observed when he measured the wavelengths of distant galaxies, and explain how that provided evidence for the Big Bang theory.
 He found that all distant galaxies have red-shifts, so they are moving away, and the Universe is expanding.

7. Scientists don't really judge the color of a star to determine red shift. They use "spectral lines." What are spectral lines?

"fingerprints" in the spectrum of colors given off by each element.



Part A of diagram on the right shows the spectral lines given off by hydrogen in a star that is not moving.

8. Which letter shows hydrogen spectral lines that have been red-shifted? If this light is coming from a star, which way is the star moving?

C is moving away from Earth

9. Which letter shows hydrogen spectral lines that have been blue-shifted? If this light is coming from a star, which way is the star moving?

B is moving towards us

~~How do we know how long ago the Big Bang occurred?~~