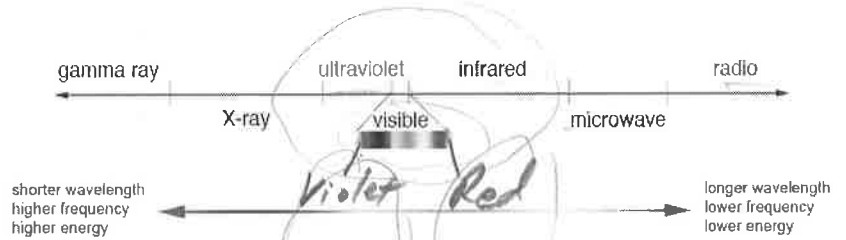
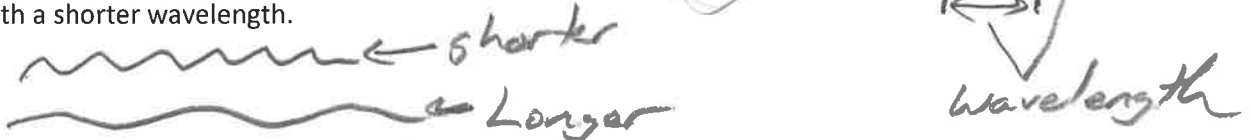


1. What is the general name that includes gamma rays, x-rays, ultraviolet, visible light, infrared, microwaves, and radio waves?



Electromagnetic Waves

2. a. Draw and label two waves, one with a longer wavelength, and one with a shorter wavelength.



- b. Which waves have the most energy? [Hint: think of the waves as ropes that are being shaken.]

Shorter → more energy

3. List the colors of the visible spectrum from longest wavelength to shortest wavelength.

Longest → ROY G BIV
 (Red Orange Yellow Green Blue Indigo Violet)

4. Rank these star colors from hottest to coolest. Orange, Red, Yellow, Blue, White

Hottest → Blue, White, Yellow, Orange, Red

5. a. Which stars are the hottest, ~~larger~~ stars or smaller stars?

b. Why?

c. What color are they?

↑ massive
 → more gravity and pressure
 Massive stars

Blue

6. Stars get their energy from a process called nuclear fusion. Most of the time,

during this process, hydrogen atoms are squeezed together to make

helium atoms. In this process, the new atoms that are created

have less (more or less) mass than the atoms that fused.

Energy is created from this lost (lost or gained) mass being turned to energy. The

amount of energy that is produced can be calculated using the formula $E=mc^2$.

In this formula, E = energy, m = mass, and c = speed of light

7. a. When elements fuse in a star, lighter elements fuse to become heavier elements. Where do these heavier elements go?

Core

b. Why?

Denser things sink.

8. a. Bigger stars can fuse more "fuels" than our sun. Why?

More gravity and pressure

- b. What is the heaviest element that can be created by fusion in a very large star?

Iron

9. a. At some point, our sun will run out of hydrogen that it can fuse. When this happens, the next fuel that will fuse is helium

b. At this point, the sun will expand, and its color will shift to red because the surface will be cooler than before. At this point, the sun will be called a

red giant

10. a. After all nuclear fusion ceases in our sun, it will _____ (expand or shrink).

b. This change in size will cause the sun's temperature to increase

c. This change in temperature will cause its color to change from red to white.

a. At this point, the sun will be called a white dwarf.

11. The early universe was about 75% hydrogen and 25% helium. Where did the rest of the elements come from?

- a. Where did the lighter elements come from (up to the mass of iron)?

Nuclear fusion in stars

(CHNOPS)

- b. Where did the heavier elements (heavier than iron) originate?

Supernova Explosions

12. "One solar mass" is the mass of our sun

13. In order for a star to die as a supernova, the star's mass needs to be at least 8-12 solar masses.

14. Just before a star dies as a supernova, what element can be found at the star's core? Iron

15. After a supernova, the material left over from a very large star can have three different fates:

1) Some matter is scattered and incorporated into new nebulae like ours.

2) If the leftover material is between 1 and 3 solar masses, it can become a: Neutron Star

3) If the leftover material is over 3 solar masses, it can become a: black hole