Earth Science

Lab # 9
The Electromagnetic Spectrum

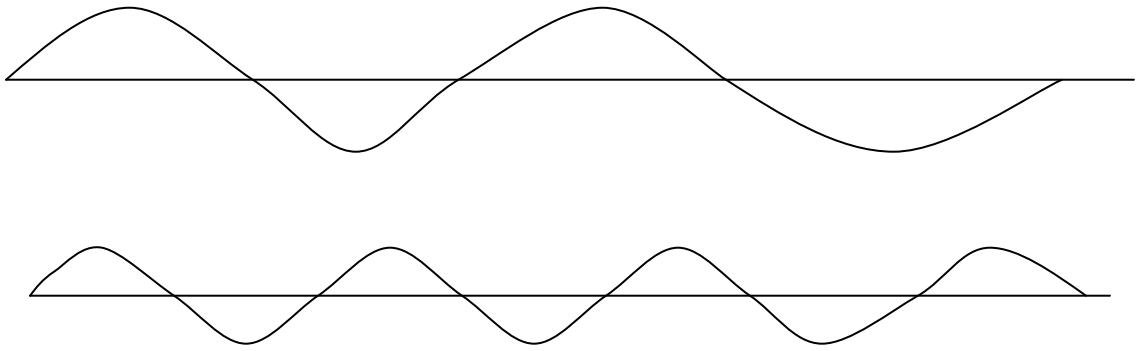
Name_____

Date_____

Period_____

Electromagnetic Energy is a form of Kinetic Energy that

-travels at light speed
-has transverse wave properties
-can travel through a vacuum (Radiation)



Base your answers to the following questions on the

Earth Science Reference Tables

Page 14- The Electromagnetic Spectrum Diagram

1. _____ The numbers across the top of the chart measure what property of the electromagnetic waves?

2._____ In what units of measure are the numbers expressed?

3._____ What is 10^{-4} expressed as a decimal?

4._____ Which type of electromagnetic energy has the **shortest** wavelength?

5._____ Which type of electromagnetic energy has the **longest** wavelength?

6._____ Your television remote control uses electromagnetic energy in the range 10^{-4} of meters in wavelength. What part of the electromagnetic spectrum is this?

7._____ What form of electromagnetic energy has a wavelength range greater than infrared and less than radio waves?

8._____ The narrow range that we can see-Visible Light is slightly longer in wavelength than ..... and slightly shorter in _____ wavelength than ..... .

9._____ What color of visible light has the **shortest** wavelength?

10._____ What color of visible light has the **longest** wavelength?

11._____ Which form of electromagnetic energy has wavelengths in the range of 100 meters?

12._____ What is the average wavelength of ultraviolet to the nearest power of 10?

13._____ What is the average wavelength of red visible light to the nearest power of 10?

14._____ What two forms of electromagnetic energy have wavelengths of 1 meter?

15._____ What form of electromagnetic energy has a wavelength 1000 **longer** than ultraviolet?

16._____ What form of electromagnetic energy has a wavelength 1000 **shorter** than ultraviolet?

17._____ As wavelength increases, Frequency___?

18._____ Which form of electromagnetic energy has the highest frequency?

19._____ Which form of electromagnetic energy has the lowest frequency?

20._____ Which forms of electromagnetic energy are most harmful to living organisms?

21._____ State the relationship between frequency and power of Electromagnetic Energy: As the frequency increases…

22._____ State the relationship between wavelength and power of Electromagnetic Energy: As the wavelength increases…

EARTH SCIENCE

Finelli

EM SPECTRUM

Fill in the blank with the correct type of *Electromagnetic energy* (ESRT p 14)

EVERYDAY EXPOSURE OF THE EM SPECTRUM

When I woke up this morning, I opened the window shade and was greeted by ROY-G-BIV, 1._____. I took a shower, cooked my breakfast using the 2._____oven, and turned on the television , which comes through the cable now instead of the antennae receiving 3._____. I opened the garage door for my mother, got in the car, and turned the dial to 92.3 fm; reception of the 4._____ always fades when we pass the HIP building on Sunrise Hwy.

At Lunch, the lunch-lady served us pizza by removing it from the 5._____heat lamps; the red colored light makes the pizza look better than when its on our plate. After we ate, we went outside for recess, and stayed in the shade. The Sun was too hot and intense for our fragile skin, and we were warned to put on sunscreen to protect us from the harmful 6._____rays.

In Science class, we learned how 7._____rays from deep space Supernovae are harmful to living organisms. For the same reason, Doctors and Dentists always stand in another room when they flip the switch to take an internal picture, called an 8._____. While a few doses are not harmful, a lifetime of exposure could put Doctors at risk.

1. At which temperature would an object radiate the *least* amount of electromagnetic energy?
   (1) the boiling point of water (100°C)
   (2) the temperature at the stratopause (0°C)
   (3) the temperature of the North Pole on December 21 (-60°F)
   (4) room temperature (293 K)

2. The various forms of electromagnetic energy are distinguished from one another by their
   (1) temperature
   (2) wavelengths
   (3) longitudinal wave properties
   (4) speed of travel

3. Which statement about electromagnetic energy is correct?
   (1) Violet light has a longer wavelength than red light.
   (2) X rays have a longer wavelength than infrared waves.
   (3) Radar waves have a shorter wavelength than ultraviolet rays.
   (4) Gamma rays have a shorter wavelength than visible light.

4. Which color is the best radiator of electromagnetic energy?
   (1) red (3) black
   (2) white (4) yellow

5. According to the *Earth Science Reference Tables*, the wavelength of visible light is closest to
   (1) 10^{-6} m (3) 10^{6} m
   (2) 10^{-4} m (4) 10^{8} m

6. An object that is a good radiator of electromagnetic waves is also a good
   (1) insulator from heat
   (2) reflector of heat
   (3) absorber of electromagnetic energy
   (4) refractor of electromagnetic energy

7. Which part of the solar electromagnetic spectrum has the maximum intensity?
   (1) visible light radiation (3) ultraviolet radiation
   (2) infrared radiation (4) X-ray radiation

8. The energy radiated from the Sun consists of a
   (1) narrow range of wavelengths, with ultraviolet radiation having the greatest intensity
   (2) narrow range of wavelengths, with infrared radiation having the greatest intensity
   (3) wide range of wavelengths, with visible radiation having the greatest intensity
   (4) wide range of wavelengths, with x-ray radiation having the greatest intensity

9. Which source provides the most energy for atmospheric weather changes?
   (1) radiation from the Sun
   (2) radioactivity from the Earth's interior
   (3) heat stored in ocean water
   (4) heat stored in polar ice caps