Name: _____ Period: _____

Waves-EM Spectrum

1. Compared to the speed of a sound wave in air, the speed of a radio wave in air is
   1. less
   2. greater
   3. the same

sound around 343 m/s
radio wave 3×10^8 m/s

2. An electromagnetic AM-band radio wave could have a wavelength of
   1. 0.005 m
   2. 5 m
   3. 500 m
   4. 5,000,000 m

Radio waves in hundreds on spectrum

3. Which color of light has a wavelength of 5.0×10^{-7} meter in air?
   1. blue
   2. green
   3. orange
   4. violet

see spectrum

4. In a vacuum, all electromagnetic waves have the same
   1. speed
   2. phase
   3. frequency
   4. wavelength

5. An electromagnetic wave traveling through a vacuum has a wavelength of 1.5×10^{-1} meter. What is the period of this electromagnetic wave?
   1. 5.0×10^{-10} s
   2. 1.5×10^{-1} s
   3. 4.5×10^{7} s
   4. 2.0×10^{9} s

$c = \lambda f$
$3\times10^8 = (f)(1.5\times10^{-1})$
$f = 2\times10^9$
$T = \frac{1}{2\times10^9} = 5\times10^{-10}$ s

6. Which characteristic is the same for every color of light in a vacuum?
   1. energy
   2. frequency
   3. speed
   4. period

7. Explosure to ultraviolet radiation can damage skin. Exposure to visible light does not damage skin. State one possible reason for this difference.

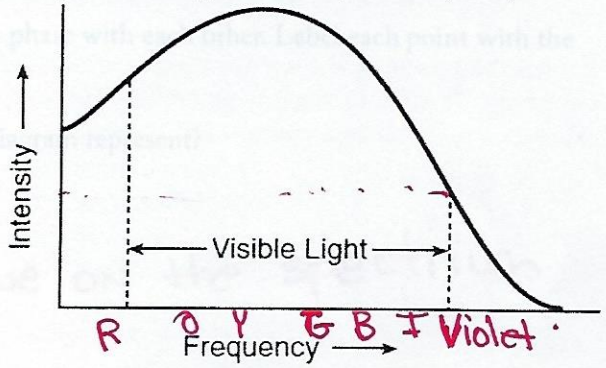
there is less energy in visible light — higher the frequency the more energy

8. An FM radio station broadcasts its signal at a frequency of 9.15×10^7 hertz. Determine the wavelength of the signal in air.

$c = \lambda f$
$3\times10^8 = \lambda(9.15\times10^7)$ $\lambda = 3.28$m

Base your answers to questions 9 and 10 on the information and graph below.

Sunlight is composed of various intensities of all frequencies of visible light. The graph represents the relationship between light intensity and frequency.



9. Based on the graph, which color of visible light has the lowest intensity?

violet has the lowest intensity

10. It has been suggested that fire trucks be painted yellow green instead of red. Using information from the graph, explain the advantage of using yellow-green paint.

yellow-green has the highest intensity of white light

11. Which wave characteristics is the same for all types of electromagnetic radiation traveling in a vacuum?
    1. speed
    2. wavelength
    3. period
    4. frequency

12. Calculate the wavelength in a vacuum of a radio wave having a frequency of 2.2×10^6 hertz. [Show all work, including the equation and substitution with units.]

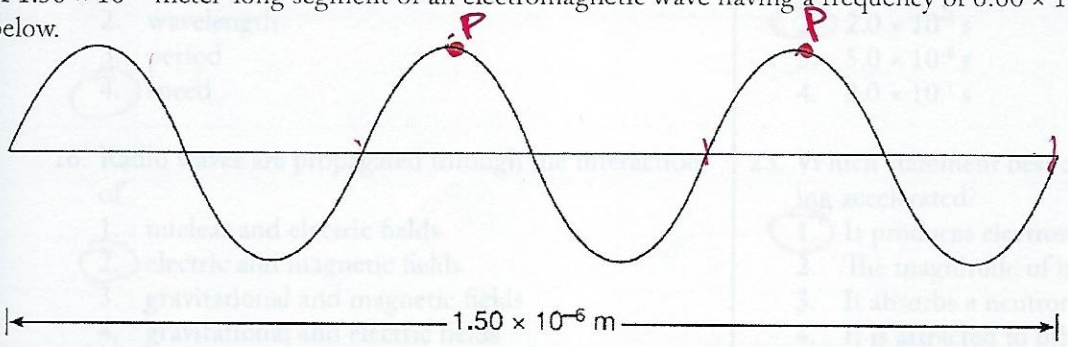
$c = \lambda f$
$3.0\times10^8 = \lambda(2.2\times10^6)$
$\lambda = 136$m

Name: _____ Period: _____

Waves-EM Spectrum

Base your answers to questions 13 and 14 on the information and diagram below.

A 1.50×10^{-6}-meter-long segment of an electromagnetic wave having a frequency of 6.00×10^{14} hertz is represented below.



13. On the diagram above, mark two points on the wave that are in phase with each other. Label each point with the letter P.

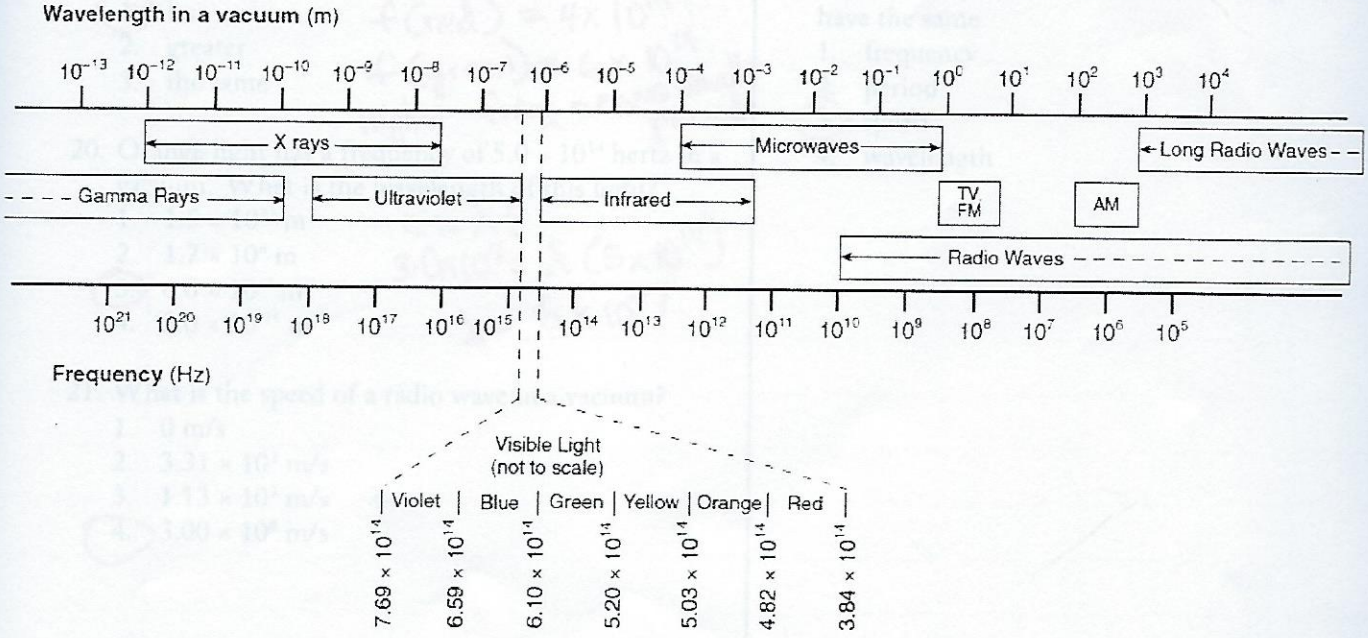
14. Which type of electromagnetic wave does the segment in the diagram represent?

$v = \lambda f$

$3.0 \times 10^8 = \lambda (6.0 \times 10^{14})$

$\lambda = 5 \times 10^{-7}$ m this is blue on the spectrum

The Electromagnetic Spectrum



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Name: _____ Period: _____

Waves-EM Spectrum

15. Radio waves and gamma rays traveling in space have the same
    1. frequency
    2. wavelength
    3. period
    4. speed

16. Radio waves are propagated through the interaction of
    1. nuclear and electric fields
    2. electric and magnetic fields
    3. gravitational and magnetic fields
    4. gravitational and electric fields

17. Which pair of terms best describes light waves traveling from the Sun to Earth?
    1. electromagnetic and transverse
    2. electromagnetic and longitudinal
    3. mechanical and transverse
    4. mechanical and longitudinal

18. Which wavelength is in the infrared range of the electromagnetic spectrum?
    1. 100 nm
    2. 100 mm
    3. 100 m
    4. 100 μm

19. Compared to the period of a wave of red light the period of a wave of green light is
    1. less
    2. greater
    3. the same

$f(red) = 4 \times 10^{14}$
$f(green) = 6 \times 10^{14}$
higher freq means smaller period

20. Orange light has a frequency of 5.0×10^{14} hertz in a vacuum. What is the wavelength of this light?
    1. 1.5×10^{23} m
    2. 1.7×10^{6} m
    3. 6.0×10^{-7} m
    4. 2.0×10^{-15} m

$c = \lambda f$
$3.0 \times 10^{8} = \lambda (5 \times 10^{14})$
$\lambda = 6 \times 10^{-7}$

21. What is the speed of a radio wave in a vacuum?
    1. 0 m/s
    2. 3.31×10^{2} m/s
    3. 1.13×10^{3} m/s
    4. 3.00×10^{8} m/s

22. How much time does it take light from a flash camera to reach a subject 6.0 meters across a room?
    1. 5.0×10^{-9} s
    2. 2.0×10^{-8} s
    3. 5.0×10^{-8} s
    4. 2.0×10^{-7} s

$6\,m \times \frac{s}{3.0 \times 10^{8}\,m} =$
2×10^{-8} s.

23. Which statement best describes a proton that is being accelerated?
    1. It produces electromagnetic radiation.
    2. The magnitude of its charge increases.
    3. It absorbs a neutron to become an electron.
    4. It is attracted to other protons.

24. An electromagnetic wave is produced by charged particles vibrating at a rate of 3.9×10^{8} vibrations per second. The electromagnetic wave is classified as
    1. a radio wave
    2. an infrared wave
    3. an x ray
    4. visible light

$f = 3.9 \times 10^{8}$
on spectrum is radio wave

25. When x-ray radiation and infrared radiation are traveling in a vacuum, they have the same
    1. speed
    2. frequency
    3. wavelength
    4. energy per photon

26. A gamma ray and a microwave traveling in a vacuum have the same
    1. frequency
    2. period
    3. speed
    4. wavelength