

Name _____

Key

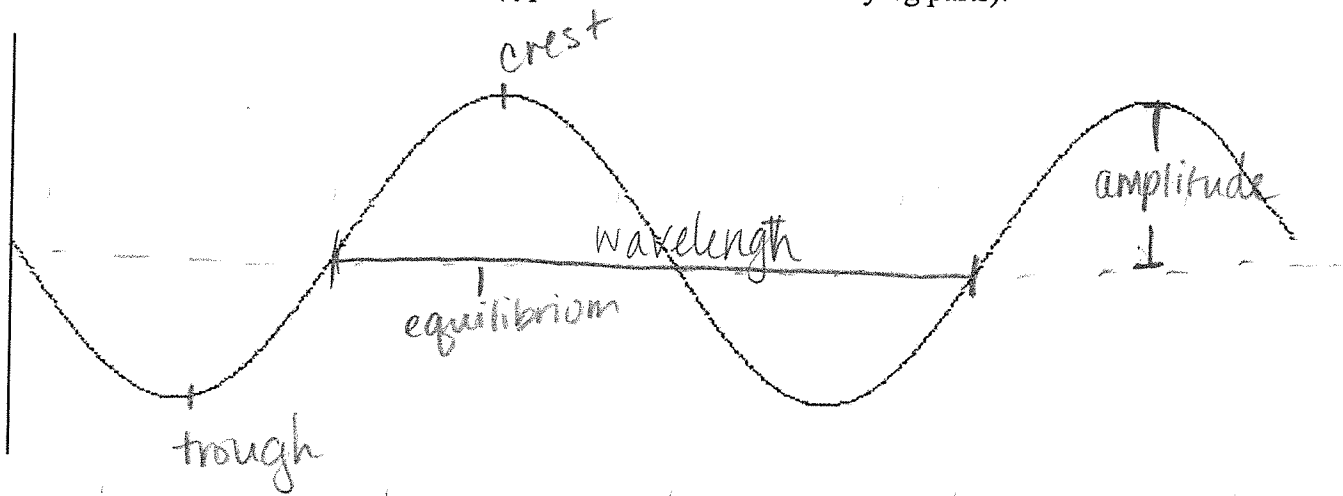
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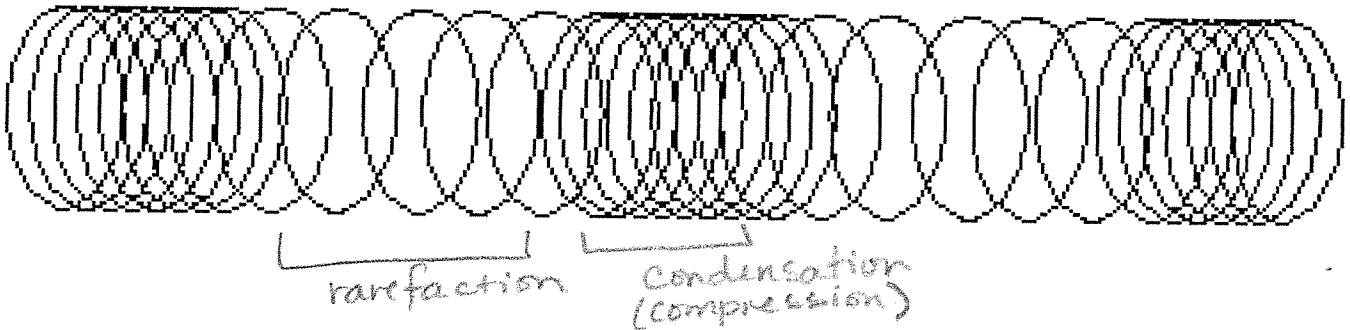
Waves Review

1. Label the following wave diagrams (type of wave and the identifying parts):

Transvers



Longitudinal



2. A bug floating in water generates waves at a rate of four per second with a wavelength of 1.5 cm.
- What is the period of these waves?
 - What is the wave velocity?

$$0.25 \text{ sec}$$

$$v = \lambda f = (0.015 \text{ m})(4 \text{ Hz}) = 0.06 \text{ m/s}$$

4. A sound wave with a frequency of 320 Hz has a wavelength of 1.06 m. With what speed would you expect this sound wave to move?

$$v = \lambda f = (1.06 \text{ m})(320 \text{ Hz}) = 339.2$$

5. Do all frequencies of sound moving through a room travel with the same velocity?

eg temp

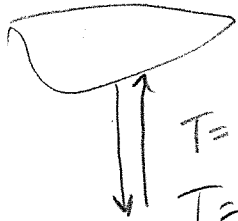
yes unless
medium changes
circumstances

6. In terms of frequency, describe the differences between infrasonic sounds and ultrasonic sounds.

lower f
than
audible

$\uparrow f$ than
audible

7. A sonar signal is sent from an oceangoing ship, and the signal returns from the bottom 1.8 s later. How deep is the ocean floor if the speed of sound in seawater is 1,530 m/s?



$$v = \frac{d}{t}$$

$$d = vt = (1530)(0.9) = 1377 \text{ m}$$

9. Describe how the frequency of a racecar's engine noise changes as it passes you.

\uparrow pitch = $\uparrow f$ approaching

\downarrow pitch = $\downarrow f$ receding (going away)

10. In terms of amplitude, what is the difference between destructive and constructive interference.

amplitudes
are out of phase
and diminish

amplitudes
are in phase
and "build up"

11. How many minutes does it take for sunlight to reach Earth if the Sun is 1.50×10^{11} m from Earth?

$$v = \frac{d}{t}$$

$$t = \frac{d}{v} = \frac{1.50 \times 10^{11}}{3 \times 10^8}$$

12. Explain why light refracts when traveling from air into water.

Medium more dense
wave bends/slow down

Electromagnetic Spectrum

Part I: Label the diagram below of the electromagnetic spectrum.

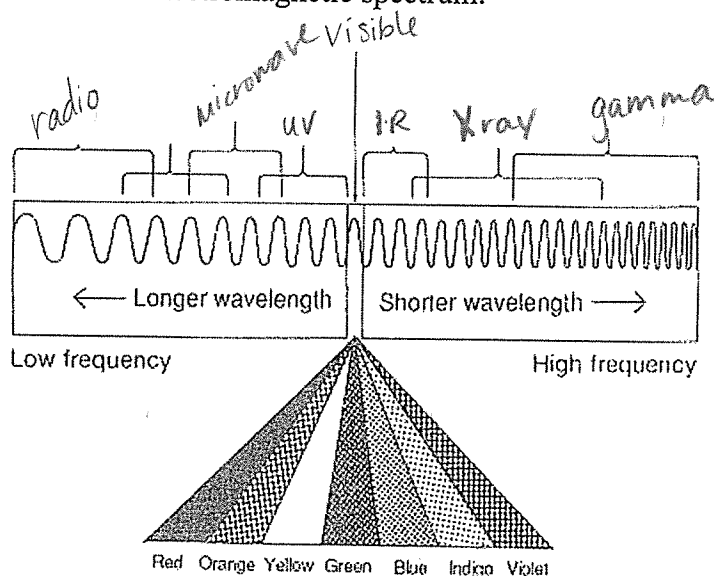


Fig. 1. Electromagnetic spectrum

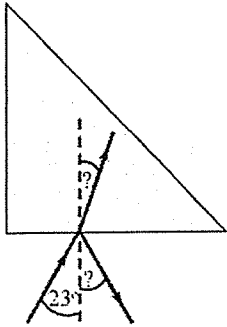
Part II. Complete the following statement using the diagram above.

1. The electromagnetic spectrum is made of light waves.
2. The only waves you can see are visible light.
3. Waves with longer wavelengths than visible light are UV, microwave, radio and radio.
4. Waves with higher frequencies than visible light are infrared, xray, and gamma rays.
5. Although waves in the electromagnetic spectrum have different frequencies and wavelengths, that all travel at the same speed.
6. Identify the type of wave in the electromagnetic spectrum used for:
 - a. cooking food microwave
 - b. broadcasting radio and TV radio
 - c. taking pictures of the interior of the body xray
 - d. killing cancer cells gamma
 - e. keeping food warm infrared
 - f. Sunburns UV

Refraction and Reflection of Light

Useful Equation = $n = \frac{c}{v}$ $c = 3.00 \times 10^8 \text{ m/s}$

1.

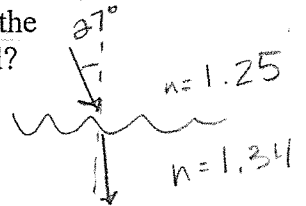


Light incident on a crown glass prism makes an angle of 23.0° with the normal to the surface, as shown to the left. The prism is surrounded by air. (a) Is the angle of refraction bigger or smaller than the incident angle? Why? (b) What is the angle of reflection at the surface?

- a) Smaller, because wave slows down in glass
 b) 23° , law of reflection

2. Light travels from a medium with $n = 1.25$ into a medium of $n = 1.34$, at an angle of 27° from the normal to the interface of the two media. (a) Will the speed of the light increase, decrease, or remain the same? (b) Will the wavelength of the light increase, decrease, or remain the same? (c) Will the light bend toward the normal, away from the normal, or not at all?

- a) decrease b) wavelength



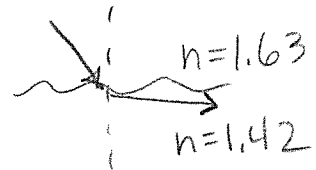
c) toward the normal

3. Light travels from a medium with $n = 1.63$ into a medium of $n = 1.42$, along the normal to the interface of the two media. (a) Will the speed of the light increase, decrease, or remain the same? (b) Will the wavelength of the light increase, decrease, or remain the same? (c) Will the light bend toward the normal, away from the normal, or not at all?

a) increase

b)

c) away from normal



4. The speed of light in an unknown medium is measured to be $2.76 \times 10^8 \text{ m/s}$. What is the index of refraction of the medium?

$$n = \frac{c}{v} = \frac{3 \times 10^8 \text{ m/s}}{2.76 \times 10^8 \text{ m/s}} =$$

5. Optical fibers are generally composed of silica, with an index of refraction around 1.44. (a) How fast does light travel in a silica fiber? (b) How long will it take for that light to travel from St. Petersburg, Florida to Anchorage, Alaska assuming the 2 cities are 6091 km apart? Remember

$v = d/t$

a) $n = \frac{c}{v}$

$$v = \frac{c}{n} = \frac{3 \times 10^8 \text{ m/s}}{1.44} =$$

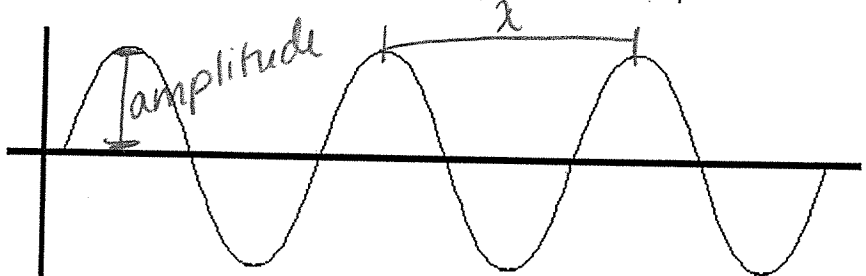
m/s

b) $t = \frac{d}{v} = \frac{6091,000 \text{ m}}{\text{m/s}}$

Name _____
 Period _____ Loc _____

Waves Worksheet

1. What is the top of a wave called? *crest*
2. What is the bottom of a wave called? *trough*
3. What is frequency? *cycles per second*
4. If a wave is traveling at 60 cm/second and has a wavelength of 15 cm, what is the frequency?
 $v = \lambda f$ $f = \frac{v}{\lambda} = \frac{60}{15} = 4 \text{ m/s}$
5. What does amplitude measure? *equilibrium to maximum displacement*
6. On the diagram below, indicate the distance that represents the wavelength of the wave and indicate the distance that represents the amplitude.



7. How many complete waves are there in the diagram above? Is it transverse or longitudinal?
3
8. What is the difference between a transverse wave and a longitudinal wave?
particle vibration perpendicular vs *particle vibration parallel*
9. Are sound waves transverse waves or longitudinal waves? Why?
longitudinal waves because particles vibrate same direction as propagation
10. Why can't you calculate the frequency of the wave in the diagram? What information is missing?
need period, value of λ or v
11. What is the wavelength of a sound wave with a frequency of 50 Hz? (Speed of sound is 342 m/s)
 $342/50 = 6.84 \text{ m}$
12. A sound wave in a steel rail has a frequency of 620 Hz and a wavelength of 10.5 m. What is the speed of sound in steel?
 6570 m/s
13. Determine the frequency of a microwave 6.0 cm in length. (A microwave is an electromagnetic wave. It travels through space at a speed of $3.0 \times 10^8 \text{ m/s}$)
 $5.0 \times 10^9 \text{ Hz}$
14. What is the period of the microwave in problem 13?

$$\frac{1}{f} = 2.0 \times 10^{-10} \text{ s}$$

Waves & Electromagnetic Spectrum Worksheet

Directions: Use the word bank to answer the following questions. **Each word will be used only once.**

Crest	Frequency	Mechanical	Infrared
Trough	Transverse	Radio	Gamma
Wavelength	Longitudinal	Ultraviolet	X-Rays
Visible Light	Amplitude	Electromagnetic	

- _____ waves are used to penetrate solids and are used in doctor's offices and as airports.
- _____ is the distance between one point of a wave to the same point in the next wave.
- _____ is the number of waves per unit of time.
- _____ waves occur when the motion of the medium is parallel to the direction of the wave.
- _____ waves have a color spectrum known as ROYGBIV.
- _____ waves disturb matter.
- The _____ is the top of a wave.
- The _____ is the bottom of a wave.
- _____ is the maximum distance that matter is displaced from the resting position.
- _____ waves are produced by stars and galaxies.
- _____ waves occur when the motion of the medium is at right angles (perpendicular) to the direction of the wave.
- _____ waves are often used in heat lamps.
- _____ waves are utilized by insects to locate nectar.
- _____ waves are transverse waves that disturb electromagnetic fields.
- _____ waves have the shortest wavelength and the highest frequency.