U07L01 Assignment

Exercises

1. A dog's tail wags 50.0 times in 40.0 s.
   (a) What is the frequency of the tail? (b) What is the period of vibration of the tail?
2. A certain tuning fork makes 7 680 vibrations in 30 s. (a) What is the frequency of the tuning fork? (b)What is the period of vibration of the tuning fork?
3. Tarzan is swinging back and forth on a vine. If each complete swing takes 4.0 s, what is the frequency of the swings?
4. A helicopter pilot with nothing better to do counts 250 crests of water waves on a lake below him, in a distance of 100 m. What is the wavelength of the waves?
5. If the frequency of a sound is tripled, what will happen to the period of the sound waves?

Exercises

1. If waves maintain a constant speed, what will happen to their wavelength if the frequency of the waves is (a) doubled? (b) halved?
2. What is the frequency of a sound wave if its speed is 340 m/s and its wavelength is 1.70 m?
3. Waves of frequency 2.0 Hz are generated at the end of a long steel spring. What is their wavelength if the waves travel along the spring with a speed of 3.0 m/s?
4. A student measures the speed of water waves in her tank to be 25 cm/s. If the wavelength is 2.5 cm, what is the frequency of the waves?
5. The speed of light is 3.0×10^{8} m/s. What is the frequency of light waves if their wavelength is 600 nm? (1 nm = 10^{-9} m) Consult a spectrum chart to see what colour of light this would be.
6. Some microwaves have a frequency of 3.0×10^{10} Hz. How long is a microwave of this frequency? (Microwave radiation travels at the speed of light.)

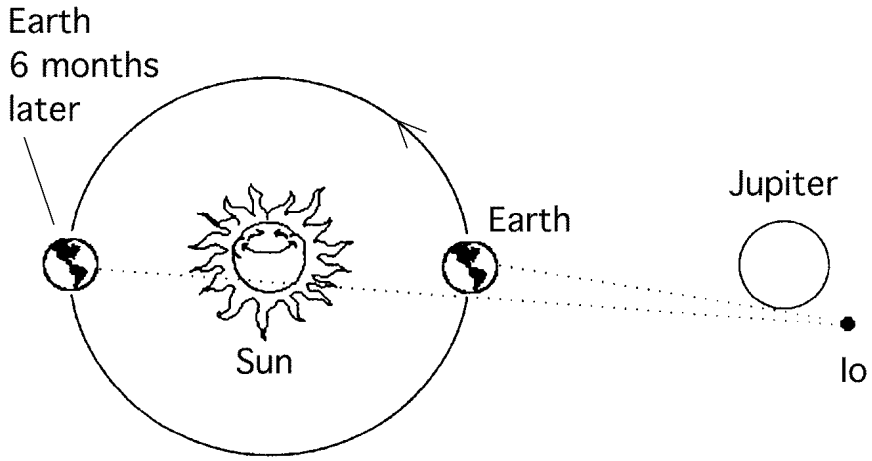
Exercises

Research and sketch the Electromagnetic spectrum labelling frequency, wavelength and energy.

Exercises

1. If light travels a million times as fast as sound, why does the sound from your television set appear to be 'synchronized' with the picture you see?
2. If a beam of light could be made to ‘circle’ the earth (using a series of mirrors), how long would it take the light to circle the globe if the earth's circumference is 4.0×10^{7} m? Also, how many times could the beam of light circle the earth in one second?

3. The distance light travels in one year is called a **light year**. How many kilometres are there in one light year?
4. An imaginary star is four light years from earth. The star has a planet, upon which a large mirror has been installed. The mirror faces earth. A ten-year-old boy aims his telescope at the mirror. How old will the boy be when he sees his own image reflected back at him? How old will he look in the mirror?



ANS.

1. (a) 1.25 Hz (b) 0.800 s
2. (a) 256 Hz (b) 3.91 x 10^{-3} s
3. 0.25 Hz 4. 0.40 m
5. $T = 1/f$; If f is tripled, period = 1/3 T.

1. (a) If f doubles, λ is halved, since $\lambda f = v$.
   (b) If f is halved, λ doubles.
2. 200. Hz
3. 1.5 m
4. 10. Hz
5. 5.0 x 10^{14} Hz (orange)
6. 1.0 x 10^{-2} m, or 1.0 cm.

1. Sound and light signals are transmitted by microwaves to your receiver, at the speed of light. The light from the TV screen reaches your eyes faster that the sound from the speaker, but the distance is so short you cannot detect the slight delay in sound.
2. 0.133 s, 7.5 trips around earth in 1 s.
3. 9.5 x 10^{12} km/year
4. It will be 8 years before he sees himself. He will be 18 a. He will still look 10 a old.