

8. LIGHT AND ELECTROMAGNETISM

Answers to conceptual exercises

2. Yes. The medium is the wheat.



6.

16. $10 \text{ m} / 0.6 \times 10^{-6} \text{ m} = 1.7 \times 10^7 = 17 \text{ million!}$

24. You cannot tell, because no matter which ends you put together, they attract each other.

35. A typical light wavelength is $0.5 \times 10^{-6} \text{ m}$, which is far bigger than the 10^{-10} m across an atom. The ratio is $0.5 \times 10^{-6} / 10^{-10} = 0.5 \times 10^4 = 5000$ times bigger.

Answers to problems

2. FM has the highest frequency. The FM frequency will be 100 higher (larger) than the AM frequency.

9. ELECTROMAGNETIC RADIATION AND GLOBAL CLIMATE CHANGE

Answers to conceptual exercises

2. No. An electric field is not made of atoms or of other material particles. The same is true of gravitational fields.
14. The distance light travels in 4 years is $300,000 \text{ km/s} \times 4 \text{ years} \times 365 \text{ days/yr} \times 24 \text{ hr/day} \times 60 \text{ min/hr} \times 60 \text{ s/min} = 3.8 \times 10^{13} \text{ km}$, or 38 trillion km.
17. Because ultraviolet radiation does not penetrate glass.
28. Individual UV waves have higher frequency and thus higher energy, so they can penetrate and alter human biological cells.
36. In Figure 9.24, the peak at about 140,000 years ago is slightly above the "present" (time 0) value of 280 ppm--perhaps about 285 ppm. According to Figure 9.25, the temperature at that time was about 3 degrees (Celsius) above current levels.

Answers to Problems

10. Suppose you use about 10 gallons (40 liters) of gasoline per week, or about 500 gallons (2000 liters) per year, equivalent to about 12,000 miles (19,000 km) per year. This is about 0.7×2000 or 1400 kg of gasoline per year, or about 1400 kg of carbon (assuming that gasoline is pure carbon) each year. This is 1.4 metric tonnes, or roughly 1.4 US tons--about 25% of the 5.5 tons of carbon emitted per capita in the US.