Electromagnetic Spectrum I

A.C. Norman
anorman@bishopheber.cheshire.sch.uk

1. (a) What does the fact that light waves can travel from the Sun to the Earth tell us about light waves?
   (b) The Sun is 150 000 000 km away from the Earth, and light takes 500 s to reach us. Calculate the speed of light in
      i. km/s,
      ii. m/s.
2. Are light waves transverse or longitudinal?
3. Which of the sentences is/are correct?
   (a) Green light has a longer wavelength than blue light
   (b) Red light has a lower frequency than blue light
   (c) Increasing the frequency of green light could make it blue
   (d) Yellow light travels more slowly than violet light
   (e) Orange light has a higher frequency than red light.

   For the following questions, take the speed of the electromagnetic waves to be 3×10^8 m/s.
4. What is the frequency of red light, where its wavelength is 6.8×10^{-7} m?
5. Calculate the wavelength of Radio 4 which broadcasts on 198 kHz.
6. Certain X-rays have a frequency of 1.0×10^{19} Hz. Calculate their wavelength.
7. Microwaves have a frequency of around 10^{11} Hz. Calculate their wavelength in
   (a) m,
   (b) cm.
8. Extra Low Frequency (ELF) waves are used to communicate with submarines. The frequency is 1.5 kHz. Calculate the wavelength of the waves in metres.
9. A radio station broadcasts on 250 m, 1200 kHz. Show that this must be an electromagnetic wave.