# Year 10 Science: Light, colour and uses of electromagnetic waves

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

## Practice

1. A microwave oven uses microwaves of frequency $2.45 \times 10^{9}$ Hz. Find their wavelength.

2. Red light has a wavelength of $7.0 \times 10^{-7}$ m. Find its frequency.

3. A green apple is seen under red light. What colour does it look, and why?

4. Which EM wave would you choose to (a) find a lost tramper at night, (b) check a broken arm, (c) send a text?

5. Why is light from a torch visible at the bottom of a clear pool, but bent where it enters the water?

## Fix the mistake

6. Correct this statement: "100 MHz, so $\lambda = 3.0 \times 10^{8} \div 100 = 3{,}000{,}000$ m."

7. Correct this statement: "A red shirt looks red under any light, because red is its colour."

8. Correct this statement: "Light entering glass bends away from the normal."

9. Correct this statement: "Radio waves are a kind of sound wave."

## Answer key (for parents and tutors)

1. A microwave oven uses microwaves of frequency $2.45 \times 10^9$ Hz. Find their wavelength.
   **$\lambda = 3.0 \times 10^8 \div 2.45 \times 10^9 \approx 0.12$ m (12 cm).**

2. Red light has a wavelength of $7.0 \times 10^{-7}$ m. Find its frequency.
   **$f = 3.0 \times 10^8 \div 7.0 \times 10^{-7} \approx 4.3 \times 10^{14}$ Hz.**

3. A green apple is seen under red light. What colour does it look, and why?
   **Black (or very dark): a green apple absorbs red light, and there is no green light for it to reflect.**

4. Which EM wave would you choose to (a) find a lost tramper at night, (b) check a broken arm, (c) send a text?
   **(a) infrared, with a thermal camera detecting body heat; (b) X-rays, which bone stops; (c) microwaves, used by cellphones.**

5. Why is light from a torch visible at the bottom of a clear pool, but bent where it enters the water?
   **Clear water transmits light, so it reaches the bottom; light slows down entering water, so a ray at an angle refracts towards the normal.**

6. Correct this statement: "100 MHz, so $\lambda = 3.0 \times 10^8 \div 100 = 3{,}000{,}000$ m."
   **Convert to hertz first: 100 MHz is $1.0 \times 10^8$ Hz, so $\lambda = 3.0$ m.**

7. Correct this statement: "A red shirt looks red under any light, because red is its colour."
   **The dye only reflects red light, so under green light there is nothing for it to reflect and it looks black.**

8. Correct this statement: "Light entering glass bends away from the normal."
   **Light slows down entering glass or water, so it bends towards the normal, and away from it only when it comes back out into air.**

9. Correct this statement: "Radio waves are a kind of sound wave."
   **Radio waves are EM waves that travel at the speed of light, even through space; a radio only turns them into sound with its speaker.**