Problem 1: While swimming in the wave pool, you observe that the water waves go up and down around five times per second and the crests are 3 meters apart. What is the wave speed?

Solution: We know that the speed of the wave is equal to the product of the frequency and the wavelength. The frequency of the water wave is 5 Hz (since the cycle is 5 times per second) while its wavelength is 3 m, so **the speed of the water wave is 15 m/s.**

Problem 2: As the ambulance goes near you, does the speed of the sound wave increase or decrease? Why?

Solution: The speed of the sound wave **neither increases nor decreases** since it is the frequency of the wave that changes when an object is in motion.

Problem 3: Red light has the lowest frequency while violet light has the highest frequency. Which among these lights has the shortest and the longest wavelength?

Solution: We know that $c = \lambda f$. The speed of light c is constant for all electromagnetic waves. To find the wavelength, we will get $\lambda = c/f$. This formula implies that the wavelength is inversely proportional to the frequency. Hence, the light that has the lowest frequency has the longest wavelength (red) while the light that has the highest frequency has the shortest wavelength (violet).

Problem 4: We usually see the lightning appear before we hear thunder. Why?

Solution: Light travels faster than sound.

Problem 5: Your friend says that gamma rays travel faster than radio waves. Is that correct? Explain your answer.

Solution: Both gamma rays and radio waves are electromagnetic waves, hence, they both travel at the speed of light.