How do the invisible waves around us affect our lives?

01 Work with a classmate. Discuss the following question: What do these devices and technologies have in common?

- cell phone
- solar panels
- Wi-Fi
- GPS

02 Read "Wave After Wave" and underline the best summary statement.

1. Electromagnetic waves can make life easier in several ways.
2. We can find one kind of electromagnetic waves all around us.
3. Many types of electromagnetic waves are used in many technologies.

03 Read the text again and correct the false statements about electromagnetic waves.

1. Only one type of electromagnetic wave is used in technology.
2. Cell phones, Wi-Fi, and GPS use the same transmitters of electromagnetic waves.
3. EM waves are only used to transmit information.
4. All EM waves are at the same frequency.

Wave After Wave

Karina: Today, on "How Does It Work?", we're talking about phones, Wi-Fi, Bluetooth, and GPS. Mr. McGuinty, from the science department, is here to tell us how they work. Mr. McGuinty...

Mr. McGuinty: Thanks. While these are all different technologies, they all use **electromagnetic** or EM waves. EM waves are both **electric** and **magnetic**; they travel at the speed of light, are invisible, and are measured in **frequencies** from long to short. Radio waves are the longest, meaning they can travel the furthest and are used to transmit data in computers. Gamma rays are the shortest, creating intense amounts of energy for nuclear explosions and cancer treatment.

Karina: Back to cell phones?

Mr. McGuinty: Yes, back to cell phones and related technologies. Cell phones send and receive radio frequency radiation or radio waves to local stations or towers. The strength of the wave dissipates with distance, which explains why you may not have cell service if you're in an isolated location remote from **cell towers**. It's also important to note that while you may not be sending or receiving messages, your phone is constantly sending waves if it's powered on. GPS works similarly by transmitting radio waves to and from satellites that use atomic time to identify locations.

Karina: That's amazing! Are Wi-Fi and Bluetooth the same?

Mr. McGuinty: Almost; insomuch that radio waves are sent and received, but in the case of Wi-Fi, the transmitting device, your phone or computer, sends binary code, which is converted to frequencies by a router and then back into binary code, repeating the process until the entire operation is complete. In the case of Bluetooth, the waves are sent between devices. Bluetooth uses **ultra-high frequency** (UHF) radio waves, bypassing internet traffic. In summary, we can use our contemporary communication technology because of electromagnetic waves.

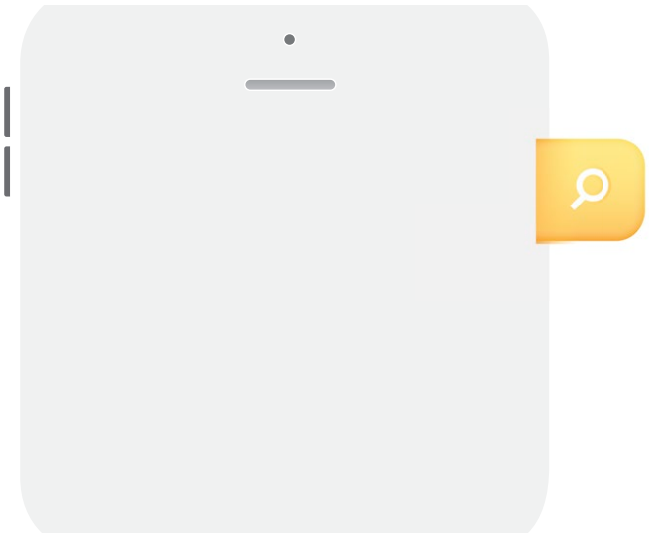
04 Work with a classmate. Get more information about one of the uses of EM waves and give a mini presentation to another pair.

05 Complete the sentences with the correct conjunctions from the word bank.

although	consequently	
so as to	until	while

1. _____ ultraviolet waves are invisible to the human eye, they play a key role in sterilization technology.
2. _____ the invention of radar, weather prediction relied mostly on observation and guesswork.
3. Smartphones use different frequencies _____ _____ avoid interference between devices.
4. Bluetooth works over short distances, _____ _____ satellite signals can travel across continents.
5. The signal was blocked by thick concrete walls; _____ , the internet connection dropped.

07 Work with a classmate to create a dialogue about the world without EM waves and our contemporary communication technology. Use conjunctions.



06 Use different types of conjunctions from Exercise 5 to create sentences about EM waves and technology in your life.

1. Concession: _____
2. Contrast: _____
3. Reason: _____
4. Result: _____
5. Time: _____

08 Imagine you can only have one technology that uses EM waves. Follow the instructions below.

1. Choose one technology or device. Example: Cell phone
2. Make a list of its benefits.
3. Create an argument supporting this technology or device as the most useful one.
4. Present your argument to a small group.
5. Together, choose the best argument in the group.