Unit 9: Waves
Content Outline: Electromagnetic Spectrum: Short waves (9.5)

I. **X Rays and Gamma Rays**
   A. The *shortest-wavelength, highest-frequency* electromagnetic waves.
   B. These rays have *so much energy* that they can pass through many materials.
      1. This makes them potentially *very harmful*, but it also makes them useful for certain purposes.
   C. **X rays**
      1. These are high-energy electromagnetic waves.
      2. They have enough energy to pass through soft tissues such as skin, but not enough to pass through bones and teeth, which are very dense.
         The bright areas on the X ray film in show where X rays were absorbed by the teeth. X rays are used not only for dental and medical purposes but also to screen luggage at airports.
      3. Too much X ray exposure may cause cancer.
         If you've had dental X rays, you may have noticed that a heavy apron was placed over your body to protect it from stray X rays. The apron is made of lead, which X rays cannot pass through.
   D. **Gamma rays**
      1. The most energetic of all electromagnetic waves.
      2. They can pass through most materials, including bones and teeth.
      3. Nonetheless, even these waves are useful. For example, they can be used to treat cancer. A medical device sends gamma rays the site of the cancer, and the rays destroy the cancerous cells.