Diffraction and Interference

The waves crash on the rocks and continue on around them. Sound pours through an open door. Like matter, waves travel in a straight line unless something interferes with them. Waves can bend around a barrier. This is called **diffraction**. The closer an object's size is to the wavelength of the wave, the more the wave bends, and the greater the diffraction is. That is why you can hear music from the band-room through an open door, but you can't see the band until you're at the door. The wavelengths of the sound waves are close to the size of the doorway, so they bend around it. The wavelengths of the light waves are much too small to be affected by the doorway. Waves can even interact with each other. Imagine two stones are dropped in a pond a short distance apart. The ripples spread, eventually meet, and keep going. When the waves meet and overlap, they combine to form a new wave. The ability of two waves to combine and form a new wave when they overlap is called **interference**. There are two types, constructive interference and destructive interference. Constructive interference results in a wave with greater amplitude. Destructive interference results in a wave with smaller amplitude. Constructive interference occurs when the crest of one wave overlaps the crest of another wave to form a wave with higher amplitude. Destructive interference occurs when the crest of one wave overlaps the trough of another wave to form a wave with lower amplitude. When a sound wave interferes destructively with another sound wave its amplitude or volume is reduced. Since a wave that interferes destructively with one wave does not have the same effect on waves with different properties it is possible to reduce noise without reducing the volume of what you want to hear. Interference and diffraction are properties of waves only, not particles.

Answer the questions below based on your reading above, and on your knowledge of physics.

1. What happens when the waves meet the rocks in the picture to the right? _____

2. Why can you hear a group of musicians playing around the corner before you can see them? _____

3. What characteristics would a barrier have to have in order to diffract light? _____

4. Two waves pass through each other. What happens to the amplitude when
   a. two crests overlap? _____
   b. a crest and a trough overlap? _____

5. How does noise reduction work? _____