

STUDY GUIDE FOR CHAPTER 29

1. **Reflection** – When a wave reaches a boundary to its path, the wave will return back into its original medium.
2. If the boundary between two media is rigid, all of the wave will be reflected. If the boundary is less rigid, part of the wave energy will be reflected and part of the wave energy will be transmitted, (travels in the second medium).
3. Still Water: 2% reflected, 98% transmitted
Glass: 4% reflected, 96% transmitted or absorbed
4. **The Law of Reflection:** When a wave is reflected from a barrier to its path, the angle of incidence is equal to the angle of reflection.
5. Real image: an image formed by the convergence of light rays. A real image can be projected on a screen.
6. Virtual image: an image that “appears” to be in a location where light does not really reach.
7. Plane mirrors produce only virtual images.
8. **Diffuse reflection** – when light is reflected from a rough surface, the light is reflected in many different directions.
9. **Specular/Regular reflection** – when light is reflected from a smooth surface, the light is reflected in ONLY one direction.
10. An **echo** is reflected sound.
11. The study of sound is called **acoustics**.
12. Multiple reflections in a room, auditorium, or concert hall is called **reverberation**.
13. Sound energy that is not reflected is absorbed or transmitted.
14. **Refraction** is the bending of a wave that is traveling at an angle from one substance to another substance. The wave changes speed as it travels from one medium to another.
15. **Wave fronts** are lines drawn to represent the positions of different crests.
16. The direction that the wave can be represented by a line perpendicular to the crests. The line will have an arrow showing the direction the wave is moving.
17. Sound waves are refracted when parts of the wave front travel at different speeds. This happens when sound is traveling through winds or when sound is traveling through uneven temperatures. Sound waves tend to bend gradually away from warm ground and vice versa. (see figure 29.15 on page 586)

18. Changes in the speed of light as it passes from one medium to another, or variations in the temperature and densities of the same medium, cause **refraction**.
19. A **mirage** is caused by the refraction of light in Earth's atmosphere. (figures 29.20, 29.21, 29.23)
20. A **prism** separates white light into its component colors: red, orange, yellow, green, blue, indigo, violet.
21. Since different frequencies of light travel at slightly different speeds in transparent materials, they will refract differently and bend at different angles. Red travels the fastest and violet travels the slowest.
22. Dispersion is the separation of light into colors according to their frequency, by interaction with a prism or diffraction grating, for example.
23. Rainbows are the dispersion of white light by raindrops. In order to see a rainbow the sun must be behind the observer and the rainbow will appear in front of the observer. Red is always on top and violet on the bottom in the primary rainbow. In a double rainbow (primary rainbow is reflected), red is on the bottom and violet is on the top.
24. In order for you to see a rainbow, the sun must be shining in one part of the sky, and the water droplets in a cloud or falling rain must be in the other part of the sky. (Figure 29.26 and 29.27)
25. **Total internal reflection** occurs when the angle of incidence is larger than the critical angle. The light starts in a more dense medium and is totally reflected back into the original medium. (Figure 29.32)
26. The **critical angle** is the minimum angle of incidence for which a light is totally reflected within a medium.
27. **Optical fibers** are thin strings of transparent material that "pipe" light from one location using a series of total internal reflection.
28. Optical fibers are used in communication (phone lines, cable lines) because the fibers are more bendable than traditional copper wire, less expensive, and faster to deliver data by light impulses than electrical impulses.