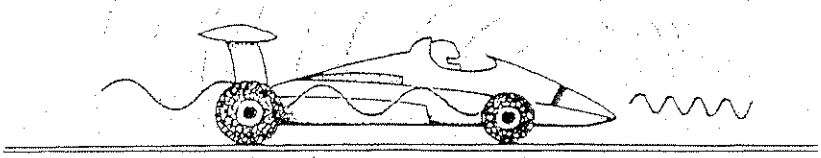
8. Doppler Effect: When a sound is moving with respect to the observer, the sound's pitch appears to change. Because of the motion of the source, illustrated here as a racing car, the sound waves appear to be bunched up in front and spread out in back. This results in shorter wavelengths, or an increased frequency, in the front of the source and longer wavelengths. or a lower frequency, behind the source.

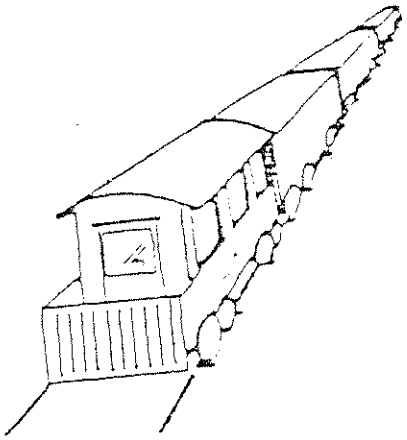


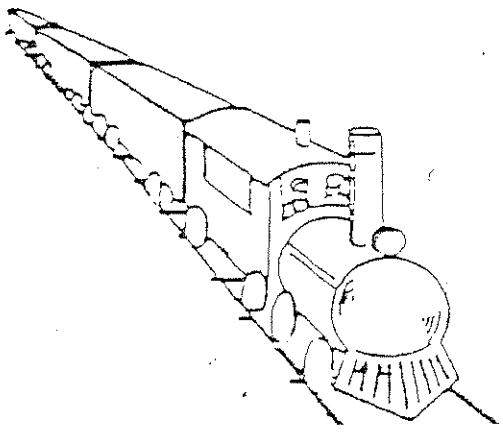
2. View and read the following video clips illustrating the Doppler Effect.

Classroom Procedure

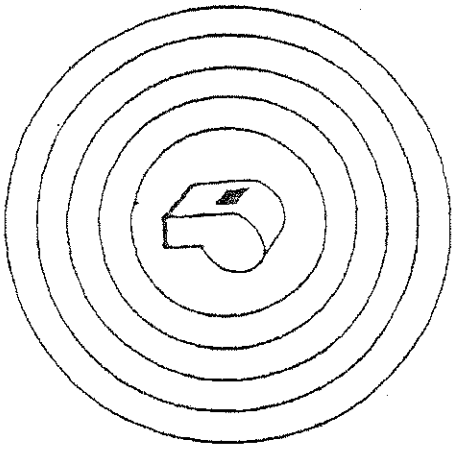
Have students complete the following steps:

1. Have you ever noticed the change in pitch that occurs as a moving train whistles or a fire engine siren passes you? The higher pitch produced by an approaching sound-maker is the result of sound vibrations crowding together in front of the sound-maker. Vibrations reach your car closer together and you hear a higher pitch. The lower pitch produced by a sound-maker is the result of sound vibrations spreading out behind the sound-maker. Vibrations reach your ear farther apart and you hear a lower pitch.If a vibrating object ismoving,soundwaves crowd together in front to produce a high pitch and spread apart behind to produce a low pitch.



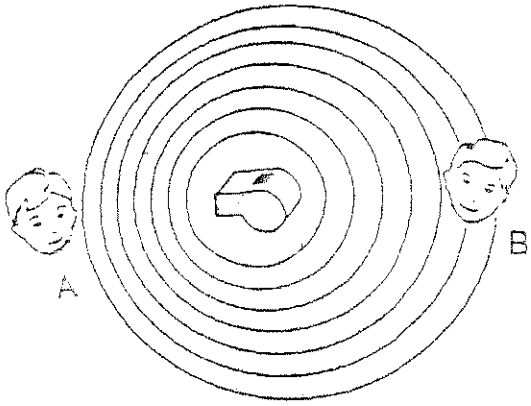


2. Let's use circles to represent vibrations from a whistle. The circles get bigger and bigger as the vibrations move out from the whistle. How many vibrations are shown for this whistle?



3. Suppose the whistle is not moving. Observers on all sides of the whistle hear the same pitch because the same numbers of vibrations reach each observer in a given period of time.

4. Now let's suppose the whistle is moving. The diagram shows waves crowding together in front of the moving whistle and spreading out behind the whistle.



5. In which direction is the whistle moving?Place an arrow on the diagram to show direction.

6. Which observer will hear the higher pitch?Circle that person on the diagram.

7. Draw sound vibrations around the moving buzzer that is moving in the direction of the arrow. Write "HIGH" on the side of the whistle where an observer would hear a high-pitched sound and "LOW" on the side where an observer would hear a low-pitched sound.