Physics: Form WS8.3.3A Name _____

SOUND Date _____ Period _____

The Doppler Effect

A police cruiser speeds down the road, siren blaring. The pitch of the siren rises as the cruiser approaches. Suddenly, the police car speeds away and the pitch drops. This is the **Doppler effect**. The Doppler effect is the change in frequency that occurs when a source of sound is moving relative to the listener. As the sound source and listener approach each other the pitch and frequency increase. This is because the time between when you encounter compressions or rarefactions is shortened as you approach the source of sound. As the sound source and listener separate from each other the pitch and frequency decrease. This is because the time between when you encounter compressions or rarefactions is lengthened as you leave the source of sound. The Doppler effect is used in both radar and ultra sound. Radar detects Doppler shifts in radio wave echoes. This makes it possible to tell whether the object reflecting the radio waves is approaching or receding. Ultrasound consists of sound waves at frequencies above the normal hearing range. Ultrasound waves focused on the kidney or gall bladder can cause stones to vibrate until they break apart. Ultrasound echoes can be used to form images of the inside of the body. Ultrasound can also be used to measure blood flow in arteries by using the Doppler effect. When moving blood reflects ultrasound waves, the frequency gets higher if blood is moving toward the probe and a lower if blood is moving away from the probe. The larger the frequency change is, the faster the blood is moving.

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

1. What is the Doppler effect? _____

   _____

2. A car radio is blasting your favorite song, but the pitch is rising. What does this mean? _____

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3. A radar detects an object. The frequency of the echo reflected off the object is the same as the pulse that was sent to the object. What does this mean? _____

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4. How does ultrasound measure blood flow? _____

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