

## 6.6 - Doppler Effect

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- (1999) What is a Doppler Effect?
- (1999) A whistle sound of frequency 1200 Hz was directed to an approaching train moving at 48 km/h. The whistle-man then listened to the beats between the emitted sound and that reflected from the train. What is the beat frequency detected by the whistle-man?
- (2000) Write two uses of Doppler effect.
- (2000) An observer standing by a railway track notices that the pitch of an engine whistle changes in the ratio of 5:4 on passing him. What is the speed of the engine?
- (2007) What is meant by Doppler effect?
- (2007) Mention two (2) common applications of the Doppler shift.
- (2007) Ultra sound of frequency  $5 \times 10^6$  Hz is incident at an angle of  $30^\circ$  to the blood vessel of a patient and a doppler shift of 4.5 KHz is observed. If the blood vessel has a diameter  $10^{-3}m$  and the velocity of ultrasound is  $1.5 \times 10^3 m/s$ . Calculate the:
  - blood flow velocity.
  - volume rate of blood flow.
- (2015) What is meant by Doppler effect?
  - Write down three uses of Doppler effect.
- (2015) A whistle emitting a sound of frequency 440 Hz is tied to a string of 1.5 m length and rotated with an angular velocity of 20 rad/s in the horizontal plane. Calculate the range of frequencies heard by an observer stationed at a large distance.
- (2015) A police on duty detects a drop of a 10% in the pitch of the horn of a motor car as it crosses him. Calculate the speed of the car.
- (2016) Ultrasound of frequency 4.0 MHz is incident at an angle of  $30^\circ$  to a blood vessel of diameter 1.6 mm. If a Doppler shift of 3.2 kHz is observed, calculate the blood flow velocity and the volume rate of blood flow. Assume that the speed of ultrasound is 1.5 km/s.
- (2016) The absorption spectrum of a faint galaxy is measured and the wavelength of one of the lines identified as the calcium *H* line is found to be 478 nm. The same line has a wavelength of 397 nm when measured in a laboratory.
  - Is the galaxy moving towards or away from the observer on the Earth?

- Determine the speed of the galaxy relative to observer on the Earth.
- (2017) A cyclist and a railway train are approaching each other with a speed of 10 m/s and 20 m/s respectively. If the engine driver sounds a warning siren at a frequency of 480 Hz, calculate the frequency of the noise heard by the cyclist:
  - Before the train has passed.
  - After the train has passed.
- (2019) What is Doppler effect?
- (2019) The cyclist moving at 10 m/s and the railway train at 20 m/s are approaching each other. If the engine driver sounds a warming siren at a frequency of 480 Hz:
  - calculate the frequency of the note heard by the cyclist before and after the train has passed away.