

Answer on Question #66375 – Mechanics – Relativity

A truck moving at a speed of $v = 144 \frac{\text{km}}{\text{hr}} = 40 \frac{\text{m}}{\text{s}}$ passes a car moving at a speed of $u = 72 \frac{\text{km}}{\text{hr}} = 20 \text{ m/s}$. If the truck sounds its horn at a frequency of $f_0 = 500 \text{ Hz}$, what is the frequency of sound heard by the person in the car?

Solution

The change of frequency (the Doppler shift) is

$$\Delta f = \frac{v - u}{c} f_0.$$

Here $c = 343 \frac{\text{m}}{\text{s}}$ is the speed of sound in air.

So

$$\Delta f = \frac{40 - 20}{343} 500 \approx 29 \text{ Hz.}$$

Finally, the frequency of sound heard by the person in the car is

$$f = \Delta f + f_0 = 29 + 500 = 529 \text{ Hz.}$$

Answers: 529 Hz.

Answer provided by <https://www.AssignmentExpert.com>