Answer on Question #47928, Physics, Mechanics | Kinematics | Dynamics

Question:

A car honks its horn as it moves away from you. The car is traveling at 30. m/s and the horn has a frequency of 710. Hz. What frequency do you hear? Use 344 m/s for the speed of sound in air.

A) 710 Hz

B) 852 Hz

C) 653 Hz

D) 778 Hz

Answer:

The Doppler effect (or Doppler shift is the change in frequency of a wave for an observer moving relative to its source. In classical physics the relationship between observed frequency f and emitted frequency f_0 is given by:

$$f = \frac{c + v_r}{c + v_s} f_0$$

where c is the velocity of waves in the medium;

v_r is the velocity of the receiver relative to the medium; positive if the receiver is moving towards the source (and negative in the other direction);

v_s is the velocity of the source relative to the medium; positive if the source is moving away from the receiver (and negative in the other direction).

In this case $v_r = 0$, $v_s = 30 \frac{m}{s}$ therefore

$$f = \frac{344}{344 + 30} 710\ Hz = 653\ Hz$$

Answer: $653\ Hz$