Answer on Question#38156 – Physics – Other

A bat flies at a steady rate of 4 m/s emitting 90 kHz sound wave and is flying towards a wall. It detects a reflected signal at s frequency…….kHz. Given speed of sound=340m/s.
a)90.1 b)92.1 c)91.1 d)93.1

Solution:
The bat hears f_w coming from the wall. If $v = 4\frac{m}{s}$ is the magnitude of bat speed, $V = 340\frac{m}{s}$ is a speed of sound and f_w the frequency the wall receives (and reflects).
Bat is moving source and wall is stationary observer.

$$\frac{V}{f_w} = \frac{V - v}{90kHz}$$

Solve equation relative to f_w:

$$f_w = \frac{90kHz \cdot V}{V - v} = \frac{90kHz \cdot 340\frac{m}{s}}{340\frac{m}{s} - 4\frac{m}{s}} = 91.1\ kHz$$

Answer: c) $91.1\ kHz$