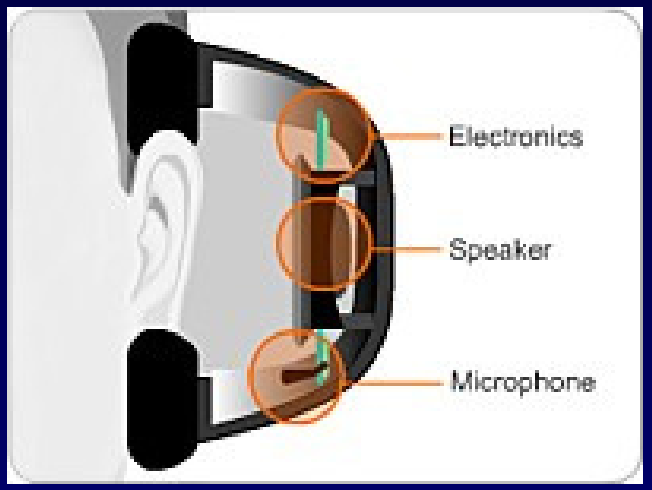
Solution

Noise-canceling headphones work using interference. A microphone on the earpiece monitors the instantaneous amplitude of the external sound wave, and a speaker on the inside of the earpiece produces a sound wave to cancel it.



1. What must be the phase of the signal from the speaker relative to the external noise?

a. 0 b. 90˚ **c. π** d. -180˚ e. 2π

Destructive interference occurs when the waves are ±180˚ out of phase.

180º = π radians!

2. What must be the intensity I_s of the signal from the speaker relative to the external noise I_n?

a. $I_s = I_n$ b. $I_s < I_n$ c. $I_s > I_n$

We want $A = A_s - A_n = 0$.
Note that I is never negative.