

Solutions

2.1 A For a source approaching a stationary observer along the line of sight, $f_{\text{observed}} = f_{\text{source}} \times v / (v - v_{\text{source}})$. Recession uses $v + v_{\text{source}}$ in the denominator. These are sound-wave models; light requires its appropriate relation.

2.2 For approach, $f' = fv / (v - u) = 600 \times 340 / (340 - 20) = 637.5 \text{ Hz}$.

2.3 False. A stationary source and moving observer require the observer-motion relation. Do not use the same denominator formula for every arrangement or import a sound formula into relativity.

2.4 Doppler shift. Doppler shift means Change of observed frequency due to relative motion.

3.1 Recession gives $600 \times 340 / (340 + 20) = 566.7 \text{ Hz}$; approach gives 637.5 Hz . Source direction is relative to a material medium; light requires its appropriate relativistic relation.