

AUTHORIZED REFERENCES: Calculator, Physics Reference Card

Wt. **No.**
60 1.

While in a platoon patrol base in Afghanistan one of your soldiers has set up a low-tech early warning device consisting of three empty coffee cans attached to a string. When the string is agitated by an intruder a traveling wave is established in the string. This wave can be described by the wave function:

$$y(x,t) = 0.0173 \text{ m} \sin [(5.11 \text{ rad/m})x + (487 \text{ rad/s})t]$$

15 a. Calculate the wavelength of this wave.

20 b. If the string is agitated 7.32 m from the cans, calculate the time elapsed before the cans start shaking and sound the alarm.

25 c. Calculate the maximum transverse speed of a point on this string.

Wt. **No.**

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2.

A potential dirty bomb scenario is for terrorists to incorporate a ^{60}Co “pencil” (a rod about 2.54 cm in diameter by 30.5 cm in length which can be used for irradiating food) into an explosive device with about 5 kg of TNT. Detonating such a device might cause an average activity level of 5.32 Bq over an area of $2.51 \times 10^6 \text{ m}^2$ (300 city blocks). The half-life of ^{60}Co is 5.27 years. Calculate the time required for the activity to reduce to 2.09 Bq.

Bonus (5 Marks): Describe the two properties a medium must possess in order to transmit a mechanical wave.