PHYSICS IN MOTION
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Unit 6E
Standing Waves and Resonance
Note-Taking Guide TEACHER

Main Ideas, Key Points, Questions:

After watching the video segment, write down key points, main ideas, and big questions.

Objective(s):

- *Understand what affects an object's natural frequency, and what is necessary for resonance to occur.*
- *Recognize how standing waves are created, and understand the similarities and differences between standing waves on a string, in an open-ended tube, and in a closed-ended tube.*

Notes:

During the video segment, use words, phrases, or drawings to take notes.

Summary:

After watching the video segment, write at least three sentences explaining what you learned. You may ask yourself: "If I was going to explain this to someone else, what would I say?"

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Standing Waves and Resonance
Questions to Consider TEACHER

Answer the following.

1. **When are standing waves produced?**

Standing waves are produced by the interference of two waves with the same wavelength and frequency moving in opposite directions.

2. **What affects an object's resonant, or natural, frequency?**

An object's resonant, or natural, frequency is affected by its material and shape.

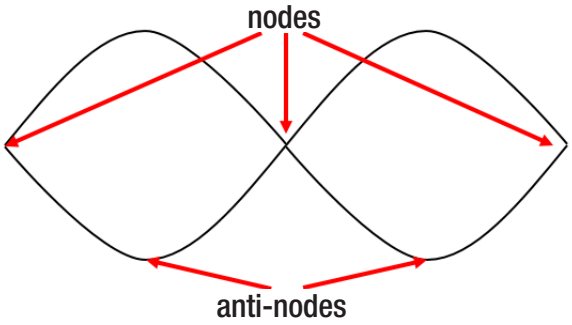
3. **What is necessary for resonance to occur?**

Resonance occurs when an object experiences a forced vibration at its natural frequency.

4. **How do incident and reflected waves differ?**

An incident wave is created by a source and travels toward a boundary, while a reflected wave travels from a boundary back toward the wave source.

5. **On the standing wave below, label the nodes and anti-nodes:**



6. **How does the frequency of the standing wave change as the harmonic number changes?**

The harmonic number is a multiple of the fundamental frequency of the standing wave. As the harmonic number increases, the frequency also increases.

questions continued on next page

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Answer the following.

7. **What must be present on each end of a string in order for a standing wave to be created?**

The string must have nodes on each end.

8. **Complete the equation for the possible wavelengths of standing waves on a string in terms of the length of the string and the harmonic numbers:**

$$\lambda = \frac{2L}{n}$$

9. **What affects the speed of a wave on a string?**

The speed of a wave on a string depends upon the string's tension and density,

which is the string's mass divided by its length.

10. **What must be present on each end of an open-ended tube in order for a standing wave to be created?**

The open-ended tube must have anti-nodes on each end.

11. **Complete the equation for the possible wavelengths of standing waves in an open-ended tube in terms of the length of the tube and the harmonic numbers:**

$$\lambda = \frac{2L}{n}$$

12. **What must be present on each end of a closed-ended tube in order for a standing wave to be created?**

The closed end of the tube must have a node, and the open end must have an anti-node.

13. **Complete the equation for the possible wavelengths of standing waves in a closed-ended tube in terms of the length of the tube and the harmonic numbers:**

$$\lambda = \frac{4L}{n}$$

where n is an odd number

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