1. Which set of waves shown below is in order from highest to lowest frequency?

A

B

C

D
2. What is the period of the wave shown below?

![Wave diagram](image)

A 0.10 s  
B 0.40 s  
C 1.0 s  
D 2.5 s

3. Assuming the waves all have the same velocity, which wave has the **lowest** frequency?

![Wave diagrams](image)
4. What is the period of a wave that has a wavelength of 0.80 m and is traveling at 2.0 m/s?
   A 0.40 s
   B 0.63 s
   C 4.0 s
   D 6.3 s

5. A student sits on one side of a door sending a horizontal pulse along a rope that runs under the door. The reflected pulse is inverted. What information can be inferred from this observation?
   A The rope is unattached.
   B The rope is attached to a rigid boundary.
   C The rope is attached to a more flexible boundary.
   D The rope is attached to a boundary that has equal rigidity as the rope.

6. A physicist measures the speed of an electromagnetic wave as $1.3 \times 10^8$ m/s in a medium. What is the index of refraction of the medium?
   A 0.43
   B 2.3
   C 2.5
   D 3.9

7. In which media would sound waves travel fastest?
   A a vacuum
   B air
   C water
   D glass
8. A pulse travels from a spring to a thin thread that is attached to a wall.

Which best describes the pulse in the thread after it leaves the spring at point A?

A. The pulse is upright.
B. The pulse is inverted.
C. The pulse stops.
D. The pulse is totally reflected with no transmission.

9. A light ray is incident on a plane mirror as shown in this diagram.

What is the angle of reflection?

A. 0°
B. 30°
C. 45°
D. 90°
10. A child is playing with a string attached to a doorknob. She sends a series of pulses down the string. Assume that the pulses are reflected with no loss of amplitude. If all the pulses have an amplitude of 15 cm, which best describes what the child sees where an incident pulse and reflected pulse meet?

A a larger pulse of 30 cm
B a smaller pulse of 15 cm
C Both pulses are seen on either side, each with an amplitude of 15 cm.
D No pulse is seen where the two pulses meet.
11. Two wave pulses are traveling on a rope in opposite directions, as shown in the diagrams. The wave pulses have the same length and amplitude.

When wave X meets wave Y, what will most likely be the appearance of the resulting pulse?

A  

B  

C  

D  

12. Both constructive and destructive interference are a result of wave superposition. The result of interference can best be described by which statement?

A  the algebraic sum of the individual displacements

B  the algebraic product of the individual displacements

C  the exponential relationship between individual displacements

D  the inverse relationship between individual displacements
13. A train whistle produces a pitch of 400 Hz when the train is not moving. If an observer is stopped at a railroad crossing and the train passes him at time \( t \), what pitch is heard by the observer?

A.  
```
\begin{array}{c}
\text{Pitch (Hz)} \\
\hline
400 \\
0 \\
\end{array}
```

B.  
```
\begin{array}{c}
\text{Pitch (Hz)} \\
\hline
400 \\
0 \\
\end{array}
```

C.  
```
\begin{array}{c}
\text{Pitch (Hz)} \\
\hline
400 \\
0 \\
\end{array}
```

D.  
```
\begin{array}{c}
\text{Pitch (Hz)} \\
\hline
400 \\
0 \\
\end{array}
```

14. The stars in a galaxy emit light with a wavelength of 300 nm, but this light appears to have a wavelength of 400 nm to an astronomer on Earth. Which describes the motion of the galaxy relative to Earth?

A. away from Earth
B. toward Earth
C. left of Earth
D. right of Earth

End of Goal 7 Sample Items

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1  **Objective: 7.01**  
Analyze, investigate, and evaluate the relationship among the characteristics of waves:  
a. Wavelength.  
b. Frequency.  
c. Period.  
d. Amplitude.  
**Thinking Skill:** Generating  
**Correct Answer:** C

2  **Objective: 7.01**  
Analyze, investigate, and evaluate the relationship among the characteristics of waves:  
a. Wavelength.  
b. Frequency.  
c. Period.  
d. Amplitude.  
**Thinking Skill:** Knowledge  
**Correct Answer:** B

3  **Objective: 7.01**  
Analyze, investigate, and evaluate the relationship among the characteristics of waves:  
a. Wavelength.  
b. Frequency.  
c. Period.  
d. Amplitude.  
**Thinking Skill:** Knowledge  
**Correct Answer:** C

4  **Objective: 7.01**  
Analyze, investigate, and evaluate the relationship among the characteristics of waves:  
a. Wavelength.  
b. Frequency.  
c. Period.  
d. Amplitude.  
**Thinking Skill:** N/A  
**Correct Answer:** A

5  **Objective: 7.02**  
Describe the behavior of waves in various media.  
**Thinking Skill:** Knowledge  
**Correct Answer:** B

6  **Objective: 7.02**  
Describe the behavior of waves in various media.  
**Thinking Skill:** Applying  
**Correct Answer:** B
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<tr>
<th>Objective:</th>
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<td>Analyze the behavior of waves at boundaries between media:</td>
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