

Brett Robbins Academic Consulting

Physics 20 Practice Test

Unit D: Oscillatory Motion & Mechanical Waves

25 Questions

Original practice questions written to the Alberta curriculum, in the style of past diploma examinations. Work through each question, then check your answers with the key at the end.

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, contact Brett for clarification.

Question 1

In simple harmonic motion, the restoring force acting on an oscillating object is always directed

- A) away from the equilibrium position
- B) toward the equilibrium position
- C) in the direction of the object velocity
- D) perpendicular to the direction of motion

Question 2

A pendulum swings back and forth with a period of 0.50 s.

The frequency of the pendulum is

- | | |
|------------|------------|
| A) 0.50 Hz | B) 5.0 Hz |
| C) 2.0 Hz | D) 0.20 Hz |

Question 3

The period of a simple pendulum depends on

- A) the length of the pendulum and the gravitational field strength
- B) the mass of the bob and the length of the pendulum
- C) the mass of the bob and the amplitude of the swing
- D) the amplitude of the swing and the length of the pendulum

Question 4

A wave travelling along a rope has a frequency of 5.0 Hz and a wavelength of 0.40 m.

Using $v = f\lambda$, the speed of the wave, to the nearest tenth, is ____ m/s.

Question 5

In a transverse wave, the particles of the medium vibrate

- A) parallel to the direction of wave travel
- B) in large circles around the equilibrium position
- C) not at all once the wave has passed
- D) perpendicular to the direction of wave travel

Question 6

A 0.20 kg mass attached to a spring oscillates on a frictionless horizontal surface.

The spring constant is 50 N/m. Using $T = 2\pi\sqrt{\frac{m}{k}}$, the period of oscillation is

- A) 0.40 s
- B) 0.63 s
- C) 1.6 s
- D) 2.5 s

Question 7

A simple pendulum has a length of 0.25 m.

Using $T = 2\pi\sqrt{\frac{L}{g}}$ with $g = 9.81 \text{ m/s}^2$, its period, to the nearest tenth, is ____ s.

Question 8

When a force of 12 N is applied to a spring, the spring stretches by 0.30 m.

The spring constant is

- A) 3.6 N/m
- B) 0.025 N/m
- C) 40 N/m
- D) 360 N/m

Question 9

An air column that is closed at one end can support standing waves with frequencies that are

- A) all whole-number multiples of the fundamental frequency
- B) only odd multiples of the fundamental frequency
- C) only even multiples of the fundamental frequency
- D) only the fundamental frequency itself

Question 10

A stretched string 0.80 m long supports waves that travel at 320 m/s.

The frequency of the third harmonic of the string is ____ Hz.

Question 11

A wave pulse travels along a light rope and enters a heavier rope, in which waves travel more slowly.

As the wave enters the heavier rope,

- A) its frequency increases and its wavelength increases
- B) its frequency decreases and its speed stays the same
- C) its frequency stays the same and its wavelength increases
- D) its frequency stays the same and its wavelength decreases

Question 12

A pulse travelling along a rope reaches the end of the rope, which is firmly tied to a wall.

The reflected pulse is

- A) inverted compared with the incoming pulse
- B) upright, with a larger amplitude than the incoming pulse
- C) completely absorbed by the wall
- D) upright, with the same amplitude as the incoming pulse

Question 13

A vehicle approaches a stationary observer at 20 m/s while sounding a horn with a frequency of 500 Hz.

The speed of sound in air is 343 m/s. The frequency heard by the observer, to the nearest hertz, is ____ Hz.

Question 14

A tube open at both ends has a length of 0.85 m. The speed of sound in the air inside the tube is 343 m/s.

The fundamental frequency of the tube is approximately

- | | |
|-----------|-----------|
| A) 101 Hz | B) 202 Hz |
| C) 303 Hz | D) 404 Hz |

Question 15

In a standing wave pattern on a string, the distance between two adjacent nodes is 0.35 m.

The wavelength of the waves that produced the pattern is

- | | |
|-----------|-----------|
| A) 0.18 m | B) 0.35 m |
| C) 0.70 m | D) 1.40 m |

Question 16

A 0.50 kg mass attached to a spring with a spring constant of 80 N/m oscillates on a frictionless surface.

Using $f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$, the frequency of oscillation, to the nearest tenth, is ____ Hz.

Question 17

A pendulum clock that keeps correct time on Earth is taken to the Moon, where the gravitational field is weaker.

Compared with its period on Earth, the period of the pendulum on the Moon

- A) decreases
- B) remains the same
- C) becomes zero
- D) increases

Question 18

Two pulses travelling toward each other on a rope meet. One pulse has an amplitude of +0.30 m

and the other has an amplitude of -0.50 m. At the instant the pulses completely overlap, the displacement of th

- | | |
|------------|------------|
| A) -0.20 m | B) +0.80 m |
| C) -0.80 m | D) +0.20 m |

Question 19

An air column closed at one end has a length of 0.25 m. The speed of sound in the air is 343 m/s.

The fundamental frequency of the column is ____ Hz.

Question 20

Resonance occurs when a vibrating system is driven by a periodic external force whose frequency

- A) is much greater than the natural frequency of the system
- B) equals the natural frequency of the system
- C) is much less than the natural frequency of the system
- D) changes randomly from one cycle to the next

Question 21

The speed of a wave in a stretched string is 240 m/s when the tension in the string is 36 N.

If the tension is increased to 144 N in the same string, the new wave speed is

- A) 240 m/s
- B) 340 m/s
- C) 480 m/s
- D) 960 m/s

Question 22

A pendulum is to be built with a period of exactly 2.0 s on Earth.

Using $T = 2\pi\sqrt{\frac{L}{g}}$ with $g = 9.81 \text{ m/s}^2$, the required length, to the nearest hundredth, is ____ m.

Question 23

In a longitudinal wave, such as a sound wave, the wavelength is the distance between

- A) a compression and the next rarefaction
- B) two consecutive compressions
- C) the source of the wave and the observer
- D) two particles that are not moving

Question 24

A wave travels a distance of 12 m in 3.0 s. If the wavelength of the wave is 1.5 m, then the frequency of the wave is

- | | |
|------------|-----------|
| A) 0.38 Hz | B) 2.0 Hz |
| C) 6.0 Hz | D) 2.7 Hz |

Question 25

A guitar string has a fundamental frequency of 110 Hz.

The frequency of the fifth harmonic of the string is

- | | |
|-----------|-----------|
| A) 550 Hz | B) 440 Hz |
| C) 330 Hz | D) 110 Hz |

Answer Key

- | | | |
|--------|---------|----------|
| 1. B | 10. 600 | 19. 343 |
| 2. C | 11. D | 20. B |
| 3. A | 12. A | 21. C |
| 4. 2.0 | 13. 531 | 22. 0.99 |
| 5. D | 14. B | 23. B |
| 6. A | 15. C | 24. D |
| 7. 1.0 | 16. 2.0 | 25. A |
| 8. C | 17. D | |
| 9. B | 18. A | |

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