

Arts & Science 2D06

Quiz #6 2008 Feb 29

Name:

NB: Mark values are given in brackets [] beside each problem. Write all your answers on the quiz paper. No books or notes allowed. Time to write quiz: 50 minutes.

Period of simple pendulum: $T = 2\pi\sqrt{\frac{L}{g}}$ Wave speed: $v = f\lambda$

SHM equation of motion: $x = A \cos(\omega t + \varphi)$ where $\omega = \sqrt{k/m} = 2\pi/T$

Wave equation: $y = A \sin(kx - \omega t + \varphi)$ where $k = 2\pi/\lambda$

Two-slit interference: $\sin\theta = m\lambda/d$ and $\sin\theta = (m+1/2)\lambda/d$

Diffraction: $\sin\theta = m\lambda/a$

1. [2] If the amplitude of a simple harmonic oscillator is doubled, which of the following quantities will be most affected? (Explain your answer.)

- (a) Frequency
- (b) Period
- (c) Maximum speed
- (d) Maximum acceleration
- (e) Total energy

2. [3] Blue light of wavelength λ passes through a single slit and forms a diffraction pattern on the screen. If the blue light is then replaced by red light of wavelength 2λ , the original diffraction pattern can be reproduced if the slit width is: (Explain your answer.)

- (a) made four times smaller
- (b) made two times smaller
- (c) kept unchanged
- (d) made two times bigger
- (e) made four times bigger

3. [5] A simple pendulum of length 0.3 meters is released from an angle of 4 degrees. How much time does it take the pendulum to reach its highest speed? How much time does it take if the pendulum is released from 2 degrees instead?

4. [5] A sinusoidal wave travels along a stretched string. A particle on the string has a maximum velocity of 1 m/s and maximum acceleration of 100 m/s^2 . Find the frequency (f) and amplitude (A) of the wave.

5. [5] An interference pattern is made by shining light on two narrow slits spaced 0.3 mm apart. The distance between the first and the fourth minimum on a screen 50 cm behind the slits is 5.0 mm. What is the wavelength of the light used in this experiment?

[20] total marks