CHAPTER 9 FREESTANDING PRACTICE QUESTIONS

1. A 2 kg mass is attached to a massless, 0.5 m string and is used as a simple pendulum by extending it to an angle $\theta = 5°$ and allowing it to oscillate. Which of the following changes will increase the period of the pendulum?

A) Replacing the mass with a 1 kg mass
B) Changing the initial extension of the pendulum to a 10° angle
C) Replacing the string with a 0.25 m string
D) Moving the pendulum to the surface of the moon

2. A 100 kg bungee jumper attached to a bungee cord jumps off a bridge. The bungee cord stretches and the man reaches the lowest spot in his descent before beginning to rise. The force of the stretched bungee cord can be approximated using Hooke's law, where the value of the spring constant is replaced by an elasticity constant, in this case, 100 kg/s^2. If the cord is stretched by 30 m at the lowest spot of the man's descent, then what his acceleration at the lowest spot?

A) 0 m/s^2
B) 10 m/s^2
C) 20 m/s^2
D) 30 m/s^2

3. A physics student is doing a wave experiment with a 1 m long cord stretched across the lab table. In the middle of the cord, a 1 cm section is painted red. A specially designed machine creates vibrations so that a sine wave will travel on the cord from the east side of the table to the west side of the table. The vibrations of the sine wave are parallel to the table and peak at the north side of the table and the south side of the table. Which of the following best describes the motion of the red spot?

A) The spot moves from east to west along the sine wave.
B) The spot moves from west to east along the sine wave.
C) The spot remains in a fixed location on the table.
D) The spot vibrates between the north side and south side of the table.

4. A parent is pushing a young child on a swing at the playground. When the parent stops pushing, the child's swinging motion continues without assistance. Assume the chain on the swing has negligible mass and any friction is negligible. Which of the following would need to be true in order for the child's motion on the swing to be considered simple harmonic motion?

I. The mass of the child is not too large
II. The child is not swinging too high, so the angle between the swing and the vertical is not too big
III. The tension in the chain of the swing is negligible

A) I only
B) II only
C) I and III
D) I, II, and III

5. Immediately before a performance, a musician breaks a guitar string. The only string available to repair the guitar is twice the linear density of the string normally used. How can the musician adjust the new string so that it will still have the correct frequency? (Note: $v = (\text{Tension}/\mu)^{0.5}$, where μ = linear mass density.)

A) The tension of the new string should be twice the tension of the old string.
B) The tension of the new string should be half the tension of the old string.
C) The amplitude of the new string should be twice the amplitude of the old string.
D) The amplitude of the new string should be half the amplitude of the old string.

6. The speed of a 2 kg mass on a spring is 4 m/s as it passes through its equilibrium position. What is its frequency if the amplitude is 2 m?

A) 1/5 Hz
B) 1/3 Hz
C) 3 Hz
D) 5 Hz

7. The distance from a trough to a crest is 20 cm on a 3 m rope of 1 kg. If the tension in the rope is 3 N, what is the period? (Note: v = [tension/linear density]$^{0.5}$)

A) 1/15 s
B) 2/15 s
C) 15/2 s
D) 15 s