Questions on Simple Harmonic Motion*

1. How would you find the period of a pendulum?
2. How are frequency and period related?
3. Define the units of frequency.
4. If the period of an oscillation doubles, what happens to the frequency?
5. The frequency of middle C sound wave is 262 Hz. What period of oscillation produces this sound?
6. What is the period of oscillation if the frequency is 200 Hz?
7. What is the frequency of oscillation if the period is 1.2 s?
8. A cork fishing float bobs up and down 15 times per minute. What is period of oscillation in seconds? What is the frequency in Hertz?
9. The frequency of a local radio station is 89.3 MHz (M = mega = 10^6). What is the period of oscillation of the electromagnetic waves of this signal?
10. What is the period of the second hand of a watch for going all the way around once?
11. Define amplitude and maximum amplitude.
12. Suppose a vibrating guitar string moves a total distance of 1.0 cm from it’s maximum in one direction to the maximum in the other direction. What is the maximum amplitude for this motion?
13. Suppose a clarinet reed vibrates with a maximum amplitude of 0.04 cm. How far does it travel in a complete cycle (all the way back to its starting point)?
14. What does the phase of an oscillation tell you about its motion?
15. A phase of 270 degrees is how many radians?
16. A phase of 200 degrees is how many radians?
17. Define simple harmonic motion.
18. What is the difference between simple harmonic motion and damped, driven harmonic motion?
19. When does simple harmonic motion occur (what kind of force is needed)?
20. What is a non-linear restoring force?
21. What happens to the period of a pendulum if the string is longer?
22. What happens to the period of a pendulum if the mass is larger?
23. Which has the larger period, a stiff spring or a soft spring?
24. Which has the larger frequency, a stiff spring or a soft spring?
25. Which has the larger period, a small mass hanging from a spring or a large mass hanging from the same spring?
26. What kind of clarinet reed would more easily play low frequency notes, a stiff reed or a soft reed (assuming the mass is the same)? Explain your thinking.
27. What kind of saxophone reed would more easily play low frequency notes, a thick, heavy reed or a thin, light reed (assuming the stiffness is the same)? Explain your thinking.
28. The mathematical description of SHM is given by \( y(t) = A\cos(2\pi ft + \phi) \). Explain what each of the terms (A, cos, \( \pi \), f, t, \( \phi \)) represent in the motion of a mass on a spring.

* Many of these ideas came from *Conceptual Physics* 11th Ed. by Paul Hewitt (Addison Wesley, 2011).