

AP Physics C
HW Set 1
Simple Harmonic Motion

1. In an electric shaver, the blade moves back and forth over a distance of 2.0 [mm]. The motion is simple harmonic, with frequency 94 [Hz].
 - a. Find the amplitude.
 - b. Find the maximum blade speed.
 - c. Find the magnitude of the maximum blade acceleration.

2. A 0.15 kg body undergoes simple harmonic motion of amplitude 8.7 [cm] and period 0.20 [s].
 - a. What is the magnitude of the maximum force acting on it?
 - b. If the oscillations are produced by a spring, what is the spring constant?

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4. A block is on a horizontal surface (a shake table) that is moving back and forth horizontally with simple harmonic motion of frequency 2.4 [Hz]. The coefficient of static friction between block and surface is 0.36 [1]. How great can the amplitude of the motion be if the block is not to slip along the surface?

5. The velocity of a rocket is $v(t) = 4t^3$ [m/s]. How far does the rocket travel from time 2 [s] to 8 [s]?

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AP FRQs

7. 2017 #1 (Graphical Analysis)
8. 2006 #2 (Linearizing Graphs)
9. 2007 #3 (Graphical Analysis)

Extra Problem(s)

- E1. A performer, seated on a trapeze, is swinging back and forth with a period of 8.55 [s]. If she stands up, thus raising the center of mass of the trapeze + performer system by 25.0 [cm], what will be the new period of the system? Treat trapeze + performer as a simple pendulum.**
- E2. An automobile is mounted on four identical vertical springs. The springs of a certain car are adjusted so that the oscillations have a frequency of 4 [Hz].**
- a. What is the spring constant of each spring if the mass of the car is 1450 [kg] and the weight is evenly distributed over the springs?**
 - b. What will be the vibration frequency if five passengers, averaging 68 [kg] each, ride in the car with an even distribution of mass?**

HW Set 1 Answers

- 1a. 1 [mm]
1a. 0.591 [m/s]
1a. 349 [m/s²]
- 2a. 12.9 [N]
2b. 148.8 [N/m]
3. Deleted
4. 0.0155 [m]
5. 4080 [m]
6. Deleted
7. Will review in class
8. Will review in class
9. Deleted

Extra Problems

- E1. 8.49 [s]
- E2 a. 2.29×10^5 [N/m]
E2 b. 3.6 [Hz]