

## PHYSICS 232 – SAMPLE TEST # 1

### Problem 1

You are given a body of mass  $M = 10$  kg which is oscillating in SHM along the  $x$ -axis, with a period  $T = 1.5$  s and amplitude  $A = 0.6$  m. The equilibrium position is at  $x = 0$ . Suppose that at time  $t = 0$  the body is going through the equilibrium position moving in the positive  $x$ -direction.

- (a) At what time will the body pass through the point  $x = 0.3$  m moving in the negative  $x$ -direction?
- (b) What will be its speed, acceleration, kinetic energy and potential energy at that point ( $x = 0.3$  m)?

### Problem 2

A string of length  $L = 80$  cm and mass  $M = 18$  g is attached to a vibrator of frequency  $f = 250$  Hz at one end. The other end of the string is fixed and the string is kept under tension. The vibrator produces a transverse wave in the string of amplitude  $A = 3$  mm which propagates with speed  $v = 16$  m/s. Assume that the energy of the wave is absorbed at the fixed end, so no standing waves form.

- (a) What is the tension in the string?
- (b) What is the maximum transverse speed of a point on the string?
- (c) What is the average power transmitted by the wave?

### Problem 3

An open pipe of length  $L = 66$  cm vibrates in the third harmonic with frequency  $f = 800$  Hz.

- (a) Use this information to calculate the speed of sound.
- (b) What is the distance from the center of the pipe to the nearest pressure node?
- (c) What is the length of the shortest stopped pipe that has fundamental frequency  $f = 800$  Hz?

### Problem 4

The howler monkey is the loudest land animal and can be heard up to a distance of 5 km (in other words, at 5 km the intensity level is 0 dB). Assume that the acoustic output is uniform in all directions.

- (a) What is the total acoustic power emitted by a howler?
- (b) At which distance is the intensity level of a howler's call 40 dB?
- (c) A chorus of five howlers call at the same time. What is the largest distance at which the chorus can be heard?