General Physics II — Practice Quiz (1 Hour)

Name: _____

1. **SHM - mass on a spring**
   A 0.30 kg mass oscillates on a horizontal spring with $k = 120\,\text{N/m}$. Its amplitude is $A = 4.0\,\text{cm}$.

   (a) Find ω and T.

   (b) Find the maximum acceleration.

   (c) Find the total mechanical energy of the motion.

2. **Traveling waves**
   A transverse wave is described by

   $$y(x,t) = (1.5\,\text{cm})\sin[(2.5\,\text{rad/m})\,x + (20\,\text{rad/s})\,t]\,.$$

   (a) What direction does this wave travel (positive or negative x)? Briefly explain.

   (b) Find λ, f, and v.

   (c) What is the displacement at $x = 0.80\,\text{m}$ and $t = 0.10\,\text{s}$?

3. **Sound levels**
   At a certain location, the sound intensity is measured to be $I = 3.2 \times 10^{-6}\,\text{W/m}^2$.

   (a) What is the sound level β in dB?

   (b) Another location is 12 dB louder. By what factor is the intensity larger there?

4. **Doppler effect**
   A mosquito produces a tone of 600 Hz as it flies in a straight line toward you at 3.5 m/s. Assume you are stationary.

   (a) What frequency do you hear as it approaches?

   (b) If the mosquito then flies away at the same speed, what frequency do you hear?

5. **Beats**
   You play two notes on a keyboard: $f_1 = 512\,\text{Hz}$ and an unknown f_2. You hear 6 beats/s.

   (a) What are the two possible values of f_2?

   (b) You increase the frequescy of f_2 and you now hear 8 beats/s. Which one of your possible frequencies in part (a) was the correct one?

6. **Standing waves on a string**
A guitar string of length $L = 0.65\,\text{m}$ is fixed at both ends. Its linear density is $\mu = 1.8 \times 10^{-3}\,\text{kg/m}$ and the tension is $T = 95\,\text{N}$.

   (a) Find the wave speed.

   (b) Find the fundamental frequency.

   (c) What tension would be needed to raise the fundamental frequency by a factor of 2 (keeping L and μ the same)?

7. **Standing sound waves in tubes**
A tube of length $L = 0.40\,\text{m}$ resonates with a $430\,\text{Hz}$ tone at its *lowest* resonance.

   (a) Is the tube more consistent with being open-open or open-closed? Justify using the fundamental frequency formulas.

   (b) Based on your choice, estimate the speed of sound implied by these data.

   (c) Predict the next resonance frequency for that same tube.