

Physics 152 First Exam Review Suggestions

What's Covered: This exam will cover the topics of Simple Harmonic Motion, Waves, and Light (which includes the behavior of light, mirrors, Snell's Law, and thin lenses). *You will also be expected to understand the math topics that are needed to display a knowledge of topics included on this exam (use of geometry, trigonometry, algebra with fractions, and the quadratic equation).*

Topics/Questions for Review – The exam will check your knowledge on any or all of the following:

Harmonic Motion

Can you define (temporal) period, (temporal) frequency, (temporal) angular frequency, and how they are related to each other? Can you define initial phase, amplitude, and displacement from equilibrium?

Do you know what factors determine the (temporal) period and (temporal) frequency of something in simple harmonic motion?

If you were given a data set, either in table or graph form, of an object in simple harmonic motion, would you be able to find the amplitude, angular frequency, and initial phase of the motion.

If you were given a description of the initial conditions of an oscillating mass on a spring, such as the displacement and velocity, could you find the equation that describes its motion including amplitude, angular frequency, and initial phase?

If you know the mass of the spring in a spring-mass system, can you find the effective mass of the system? Conversely, if you know (or can calculate from the angular frequency and spring constant) the effective mass of the system, can you find the mass of the spring?

Waves

Can you describe the difference between longitudinal waves and transverse waves?

Can you define period (temporal & spatial), frequency (temporal & spatial), angular frequency (temporal & spatial), and how they are related to each other? Can you define initial phase, amplitude, and displacement from equilibrium?

Do you know what factors determine the (temporal) period, the (spatial) period, and the wave speed of a wave?

If you were given the equation of motion describing a harmonic wave, would you be able to find the amplitude, wavelength, frequency, and wave speed of the wave. Conversely, if you were given the amplitude, wavelength, frequency, and wave speed, could you write the equation of motion describing the displacement of the wave?

Can you describe (and use) what happens to a wave or wave pulse when it interacts with a boundary, either fixed or free?

Can you draw the resultant wave when two (or more) waves or wave pulses overlap (interfere) with each other?

Light – Mirrors

Can you use the ray model of light to describe how light travels before and after it interacts with matter, such as mirrors or transparent material?

Can you use the law of reflection to determine the angle reflected light rays make with a mirror (either the mirror surface or the normal to the surface)?

Light – Lenses

Can you use the thin lens equation to find the object distance, the image distance, and/or the focal length of a lens?

Can you find the magnification and orientation of an image, and use the sign convention to determine whether the image is real or virtual (i.e., what does it mean if the image distance is positive? Negative?)?

Can you draw a ray diagram of the principal rays to find the location of an image, given the location of the object? Conversely, can you draw a ray diagram to find the location of the object, given the location of the image. Finally, given the location and sizes of the object and the image, can you draw a ray diagram to find the location and focal length of the lens?

Light – Refraction & Snell's Law

Do you know the definition of index of refraction?

What happens to a ray of light when it travels from one transparent material to a different transparent material with a different index of refraction? Can you use Snell's Law to find angles the light ray makes (either with the interface surface or the normal to the surface), or to find the refractive index of one of the materials?

Do you understand the conditions in which a light ray can undergo total internal reflection (TIR)? Can you find the incident angle where TIR first occurs?