

IPSH WAVES UNIT EXAM, STUDY GUIDE

This is a ~60-point exam, part scantron, part short answer. You must bring a no.2 pencil and a scientific calculator. No notecards are allowed on this exam. You will be give an equation sheet.

- Identify the characteristics of waves (crest & trough/compression & rarefaction, wavelength, amplitude) for both transverse and longitudinal waves.
- Know the differences between transverse, longitudinal, physical (mechanical), and electromagnetic waves.
- How is energy travel direction and particle motion different when comparing transverse and longitudinal waves?
- Calculate and conceptually understand frequency and period.
- Be able to use the equation: wave speed = frequency x wavelength.
- Conceptually understand how wave speed, frequency, and wavelength are related.
- Distinguish between reflection, refraction, and diffraction.
- Understand the Law of Reflection and be able to label incident ray, reflected ray, normal, incident angle, and reflected angle.
- Understand how light can be refracted and be able to label a diagram.
- Review wkst *Reflection and Refraction Exercises*.
- Be able to explain how concave and convex lenses refract light and how mirrors reflect light.
- How are virtual images different from real images?
- Be able to draw the product of interfering waves. Destructive vs. constructive?
- Know the speed of sound (at room temp) and the speed of light (in a vacuum).
- How does the speed of sound and light change in different mediums?
- How is pitch related to wavelength, frequency, and tension?
- How is amplitude related to loudness or brightness?
- Be able to mathematically determine the wavelength of a sound wave produced in closed and opened tubes.
- Be able to label and explain the functions of both the eye and ear.
- How does the ear detect loudness and pitch? How do we maintain balance?
- Be able to explain and apply the Doppler effect.
- What is light? What is white light?
- Know the order of the electromagnetic spectrum and how wavelength and frequency change.

- Understand and be able to explain the differences between convex and concave mirrors and lenses, real vs virtual images.
 - Be able to use the appropriate equations to find an image and describe its quality, including the image height.
 - Know the order of color in the visible spectrum.
 - Know how colors relate to wavelength and frequency.
 - Know what the different types of electromagnetic radiation do.
 - Be able to do calculations using the speed of light and sound.
 - How are opaque and transparent objects different?
 - What is pigment and how does it effect what we see?
 - Know both the primary and secondary colors of light.
 - Be able to do "color addition" and "color subtraction."
 - What is the "blind spot" in our eyes and why do we have it?
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PRACTICE PROBLEMS:

1. If a water wave vibrates up and down three times each second and the distance between wave crests is 2m, what are...
 - A. the wave's frequency?
 - B. its wavelength?
 - C. its wave speed?
2. What is the approximate distance of a thunderstorm when you note a 3 second delay between the flash of lightning and the sound of the thunder? (Hint: what's the speed of sound?)
3. Match the colored objects on the left to the way the colors are produced on the right.

A. Yellow daffodil (flower)	1. Interference
B. Blue sky	2. Diffraction
C. Rainbow	3. Selective reflection
	4. Refraction
	5. Scattering
4. A 2cm tall object stands 5cm in front of a concave mirror with a focal length of 10cm. Find the image and describe its quality (image distance, image magnification, real or virtual, upright or inverted). How tall is the image?

ANSWERS: 1. $f=3\text{Hz}$, $\lambda=2\text{m}$, $v=6\text{m/s}$; 2. $d=1020\text{m}$; 3. A=3, B=5, C=4; 4. Virtual image, 10cm from mirror, 2 times magnification and upright, image is 4cm tall.