

# Physics 2020 Exam 4 Review Questions

## Dr. Luttermoser's Class

Note that your final exam is comprehensive. I consider half of the Final as Exam 4 which covers material since Exam 3. For the final, study items from all 4 review sheets: **Exam 1 Review**, **Exam 2 Review**, **Exam 3 Review**, and **Exam 4 Review** (this sheet).

1. What is Huygen's Principle?
  2. What is the difference between specular and diffuse reflection? What is the Law of Reflection? What is reflectivity and how is it related to the albedo of a surface? What are three things that can happen to photon as it encounters a surface?
  3. How does the velocity of light change as it goes from one medium to another? What is the index of refraction? What is Snell's Law? A spectral line has a wavelength of  $2802.87 \text{ \AA}$  in the vacuum of space, what is its air wavelength?
  4. What is meant by dispersion and how is it related to spectral resolution? Name 2 techniques (*i.e.*, devices) for dispersing light. Describe how a rainbow forms. Why are there sometimes secondary rainbows along with the primary bow?
  5. Describe how fiber optics work.
  6. Review the summary of Chapter 22 in the textbook and learn the definition of all boldface terms in this chapter.
  7. Review Examples XI-3 (Serway & Vuille Textbook Problem: SV 22.29, dispersion) and XI-4 (SV 22.38, fiber optics) in the class notes. Make sure you understand CAPA Problems 4.2 (total internal reflection) and 4.3 (speed of light in matter). Finally, make sure you understand how to do the Supplemental Homework Problem Set 4: 1 (SV 22.9, refraction in water) and 3 (22.28, dispersion).
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8. Describe the similarities and differences between plane, concave, and convex mirrors.
  9. Know how to use the thin lens/mirror equation and the magnification equation (**note that you will not be asked to perform ray tracing on the final**).
  10. What is meant by the thin lens approximation? Compare and contrast converging and diverging lenses.
  11. Review the summary of Chapter 23 in the textbook and learn the definition of all boldface terms in this chapter.

- Review Examples XII-1 (thin mirror equation) and XII-2 (SV 23.37, thin lens equation) in the class notes. Make sure you understand CAPA Problems 4.4 (thin mirror equation), 4.5 (lens equation and similar triangles), and 4.6 (thin lens equation). Finally, make sure you understand how to do the Supplemental Homework Problem Set 4: 5 (reflection equations) and 6 (SV 23.33, thin lens equation).
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- What is the difference between coherent and incoherent light? How does a laser work and what do the letters in the word “laser” represent?
  - Describe Young’s experiment.
  - What is the difference between constructive and destructive interference? What is a “fringe” in an interference pattern?
  - What is meant by the diffraction of light? How is diffraction similar to interference? How are they different?
  - Describe how a diffraction grating works.
  - What is meant by the polarization of light?
  - What is meant by the scattering of light? Describe Rayleigh scattering. Why is the sky blue and sunsets and sunrises red?
  - Review the summary of Chapter 24 in the textbook and learn the definition of all boldface terms in this chapter.
  - Review Examples XIII-1 (SV 24.3, double-slit interference), XIII-2 (SV 24.20, interference of thin films), and XIII-3 (SV 24.32: single-slit diffraction) from the notes.
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- How are cameras, telescopes, and microscopes similar?
- What is the *f-number*? What does this measure?
- Describe how the human eye works. What are some common defects of the eye?
- What is the light gathering power of a telescope? How is the magnification of a telescope determined?
- What is Rayleigh’s criterion? What is the limiting spatial resolution of a telescope? Why is this limiting resolution seldomly achieved for telescopes on Earth?
- What is the grating equation? How can you determine the spectral resolution of a grating?
- Review the summary of Chapter 25 in the textbook and learn the definition of all boldface terms in this chapter.

29. Review Examples XIV-2 (SV 25.37, spatial resolving power) and XIII-3 (spectroscopic gratings) from the notes. Make sure you understand CAPA Problems 4.7 (spectroscopic gratings) and 4.8 (spatial resolving power). Finally, make sure you understand how to do the Supplemental Homework Problem Set 4: 7 (SV 25.25, microscopes), 8 (SV 25.44, angular resolution), and 9 (SV 24.40, diffraction gratings).