

Physics 2205
Practice for Exam 3

7 December, 1999

The final exam will be cumulative, and will include approximately 12 multiple-choice questions and 4 free-form questions. About 35% of the exam will cover material from Chapters 23, 24, and 25. The questions below are designed to give an idea of what questions on new material might look like. The equation sheet will include useful constants like the index of refraction in air and water and the speeds of light and sound.

1. Sunlight hits the surface of a deep lake at an incident angle of 50° . If the lake is 450 m deep, how long does the light take to reach the bottom?

- A) 1.5×10^{-6} sec
- B) 2.0×10^{-6} sec
- C) 2.4×10^{-6} sec
- D) 3.0×10^{-6} sec
- E) none of the above

2. White light passes through a triangular glass prism so that it enters one face and exits an adjacent face. Which of the following statements is true?

- A) Red light will be deflected less than violet light.
- B) Red light will be deflected more than violet light.
- C) All wavelengths will exit at the same angle.
- D) Red light will be absorbed by the glass.
- E) None of the above.

3. A laser of wavelength 640 nm passes through a slit of width $2.5 \mu\text{m}$. At what angle to either side will the first order minimum appear?

- A) 0°
- B) 7.5°
- C) 15°
- D) 23°
- E) none of the above

4. Brewster's angle from an unknown material is measured to be 59° when the material is placed in air. What is the index of refraction of the material?

- A) 0.52
- B) 0.60
- C) 1.66
- D) 1.94
- E) none of the above

5. If a telescope mirror has an f-ratio of 4.5 and a focal length of 1.8 m, what is its effective resolution at a wavelength of 650 nm?

- A) 3.0×10^{-7} radians
- B) 4.4×10^{-7} radians
- C) 1.1×10^{-6} radians
- D) 2.0×10^{-6} radians
- E) none of the above

6. An object that is 1 m tall appears 2 m in front of a convex (diverging) mirror with a focal length of 0.5 m.

- a) Find the location of the image.
- b) Find the height of the image.
- c) Make a ray tracing to illustrate the formation of an image. (You might want to do this first.)

Answers: 1. C, 2. A, 3. C, 4. C, 5. D
6. (a) -0.4 m, (b) 0.2 m (upright), (c) see Fig 23-17 in text.