

Physics 112, spring 2014 Exam 3 40

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RULES

You may use an equation sheet with whatever you want on both sides, you may not use a tablet or a smartphone or a laptop as a calculator. Do not forget to include direction in all answers. Please return the test to me. Write all your answers on a separate piece of paper. Paper and staplers will be provided. You may bring one sheet of equations and one sheet with sign conventions

Problems

1:) A professor returns home after a long day at work and sits down exactly 5 meters away from a pair of noisy macaws. The macaws are separated by 1 meter. Each macaw begins squawking at a frequency of 2000 Hz and the sound travels at 350 m/s towards the professor. What is the wavelength of this sound? What is the angle and distance the professor should move to along the wall he is sitting at to get away from the noise? (10 pts)

2:) An object is placed 10 meters from a concave lens with a focal length of 4 meters. Where is the image formed? What is its magnification? Is this a real or virtual image. Draw a ray diagram to support your conclusions. (10 pts)

3:) A gold coin is placed at the bottom of water in a pond one meter deep. How far below the surface does it appear to be to an observer looking straight down at it? (5 pts)

4:) 500 nm light is incident on a slab of quartz with an index of refraction of 1.5. What is the minimum thickness of this quartz that will have no reflection of this light? (5 pts)

5:) Light is incident with the normal of water with an angle of 45 degrees, What is the angle the light makes with it in the water ($n=1.33$), what is the speed of light in this water, what is its wavelength in water if the light is 500nm in air? (6 pts)

6:) What is the energy of an x-ray photon (frequency = $3 \times 10^{15} \text{ Hz}$). $h=6.626 \times 10^{-34} \text{ Js}$ What is its wavelength. (4 pts)