

[50 points total]

“Journal” questions:

- Have you ever noticed any physics (or science or math or technology if you cannot recall a physics example) issue/idea/result presented incorrectly in the general media or popular press? In a non-science course? What was it? What, if anything, should be done about this type of problem? Is it a problem? Why or why not?
 - Any comments about this week’s activities? Course content? Assignment? Lab?
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1. (From Towne P4-4, pg 81) Calculate the rms values of p , ξ , $\dot{\xi}$, and s in air at standard temperature and pressure for a sinusoidal wave of frequency $\nu = 1000 \text{ sec}^{-1}$ and average intensity $\bar{i} = 10^{-12} \text{ W/m}^2$ [10]
2. (From Towne P4-6, pg 82) Assume that the displacement amplitude of a vibrating piston is independent of the medium in which it is operating.
 - (a) Compare the power outputs of the piston in water and air. [5]
 - (b) If the piston is under water and parallel to a water-air surface, compare the intensity of the wave transmitted into the air with the intensity of the wave obtained when the piston is operating directly in air. [5]
3. (From Towne P4-9, pg 82) A room having a volume of 1000 m^3 is filled with a sound wave of intensity level 60 db.
 - (a) Estimate the total energy present. [5]
 - (b) At what intensity level would a total energy of 1 calorie be achieved? [5]
4. (From Towne P6-4, pg 109) Show that Maxwell’s equations permit a solution in which all the components of \mathbf{E} and \mathbf{H} vanish identically everywhere except for: [10]
 - (a) E_z and H_y
 - (b) E_x and H_z

Describe the situation represented by each of these solutions.

5. (From Towne P7-4, pg 131) In optical systems which involve lenses, a loss of intensity is encountered due to reflection at the lens surfaces. Assume a relative index of refraction of 1.5 and calculate the percent loss in intensity which occurs at each passage from air to glass or glass to air. (Note: The theory of image formation by a lens assumes that all rays are nearly parallel to the axis of the lens. Consequently it is justified to assume normal incidence in this problem.) [10]
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Headstart for next week, Week 06, starting Monday 2004/10/18:

- Mid term test Friday October 22, up to and including material from Chapter 6.
- Read Chapter 7 “Analytical Description of Polarized Electromagnetic Plane Waves” in Towne
 - Section 7-6 “Types of polarization”
 - Section 7-7 “Natural light”
 - Section 7-8 “Energy relations for the general progressive plane wave”
 - Section 7-9 “Reflections by a thin film”