Chapter 33 End-of-Chapter Problems

Halliday & Resnick, 10th Edition

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Hit me where it Matters

1 Problem 1

A certain helium-neon laser emits red light in a narrow band of wavelengths centered at 632.8 nm and with a "wavelength width" (such as on the scale of Fig. 33-1) of 0.0100 nm. What is the corresponding "frequency width" for the emission?

1.1 Solution

Use the traditional formula for the wavelength. Here, the speed of the wave is the speed of light. We can treat this like an error and raw value issue.

$$v = \lambda f \rightarrow f = \frac{c}{\lambda} \tag{1}$$

$$\frac{\delta f}{f} = \frac{\delta \lambda}{\lambda} \tag{2}$$

$$\delta f = f * \frac{\delta \lambda}{\lambda} = c * \frac{\delta \lambda}{\lambda^2} \tag{3}$$

$$= 2.998 \times 10^8 \,\mathrm{m/s} * \frac{0.0100\,\mathrm{nm}}{(632.8\,\mathrm{nm})^2} \tag{4}$$

$$= \boxed{7.49\,\mathrm{GHz}} \tag{5}$$

2 Problem 5

2.1 Solution

3 Problem 7

3.1 Solution

4 Problem 9

4.1 Solution

5 Problem 11

5.1 Solution

6 Problem 13

6.1 Solution

7 Problem 19

7.1 Solution

8 Problem 21

8.1 Solution

9 Problem 29

9.1 Solution

10 Problem 33

10.1 Solution

11 Problem 37

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