

## Holt Physics

**Problem 14A****ELECTROMAGNETIC WAVES****PROBLEM**

The atoms in an  $\text{HCl}$  molecule vibrate (like two charged balls attached to the ends of a spring). If the wavelength of the emitted electromagnetic wave is  $3.75 \mu\text{m}$ , what is the frequency of the vibrations?

**SOLUTION**

Given  $\lambda = 3.75 \times 10^{-6} \text{ m}$   
 $c = 3.00 \times 10^8 \text{ m/s}$

Unknown  $f = ?$

Use the wave-speed equation, and solve for  $\lambda$ .

$$c = f\lambda$$

$$f = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{3.75 \times 10^{-6} \text{ m}} = \boxed{8.00 \times 10^{13} \text{ Hz}}$$

**ADDITIONAL PRACTICE**

1. New-generation cordless phones use a  $9.00 \times 10^2 \text{ MHz}$  frequency and can be operated up to 60.0 m from their base. How many wavelengths of the electromagnetic waves can fit between your car and a base 60.0 m away?
2. The highest directly measured frequency is  $3.28 \times 10^{14} \text{ Hz}$ , corresponding to one of the transitions in cadmium-112. How many wavelengths of electromagnetic waves with this frequency could fit across a dot on a book page? Assume the dot is  $2.80 \times 10^{-3} \text{ m}$  in diameter.
3. Commercial trucks cause about 18 000 lane-change and merging accidents per year in the United States. To prevent many of them, a warning system covering blind spots is being developed. The system uses electromagnetic waves of frequency  $2.40 \times 10^{10} \text{ Hz}$ . What is the wavelength of these waves?
4. A typical compact disc stores information in tiny pits on the disc's surface. A typical pit size is 1.2  $\mu\text{m}$ . What is the frequency of electromagnetic waves that have a wavelength equal to the typical CD pit size?
5. A new architectural technique detects the differences in electromagnetic waves emitted by humans and by weapons made of metal, plastic, or ceramic. One possible range of wavelengths used with this technique is from 2.0 mm to 3.0 mm. Calculate the associated range of frequencies.
6. The U.S. Army's heaviest landspike is almost 17 m across and is transported on a special trailer. The sound is produced by an electromagnetic coil that can generate a minimum frequency of 30.8 Hz. What is the wavelength of these electromagnetic waves?

# Holt Physics Problem 14a Electromagnetic Waves Answers

**L Darling-Hammond**



## **Holt Physics Problem 14a Electromagnetic Waves Answers:**

**Holt Physics** Raymond A. Serway, 2002      Monthly Index of Russian Accessions , 1963      **Monthly Index of Russian Accessions** Library of Congress. Processing Department, 1963      **Proceedings of the IRE.** Institute of Radio Engineers, 1960      **Proceedings of the IRE.** , 1960      *Problem Workbook* Holt Rinehart & Winston, Holt, Rinehart and Winston Staff, 1998-04      **Holt Physics Teaching Resources** , 2005      **Reteaching Worksheets with Answer Key** Holt Rinehart & Winston, Holt, Rinehart and Winston Staff, 1997-01-01      *The Gateway to Understanding* Matthew M. Radmanesh, 2005

The subject of waves particularly electronic waves has been piecemealed to a point where every text covers only a small part of the subject and leaves the rest to someone else to develop At the present moment there is no coherent and one stop approach that covers this material from A to Z and presents it in such a way that an average person can wrap his wits around it There has been a need for such a book for quite some time Over the last hundred years the field of electronic waves initially placed on a firm ground by James Clerk Maxwell has grown and blossomed magnificently primarily in the area of applications to match up with the mathematical sophistication with which Maxwell s equations was presented Today almost anyone in our highly technological society strives toward a higher understanding of the inner workings of electronic equipment and desires to know the major principles behind this fascinating form of energy called electricity and electronic waves and yet most electrical books present the basic concepts with so much complexity and filled with so many mathematical equations that the average individual has given up on the subject and perforce has decided to retire to the sideline to be a spectator on the subject In other words their hope has been dashed aside and their dream of a higher understanding has not been fulfilled in any of the modern texts on electricity The present work is the culmination of many years of study observation and pondering on the dilemmas and enigmas of the physical universe in which we live with particular attention to electronic waves In this work the origin of electronic waves and the resultant understandings that has been extracted from years of study of this sophisticated and at times incomprehensible subject is presented with many lucid examples and applications Within the confines of this book one is given a chance for the first time to take an in depth look and inspect first hand one of the most dynamic fields of study that has ever been developed in the history of mankind on this planet The basics are laid in simple terms and clear explanations express the powerful principles lucidly and dynamically providing an unforgettable impression in the reader s mind Rather than looking into the complicated mathematical equations for solutions Man s long search for answers to the riddles of the technical world will finally be amply rewarded through the pages of this book By avoiding undue complexities the reader will achieve occum s razor doctrine and will be actually traveling in the direction of the actual why and thus be able to put his thoughts on the right track for all the future problems forthcoming It is an interestingly uncommon book intended to lift the aura of black magic surrounding the world of sciences particularly electricity to enlighten and demystify the subject of sciences in the minds of ordinary individuals It is written

primarily for the technical as well as the non technical man and intends to serve several classes of our society a The professional engineers b The technical inventors c The technically versed individuals d The college professors e The college senior and graduate students f The interested but non technical individuals and g The business and industrial leaders The scientist armed with the tools solidly laid out in this book will be well equipped to understand scientific journals and handle the problems of work a day world of sciences particularly testing analysis and design of devices circuits and systems dealing with electric magnetic or electronic wave phenomena The increased depth of knowledge will allow one to achieve one s objectives with a much higher probability of success in this rapidly advancing subject      **Physics Grade 11 Laboratory Kit**  
Holt Rinehart & Winston,Hrw,2006-01-01

## Decoding **Holt Physics Problem 14a Electromagnetic Waves Answers**: Revealing the Captivating Potential of Verbal Expression

In a period characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its ability to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Holt Physics Problem 14a Electromagnetic Waves Answers**," a mesmerizing literary creation penned with a celebrated wordsmith, readers embark on an enlightening odyssey, unraveling the intricate significance of language and its enduring impact on our lives. In this appraisal, we shall explore the book is central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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