PHYSICS

BOOKS - R G PUBLICATION

ELECTROMAGNETIC WAVES

Exercise

1. Why are infrared waves called heat waves?

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2. Out of the four Maxwell's equations, which equation establishes the non-existence of magnetic monople?

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3. Write Gauss's law for magnetism in the form of Maxwell's equation.

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4. The magnetic field of a plane electromagnetic wave is given by

$B_y = 5 \times 10^{-7} \sin\left(2\pi \times 10^8 t + \frac{2\pi}{3} x\right)$ tesla. Find wavelength

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5. The magnetic field of a plance electromagnetic wave is given by

$B_y = 5 \times 10^{-7} \sin\left(2\pi \times 10^8 t + \frac{2\pi}{3} x\right)$ tesla Find frequency.

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6. Write down the four Maxwell's equations.

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7. The electric field of an e.m. wave is given by

$E_y = 40 \sin\left(\frac{2\pi}{2} x - 2\pi \times 10^8 t\right)$ where E is in V/m, t in

seconds, and x is in meters. Find Propagation vector k

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8. The electric field of an e.m. wave is given by $E_y = 40\sin\left(\frac{2\pi}{2}x - 2\pi \times 10^8 t\right)$ where E is in V/m, t in seconds, and x is in meters. Find Wavelength λ

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9. The electric field of an e.m. wave is given by $E_y = 40\sin\left(\frac{2\pi}{2}x - 2\pi \times 10^8 t\right)$ where E is in V/m, t in seconds, and x is in meters. Find Frequency of the e.m. wave.

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10. How does a charge 'q' oscillating at certain frequency produce electromagnetic waves?

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11. What is demodulation? Why is satellite communication necessary for TV signal?

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12. What is the basic difference between amplitude modulation and frequency modulation?

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13. Write down the expression for the velocity of electromagnetic wave in a medium and heance find out an expression for the refractive index of the medium.

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14. What percentage of power of AM wave is carried by the side bands for modulation index m = 1?

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15. How is the critical frequency related to maximum electron density in the ionosphere?

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16. How does a microwave oven work?

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17. A plane EM wave moving with a velocity $3 \times 10^8 m/s$ has an electric field which oscillates sinusoidally with a frequency 2×10^{10}Hz and amplitude $48 V/m$. What is the amplitude of the oscillating magnetic field?

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18. Fill in the blanks

The speed of waves, according to Maxwell's equation, turned out to be very close to the speed of____.

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19. What is the frequency of yellow light , If it's wavelength is 580 nm?

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20. Fill in the blanks

Sound waves in air are _____longitudinal waves of compression and rarefraction.

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21. Fill in the blanks

The sun is an important source of ___light.

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22. ____are used in medicine to destroy cancer cells.

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23. What is the most important prediction to emerge from Maxwell's equation.

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24. What is the missing term is Ampere's Circuital law?

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25. What is conduction current.

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26. What is displacement current?

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27. Write the Ampere-Maxwell law.

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28. What typed of waves are used in telecommunication?

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29. Write the order of frequency range of the following.

Gamma rays

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30. Write the order of frequency range of the following.

Ultra violet rays

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31. Write the order of frequency range of the following.

Gamma rays

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32. What is radiation pressure.

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33. Write a short note on microwaves.

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34. What is green house effect?

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35. Write the wavelength range of a visible ray.

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36. What is visible light?

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37. Why do the electrostatic field lines not form closed loop?

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38. Give difference between displacement current and conduction current.

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39. What are radio wave? How they propagate?

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40. Name the different layer of earth's atmosphere.

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41. Why are microwave used in Radar?

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42. Which has highest wave length, r-rays, x-ray and micro wave?

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43. What is the frequency range of the visible portion of the electromagnetic spectrum?

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44. Arrange the following radiation in descending order of wave length: x-ray, infrared light, blue light, radio wave.

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45. Write down Maxwell's equations for steady electric field.

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46. What modification was made by Maxwell in Amper's circuital law.

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47. For long distance radio broadeast, we use short wave only. Why?

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48. State two properties of e.m wave.

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49. What oscillates in electro magnetic wave.

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50. Why sky wave are not used in television signals.

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51. Give the ratio of velocities of light rays of wave length $4000\overset{\circ}{A}$ and $8000\overset{\circ}{A}$ in vacuum.

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52. Draw a diagram for a linearly polarised electromagnetic wave, propagating in the z direction with the oscillating

electric field E along the x directions and the oscillating magnetic field B along the y direction.

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53. A plane electromagnetic wave of frequency 10MH tranvells in free space along the x-direction. At a particular pointy in space and time. $E = 2.7V/m$. What is B at this point?

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54. What are radio wave? How they propagate?

Watch Video Solution

55. What is infrared waves?

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56. Write about X-rays and how they are used as a dignostic tool in medicine.

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57. The magnetic field in a plane electromagnetic wave is given by $B_y = 3 \times 10^{-7} \sin\left(0.3 \times 10^2 x + 0.8 \times 10^{12} t\right)$ what is the wavelength and frequency of the wave.

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58. Why are microwave used in Radar?

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59. For long distance radio broadeast, we use short wave only. Why?

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60. Why satellites are used for long distance TV transmission.

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61. State and explain Maxwell's modification of Ampere's circuital law.

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62. Draw a diagram of Hertz experiment for producing electromagnetic wave.

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63. Explain the term

ground wave

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64. Explain the term

sky wave

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65. What is amplitude modulation? Explain with diagram.

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66. Calculate the peak value of electric and magnetic field produced by a radiation coming from a 100 watt bulb at a distance 3 cm.

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67. What is demodulation? Why is satellite communication necessary for TV signal?

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68. What is the source of emission of r-rays.

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69. Obtain an expression for velocity of electromagnetic wave.

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70. How are carrier wave produced?

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71. Discuss the mode of propagation of radio wave in atmosphere.

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72. Write the classification of electromagnetic waves according to frequency.

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73. Write a short note on ultraviolet rays. Describe how it in large quantities has harmful effects on human.

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74. Find the wavelength of elecltromagnetic waves of frequency 5×10^{19}H. Give its two applications.

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75. Give two characteristics of electromagnetic waves. Write the expression for the velocity of electromagnetic waves in terms of the permitivity and permeability of the medium.

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76. The electric field part of an electromagnetic wave is

$$\vec{E} = \{(3.1N/C)\cos[(1.8rad/m)y + (5.4 \times 10^6 rad/s)t]\}\hat{i}$$

What is the direction of propagation?

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77. The electric field part of an electromagnetic wave is

$$\vec{E} = \{(3.1N/C)\cos[(1.8rad/m)y + (5.4 \times 10^6 rad/s)t]\}\hat{i}$$

What is the wave length λ?

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78. The electric field part of an electromagnetic wave is

$$\vec{E} = \{(3.1N/C)\cos[(1.8rad/m)y + (5.4 \times 10^6 rad/s)t]\}\hat{i}$$

What is the frequency ν?

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79. Briefly describe the work of Maxwell and Hertz in the field of electromagnetic waves.

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80. Give a brief of electromagnetic wave. Write two examples of it.

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81. Write the characteristics of an electromagnetic.

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82. Write one use of each of the following

Microwaves

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83. Write one use of each of the following

U.V. rays

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84. Write one use of each of the following

Gamma rays

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85. Write one use of each of the following

X rays

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86. Describe the various region of atmosphere. How e.m. radiation interact them?

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87. A place of electro-magnetic wave of frequency 25 MHz travell in a free space along x-direction. At a particular point in space and time, $E = 6.3\hat{J}\overline{B}v/m$. What is $\overline{B}$ at that point?

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88. Suppose that the electric field amplitude of an electromagnetic wave is E0 =120N/C and that its frequency is ν=50.0MHz. Calculate B0

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89. The amplitude of electromagnetic wave is $E_0 = 120Nl_c$ and its frequency 50MHz . Find expression of E and B.

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90. In an electromagnetic wave, electric field oscillates sinusoidaly at frequecny 2×10^{10}Hz and amplitude

$40Vm^{-1}$. What is the wavelength of the wave and amplitude of the oscillating magnetic field?

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91. Draw a diagram of Hertz experiment for producing electromagnetic wave.

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92. In a electromagnetic wave, electric field oscillates with amplitude $20Vm^{-1}$. Calculate energy density of electric field.

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93. Why L-C circuit is considered as tank circuit?

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94. What are the various properties of elecrto magentic wave?

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95. What oscillates in electro magnetic wave.

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