PHYSICS

BOOKS - MODERN PUBLICATION

ELECTROMAGNETIC WAVES

Example

1. If absolute permittivity and permeability of free space are $\varepsilon_0 = 8 \cdot 85 \times 10^{-12} C^2 N^{-1} m^{-2}$ and

$\mu_0 = 4\pi \times 10^{-7} Ns^2 C^{-2}$.Caculate the velocity of electromagnetic waves?

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2. A plane e.m. wave of frequency 25MHz travels in space along the x-axis. At a prticular point in space and time the electric vector $\overrightarrow{E} = 6.3 Vm^{-1}\hat{j}$. Calculate $\overrightarrow{B}$ at this point.

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3. Show that during the charging of parallel plate capacitor,the rato of charging of a prallel plate capacitor,the rate of change of charge on each plate equals ε_0 times the rate of change of electric flux (ϕ_E) linked with it .What is the name given to the term $\varepsilon_0 \frac{d\phi_E}{dt}$?

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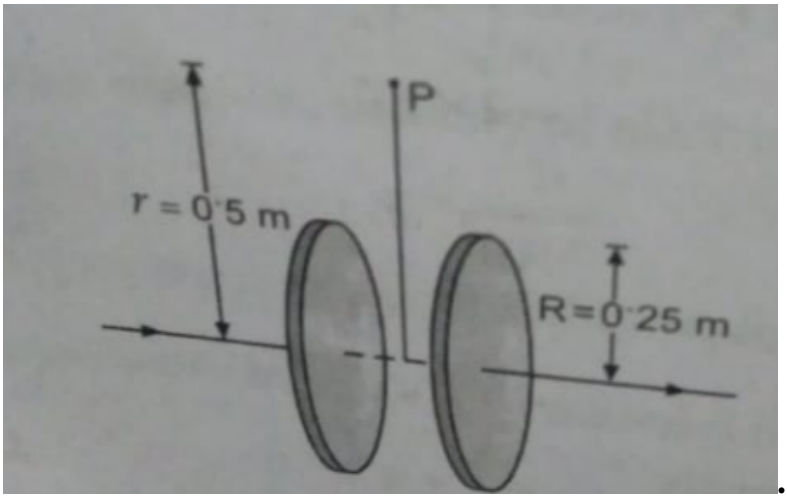
4. A capacitro is made of two circular plates each of radius $0 \cdot 25$m [Fig 1.09] .It is being

charged by an external source.What is the magnetic field at a piont P at adistnce of 0.5 m from the entre of the plates in the plane midway between them,when the charging current is 1 A?



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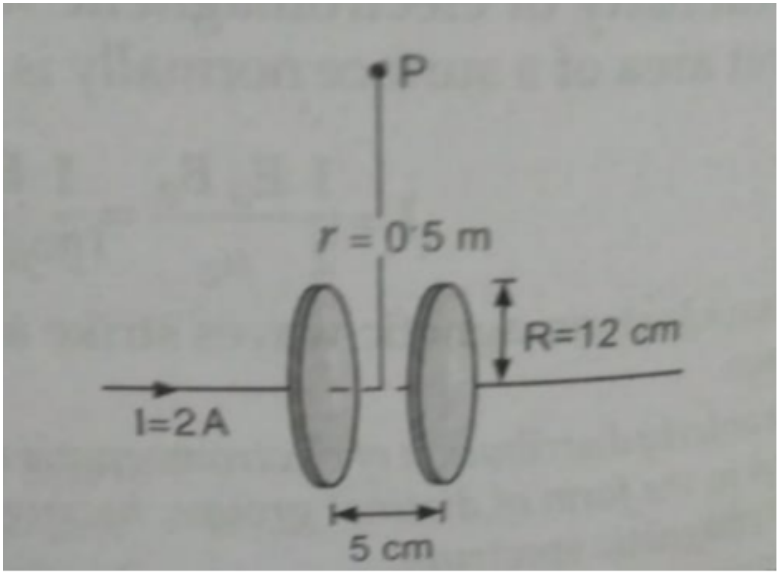
5. Fig.110 shows a capacitor made of two circular plates each of radius R=12 cm and separated by 5 cm.The capacitor is being charged by an external source (not shown in the figure).Use modified Ampere's circuital law to determine magnetic field at the point P at a distance of 0.5 m from the centre of the plats in the plane midway between them,when the

chargingg current is 2A?



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6. Green light of mercury has a wavelength $5 \cdot 5 \times 10^{-5} cm.$

What is the frequency in MHz and period in μs is vaccum?

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7. Green light of mercury has a wavelength $5 \cdot 5 \times 10^{-5} cm$.

What is the wavelength in glass,if refractive index of glasss is 1.5?Given,$c = 3 \times 10^{8} ms^{-1}$.

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8. Electromgnetic waves travel in a medium with a speed of $2 \times 10^8 ms^{-1}$.The relative permeability of the medium is 1.Find the relative permittiity.

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9. The amgnetic field in a plane electrmagnetic wave is given by

$B_y = 2 \times 10^{-7} \sin\left[0.5 \times 10^3 x + 1.5 \times 10^{11} t\right]$

(in T)

What is the waelength and frequency of the wave?

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10. The amgnetic field in a plane electrmagnetic wave is given by

$$B_y = 2 \times 10^{-7} \sin\left[0.5 \times 10^3 x + 1.5 \times 10^{11} t\right]$$

(in T)

Write an expression for the electric field.

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11. The electric field of a plane electromagnetic wave in vaccum is represented by

$E_x = 0, E_y = 0.5 \cos\left[2\pi \times 10^8 (t - x/c)\right]$

and $E_z = 0$.

What is the direction of propagation of electromagnetic waes?

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12. The amgnetic field in a plane electrmagnetic wave is given by

$B_y = 2 \times 10^{-7} \sin\left[0.5 \times 10^3 x + 1.5 \times 10^{11} t\right]\right]$

(in T)

What is the waelength and frequency of the wave?

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13. The amgnetic field in a plane electrmagnetic wave is given by

$B_y = 2 \times 10^{-7} \sin\left[0.5 \times 10^3 x + 1.5 \times 10^{11} t\right]$

(in T)

Write an expression for the electric field.

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14. A plane electromagnetic wave propagating in the X-direction has a wavelength of 6 mm.The electric field is in the Y-direction and its maximum maagnitude is 33 Vm^{-1}.Write suitable equations for the electric and magnetic fields as a function of x and t.

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15. Light with enregy flux of 18 W cm^{-2},find the average force the surface has an area of

$20cm^2$,find the average force exerted on the surface during a 30 minutes time span.

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16. Find the amplitude of the elecric field in a parallel beam of light of intensity $8Wm^{-2}$.

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17. Calculate the electric field and magnetic field produced by the rediation coming from a

100 W bulb at a distance of 3 m. Assume that the efficiency of the bulb is 2.5 % and it is a point source.

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18. A capacitor of $2\mu F$ is charged to 20 V and then uddelny short-circuited by a coil of negligible resistance and of inducrtane $8\mu H$ .Calculate

the maximum amplitude of oscillating current will be

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19. A capacitor of $2\mu F$ is charged to 20 V and then uddelny short-circuited by a coil of negligible resistance and of inducrtane $8\mu H$ .Calculate

the frequency of the resulting current

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20. Two radio stations broadcast their programmes at the same amplitude A and at

slightly different frequencies ω_1 adn ω_2 respectively, where $\omega_1 - \omega_2 = 10^{13}$ Hz. A detector receives the signals from the two stations simultaneously. It can detect signals of intensity $\geq 2A^2$.

Find the time interval between successive maxima of the intensity of the signal received by the detector.

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21. Two radio stations broadcast their programmes at the same amplitude A and at slightly different frequencies ω_1 adn ω_2 respectively, where $\omega_1 - \omega_2 = 10^{13}$ Hz. A detector receives the signals from the two stations simultaneously. It can detect signals of intensity $\geq 2A^2$.

Find the time interval between successive maxima of the intensity of the signal received by the detector.

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22. Is displacement current, like conduction current a source of magnetic field?

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23. The charging current for a capacitor is 0.25 A. WHat is the displacement current across its plates?

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24. State Ampere's circuital law.

Watch Video Solution

25. Write down Maxwell's equation for steady electric field.

Watch Video Solution

26. Name the scientist, who first:

Predicted the existance of electromagnetic

waves.

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27. Name the scientist, who first:

Experimentally demonstrated the existence of electromagnetic waves.

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28. What are electromagnetic waves?

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29. Why are electrmagnetic waves called so?

Watch Video Solution

30. Write an expression for speed of e.m. waves in free space.

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31. Give the ratio of velocities of light rays of equal wavelength in vacuum.

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32. Name the characterstics of electrromagnetic waves that increases in the electomagnetic spectrum as one moves from radio wave towards ultraviolet region.

Watch Video Solution

33. Name the characterstics of electomagnetic waves that

remains constant in the electomagnetic spectrum as one moveos from radio wave towards ultraviolet region.

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34. When can a charge act as a source of electromagnetic wave? How are there directions of electric and magneitc field

vectors, in an electromagnetic wave related to each other and to the direction of propagation of the wave?

Which physical quantity, if any has the same value for waves belonging to the differnt parts of the electromangetic spectrum?

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35. Express the velocity of propagation of an electromagnetic wave in terms of the peak values of the electric and magnetic fields.

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36. What is the relation between amplitudes of electric and magnetic field in free space for e.m. wave?

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37. In what ways the directions of the electric and magnetic field vectors representing an electromagnetic waves related to each other?

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38. In what ways the directions of the electric and magnetic field vectors representing an electromagnetic waves related to each other?

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39. A plane electromagnetic wave travels in vacuum along z-direction. What can you sayabout the directions of its electric and

magnetic field vectors? If the frequency of the wave is 30 MHz, what is its wavelength?

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40. What is the ratio of velocity of light of wavelengths $4000\overset{\circ}{A}$ and $8000\overset{\circ}{A}$ in vacuum?

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41. Name the physical quantity,which remains same for microwaves of wavelength 1 mm and

UV radiaations of 1,600 $\overset{\circ}{A}$ in vacuum.

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42. The wavelength of LED

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43. Wavelength of e.m.radiation is tripled. What will happen to its energy?

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44. Give two properties of electromagnetic waves.

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45. What is electromagnetic spectrum?

Watch Video Solution

46. Name the main parts of electromagnetic spectrum.

Watch Video Solution

47. From the following, identify the electromagnetic waves having the minimum frequency?

Radio waves

Gamma rays

visible light

Microwaves

Ultraviolet rays and Infrared rays.

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48. To which part of the electromagnetic spectrum does a wave of frequency 5×10^{19} Hz belong?

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49. To which part of electromagnetic spectrum does a wave of frequency $3 \times 10^{13} Hz$ belong?

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50. To which part of electromagnetic spectrum does a wave of frequency $5 \times 10^{11} Hz$ belong?

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51. Which of the following belong to the electromagnetic spectrum:α-rays,β-rays,γ-rays ,cathode rays,X-ray,ultraviolet rays,microwaves,ultrasonic waves,radiowaves,imfra-red rays?Arrange them in order of increasing frequency.

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52. Name any six electromagnetic waves in incresing order of their freuquencies.

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53. Which of the following has shortest waveltngth -Radio waves,red light .ultraviolet rays?

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54. Which of the following has shortest frequency-Microwaves, X-rays, Ultraviolet rays?

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55. Arrange the following electromagnetic radiation in ascending order of their frequencies.

Microwaves

Radiowaves

X-rays

Gamma rays.

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56. Arrange the following electromagnetic radiation in ascending order of their frequencies.

Microwaves

Radiowaves

X-rays

Gamma rays.

Watch Video Solution

57. Arrange the following electromagnetic radiation in ascending order of their frequencies.

Microwaves

Radiowaves

X-rays

Gamma rays.

Watch Video Solution

58. Arrange the following electromagnetic radiation in ascending order of their frequencies.

Microwaves

Radiowaves

X-rays

Gamma rays.

Watch Video Solution

59. Arrange the given electromagnetic radiations in the descending order of their frequencies. Infarred, X-rays, ultraviolet and gamma rays.

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60. Write the folowing radiations in an ascending order in respect of their fequencies:X-rays,microwaves,ultra-violet rays and radiowaves.

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61. Rewrite the following radiations in a descending order of wavelength values:Infra-red rays,radio-waves,γ-rays ,microwaves.

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62. Which of the fofllowing has shortest wave length?X-rays,microwaves and ultra-violet rays.

Watch Video Solution

63. Which of the following has shortest frequency?

X-rays, microwaves and ultra-violet rays.

Watch Video Solution

64. Write the folowing radiations in an ascending order in respect of their fequencies:X-rays,microwaves,ultra-violet rays and radiowaves.

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65. Write the following radiations in a descending order of frequencies

red light, X-rays, microwaves, radio-waves.

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66. Arrange the following radiation in the descending order of wavelength :X-ray,infra-red ray ,red light ,yellow light ,radio wves.

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67. What is common between different types of e.m. radiation?

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68. Name the part of electromagnetic spectrum,whose wavelength lies in the range of $10^{-10}m$.Give its one use.

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69. Why are microwaves considered suitable for radar system used in aircraft navigation?

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70. Name the e.m. waves which are used for the treatment of certain forms of cancer. Write their frequency range.

Watch Video Solution

71. Name the e.m.waves,which are produced during radioactive decay of a nucleus. Write their frequency range.

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72. Write the frequency limit of visible range of electromagnetic spectrum in kHz.

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73. What is the waveength range of visible part of electromagnetic spectrum?

Watch Video Solution

74. What are microwaves? give their any one use.

Watch Video Solution

75. Name the part of the electromagnetic spectrum of wavelength $10^{-2}m$

Watch Video Solution

76. What are micro wayes? Write one application of microwaves

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77. State the condition,under which a micro wave oven heats up a food item containing water molecules most efficiently.

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78. Which part of electromagnetic spectrum is used in operating a RADAR?

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79. Microwaves are used in RADAR.Why?

Watch Video Solution

80. Name the part of the electromagnetic spectrum of wavelength $10^{-2}m$

Watch Video Solution

81. State two applications of infra-red radiations.

Watch Video Solution

82. Name the part of the electromagnetic spectrum which is used for taking photographs of the earth under foggy conditions from great heights.

Watch Video Solution

83. Name the part of the electromagnetic spectrum which is used for taking

photographs of the earth under foggy conditions from great heights.

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84. Why are infra-red waves often called heat waves? Explain.

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85. What is the ratio of speed of infrared rays and ultraviolet rays in vacuum?

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86. Welders wear special glass goggles while working.Why?Explain.

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87. State two applications of ultra-violet radiations.

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88. How does the frequency of a beam of ultraviolt light change when it goes from air to glass?

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89. Name the electromagnetic waves that have frequencies greater than those of ultraviolet light but less than those of gamma rays.

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90. Write two properties of X-rays.

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91. Write two properties of gamma (γ) rays.

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92. Out of X-rays and γ-rays,which has greatest wavelength?

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93. What is the main differnce between X-rays and $\gamma - rays$?

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94. What is the ratio of speed of infrared rays and ultraviolet rays in vacuum?

Watch Video Solution

95. What is the ratio of speed of infrared and gamma rays in vacuum?

Watch Video Solution

96. What is the ratio of speed of gamma rays and radio waves in vacumm?

Watch Video Solution

97. The ratio of speed of X-rays to γ-rays in vacuum is

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98. Radiowaves and gamma rays both are transverse in nature and electromagnetic in character and have the same speed in vacuum.In what respects are they different?

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99. Which part of the electromagnetic spectrum has the largest penerating power?

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100. What is Maxwell's displacement current?

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101. When an ideal capacitor is charged by a d.c. battery,no current flows.However,when an

a.c. source is used,the current flows continously.How does one exlain this,based on the concept of displacement current.

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102. A variable-frequency a.c. source is connected to a capacitor.Will the displacement current increases or decreases with increases in frequency?

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103. What does an electromagnetic wave constist of ?On what factors does its velocity in vacuum depend?

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104. State the principle of production of e.m. waves. What is the value of velociy of these waves?

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105. Can an electromagnetic wave be deflected y magnetic or electric field ?Explain your answer.

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106. How is electromagnetic wave produced? Draw a sketch of a plane electromagnetic wave propagating along x-axis depicting the directions of the oscillating electric and magnetic field.

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107. A plain electromagnetic wave travels in vacuum along the Y-direction.Write the ratio of the magnitudes of its electric and magnetic filed vectors.

Watch Video Solution

108. A plain electromagnetic wave travels in vacuum along the Y-direction. Write the the directions of its electric and magnetic field vectors.

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109. State any four properties of elctromagnetic waves.

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110. Name the part of the electromagnetic spectrum,which is suitable for

radar system used in aircraft naigation.

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111. Name the part of the electromagnetic spectrum, which is suitable for treatment of cancer tumors and radar system used in aircraft navigation

Watch Video Solution

112. Name the part of the electromagnetic spectrum,which is suitable for radar system used in aircraft naigation.

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113. Identify the part of the electromagnetic spectrum, which is

adjacent to the low frequency end of the electromagnetic spectrum.

Watch Video Solution

114. Ideentify the part of the electromagnetic spectrum,which is

produced in nuclear reaction.

Watch Video Solution

115. Ideentify the part of the electromagnetic spectrum,which is

produced by bombarding a metal target by high speed electrons.

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116. What are radiowaves?Give their two uses.

Watch Video Solution

117. What are microwaves?Wrie their two uses.

 Watch Video Solution

118. What are infra-red rays ?Write their two uses.

 Watch Video Solution

119. How are infrared waved produces ?Why are hese referred to as 'heat waves'?Write

their one important use.

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120. Why are infrared radiations referred to as heat waves also ?Name the radiations,which are next to these radiations in electromagtnetic spectrum having shorter wavelength

Watch Video Solution

121. Why are infrared radiations referred to as heat waves also ?Name the radiations,which are next to these radiations in electromagtnetic spectrum having longer wavelength.

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122. Give two peroperties and four uses of infra-red rays?

Watch Video Solution

123. What are ultra-violet rays?Give their two uses.

Watch Video Solution

124. Give two properties and four uses of ultraviolet rays?

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125. Welders wear special goggles or face masks with glass windows to protect eyes from electromagnetic radiations. Name the radiations and write the range of their frequencies.

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126. What are X-rays?Write their two uses.

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127. Give two properties and four uses of X-rays?

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128. Give frequency range of gamma rays.Also write its any two uses.

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129. Give two peroperties and four uses of infra-red rays?

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130. Write the order of frequency range and one use of each of the following electromagnetic radiations

Gamma rays.

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131. Write the order of frequency range and one use of each of the following electromagnetic radiations

Microwaves.

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132. Give one use of each

Ultraviolet radiation

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133. identify the following electromagnetic radiations as per the wavelengths given below.Write one application of each.

$10^{-3}nm$

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134. identify the following electromagnetic radiations as per the wavelengths given below.Write one application of each.

$10^{-3}m.$

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135. identify the following electromagnetic radiations as per the wavelengths given below.Write one application of each.

1 m.

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136. Electromagnetic waves with wavelength

λ_1 used in statellite communication.

λ_2 used to kill germs in water purifies.

λ_3 is used to detect leakage of oil in

underground pipelines.

λ_4 is used to improve visibility in runway during fog and mist conditions.

Identify and name the part of electromagnetic spectrum to which these radiations belong.

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137. Electromagnetic radiations with wavelength:

γ_2 are used in TV communication systems.

Identify and name the part of e.m. spectrum to which these radiations belong.

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138. Electromagnetic radiations with wavelength:

γ_3 play an important role in maintaining the earth's warmth.

Name the part of electromagnetic spectrum to which these radiations belong.

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139. Identify the type of elecromagnetic waves,whose method of porduction is associated with

a klystron valve,

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140. Identify the type of elecromagnetic waves,whose method of porduction is associated with

vibration of atoms and molecules and Also give the approximate range of wavelengths .

Watch Video Solution

141. Identify the type of elecromagnetic waves,whose method of porduction is associated with

deay of atomic nulei.Also give the approximate range of wavelengths .

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142. What is the wave length of a television station,which transmits vision in 500 MHz? Given $c = 3 \times 10^8 ms^{-1}$.

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143. Find the wavelength of electromagnetic waves of frequency $6 \times 10^{12} Hz$ in free space. Give its two applications.

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144. Find the wavelength of electromagnetic waves of frequecies 4×10^{17} Hz in free space.Give its two applications.

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145. Find wavelength of electromagnetic waves of frequency $5 \times 10^{19} Hz$ in free space. Give its two applications.

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146. In an electromagnetic wave,the amplitude of oscillating magnetic field is 2×10^{-7} T. What is the amplitude of oscillating electric field in the wave?Given $c = 3 \times 10^{8} ms^{-1}$.

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147. An electromagnetic wave exerts pressure on the surface on which it is incident. Justify.

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148. Why is the amount of the momentum transferred by the e.m. waves incident on the surface so small?

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149. When the electromagnetic wave propagate through free space,how does it transport energy in the absence of any material medium?

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150. Radio waves diffract pronouncedly around building while light waves do not why?

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151. Why is it that induced electric fields due to changing magnetic flux are more readily observable than the induced magnetic field due to changing electric fields?

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152. If you find closed loops of B in a region in space, does it necessarily mean that actual charges are flowing across the area bounded by the loops?

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153. A closed lop of B is produced by a changing electric field l.Does it necessarily mean that $(dB)/(dt)$ are non - zero at all the points on the loop and in the area enclosed by the loop?

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154. What should be the order of magnitude of the minimum frequency of electromagnetic waves that could be used to detect the presence of the planet venus.

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155. What should be the order of magnitude of the minimum fequency of electromagnetic

waves that could be used to detect the presence of

an aircraft 50 m long and

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156. What should be the order of magnitude of the minimum fequency of electromagnetic waves that could be used to detect the presence of a bird 0.1m long?

From what sources of electromagnetic

radiation would you be able to generate radiation of these wavelengths?

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157. Show that

$$\frac{E_0}{B_0\sqrt{\mu_0\varepsilon_0}} = c^2$$

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158. Show that

$$n = \sqrt{\mu_r \cdot \varepsilon_r}$$

where the symbols have their usual meanings.

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159. The oscillating electric field in a plane electromagnetic wave is given by $E_x = 50\sin(\omega t - kx)\left(Vm^{-1}\right)$.

The fequency of electric field is 2×10^7 Hz.

Find ω

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160. The oscillating electric field in a plane electromagnetic wave is given by $E_x = 50\sin(\omega t - kx)\left(\in Vm^{-1}\right)$.

The fequency of electric field is 2×10^7 Hz.

Find B_0

Watch Video Solution

161. The oscillating electric field in a plane electromagnetic wave is given by $E_x = 50\sin(\omega t - kx)\left(\in Vm^{-1}\right)$.

The fequency of electric field is 2×10^7 Hz.

Predict the direction fo propagation of electromagnetic wave.

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162. The oscillating magnetic field in a plane electromagnetic wave is given by:

$$B = 8 \times 10^{-6} \sin\left(2 \times 10^{11} t + 300\pi x\right) T$$

Calculate the wavelength of the electromagnetic wave.

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163. The oscillating magnetic field in a plane electromagnetic wave is given by:

$B = 8 \times 10^{-6} \sin\left(2 \times 10^{11} t + 300\pi x\right) T$

Write down the expression for the oscillating electric field.

Watch Video Solution

164. The oscillating electric field of an electromagnetic wave is given by $E_y = 30 \sin\left(2 \times 10^{11} t + 300\pi x\right) vm^{-1}$.

Obtain the value of wavelength of the electromagnetic wave.

Watch Video Solution

165. The oscillating electric field of an electromagnetic wave is given by $E_y = 30\sin\left(2 \times 10^{11}t + 300\pi x\right)vm^{-1}$.

Write down the expression for the oscillation magnetic field.

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166. Show that the total energy of the electromagnetic wave is equally divided between the electric and magnetic fields.

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167. Why we use good quality plastic containers for heating the food in a microwave and not any metal made utensil?

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168. Suggest reasons,why

an empty glass container does not get hot in a microwave oven.

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169. Static crashes are heard on radio when a lightning flash occurs-even if the lightning occurs far away .Why does this happen?

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170. The wave emitted by any atom or molecule must have some finite total length. For sodium light this length(called coherence length)is 2.4 cm.Deduce

the number of oscillations in this length

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171. The wave emtted by any atom or molecule must have some finite total length .For sodium light this length(called coherne length)is 2.4

cm.Deduce

the cohernece time.Given that

$\gamma = 5 \cdot 9 \times 10^{-7}$ cm and $c = 3.0 \times 10^{8} ms^{-1}$.

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Exercise

1. Why did Maxwell introduce the concept of displacement current ?Explain.

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2. What is displacement current?

Watch Video Solution

3. What is displacement current?

Watch Video Solution

4. Considering the case of a parallel plate capacitor being charged,tell how one is

requried to generalize Ampere's circutal law to include thevterm due to displacement current.

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5. Show that the displacement current produced is equal to the conduction current ,when a capacitor is discharged.

Watch Video Solution

6. What is the source of displacement current?

Watch Video Solution

7. A capacitor ,made of two parallel plates,each of area A and separaion d,is being charged by an external a.c. surce.show that the displacement current inside the capacitor is the same as the current charging the capacitor.

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8. What are electromagnetic waves?

Watch Video Solution

9. What are e.m. waves?How are they produced?

Watch Video Solution

10. Draw a labelled diagram of Hertz's experiment set up to produce electromagnetic

waves. Explain the generation of electromagnetic waves using this set up.

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11. Explain with the help of a diagram, Hertz experiment for the production of electromagnetic waves.

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12. Hertz,in his historical experiment ,produced stationary electromagnetic waves and measured the distance between two successivendoes.Explain,how this measurement enabled him to show that the electromgnetic waves travelled with the same speed as the speed of lght.

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13. Draw a labelled diagram of Hertz's experiment set up to produce electromagnetic waves. Explain the generation of electromagnetic waves using this set up.

Watch Video Solution

14. The source of electromagnetic waves can be a charge.

Watch Video Solution

15. How does a charge q oscillating at certain frequency produce electromagnetic waves? Sketch a chematic deiagram depicting elecric and magnetic fields for an elctromagnetic wave propagating alng the Z-direction.

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16. Why is it not possible to produce electro-megnetic waves in the visible region with modern electronic circuits in the laboratory ?

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17. What are electromagnetic waves?

Watch Video Solution

18. Prove that electromagnetic waves are transverse in nature.

Watch Video Solution

19. What do you understand by electromagnetic waves? Give their important properties.

Watch Video Solution

20. What do you understand by electromagnetic waves? Give their important properties.

Watch Video Solution

21. What is unit of $1/\mu_0\varepsilon_0$?

Watch Video Solution

22. The amplitude of electric and magnetic fields related to each other are:

Watch Video Solution

23. Write an expression for speed of e.m. waves in free space.

Watch Video Solution

24. Give two properties of electromagnetic waves.

Watch Video Solution

25. What is electromagnetic spectrum?

Watch Video Solution

26. What is electromagnetic spectrum? Give its four uses.

Watch Video Solution

27. Give two peroperties and four uses of infra-red rays?

Watch Video Solution

28. Give two uses each of the following:

Gamma rays

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29. Give two peroperties and four uses of infra-red rays?

Watch Video Solution

30. Give two properties and four uses of ultraviolet rays?

Watch Video Solution

31. Write any four characteristics of electromganetic waves.Give two uses of radiowaves

Watch Video Solution

32. Write any four characteristics of electromganetic waves.Give two uses of microwaves.

Watch Video Solution

33. Write the order of frequency range and one use of each of the following electromagnetic radiations

Microwaves.

Watch Video Solution

34. Write the order of frequency range and one use of each of the following electromagnetic radiations

Ultraviolet rays.

Watch Video Solution

35. Write the order of frequency rnge and one use of the following radiations,

X-rays.

Watch Video Solution

36. Give frequency range of gamma rays.Also write its any two uses.

Watch Video Solution

37. Give four uses of X-rays

Watch Video Solution

38. What is Maxwell's modification of Ampere's circuital law?

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39. How does the concept of displacement current lead to the production of electromagnetic waves?

Watch Video Solution

40. Give two properties of electromagnetic waves.

Watch Video Solution

41. Prove that for an electromagnetic wave $E_0 = cB_0$.

Watch Video Solution

42. What are electromagnetic waves?

Watch Video Solution

43. Prove that electromagnetic waves are transverse in nature.

Watch Video Solution

44. Check the correctness of the relation $c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ dimensionally and numerically.

Watch Video Solution

45. Name the main parts of electromagnetic spectrum.

 Watch Video Solution

46. Name the main parts of electromagnetic spectrum.

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47. What are infra-red rays ?Write their two uses.

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48. Fill ups

The .....current is always equal to the conduction current.

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49. A parallel plate cpacitor has plates of area $0.32m^2$,which are separated by a distance of 5mm.The capacitor is raised to a potential of 1,200 V.Estimate the average value of displacement current,when it is discharged for 1 μs.

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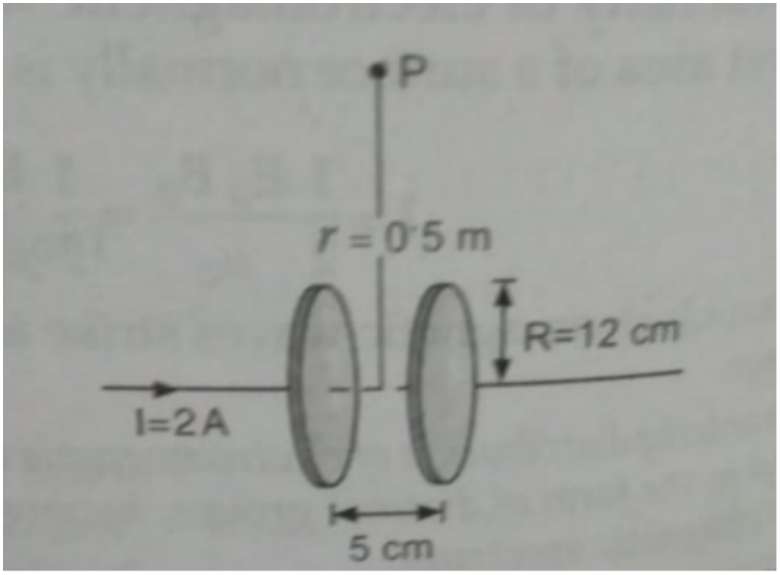
50. Fig.110 shows a capacitor made of two circular plates each of radius R=12 cm and

separated by 5 cm.The capacitor is being charged by an external source (not shown in the figure).Use modified Ampere's circuital law to determine magnetic field at the point P at a distance of 0.5 m from the centre of the plats in the plane midway between them,when the chargingg current is 2A?



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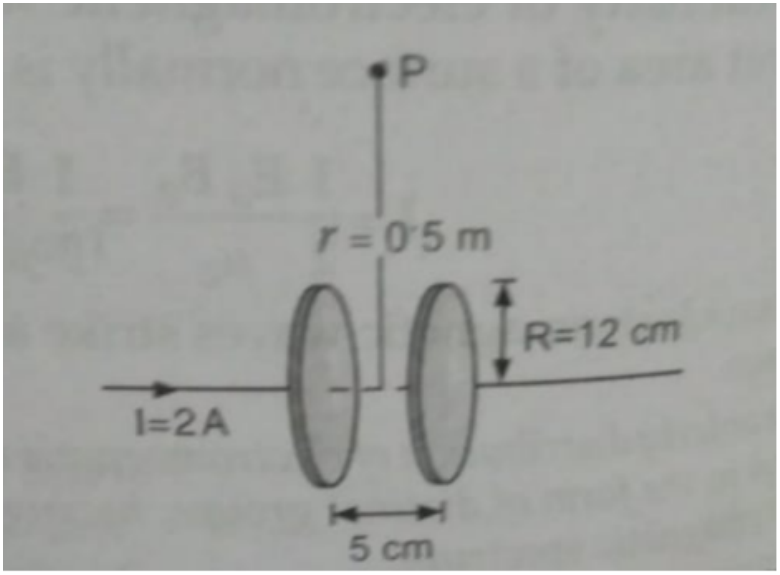
51. Fig.110 shows a capacitor made of two circular plates each of radius R=12 cm and separated by 5 cm.The capacitor is being charged by an external source (not shown in the figure).Use modified Ampere's circuital law to determine magnetic field at the point P at a distance of 0.5 m from the centre of the plats in the plane midway between them,when the

chargingg current is 2A?



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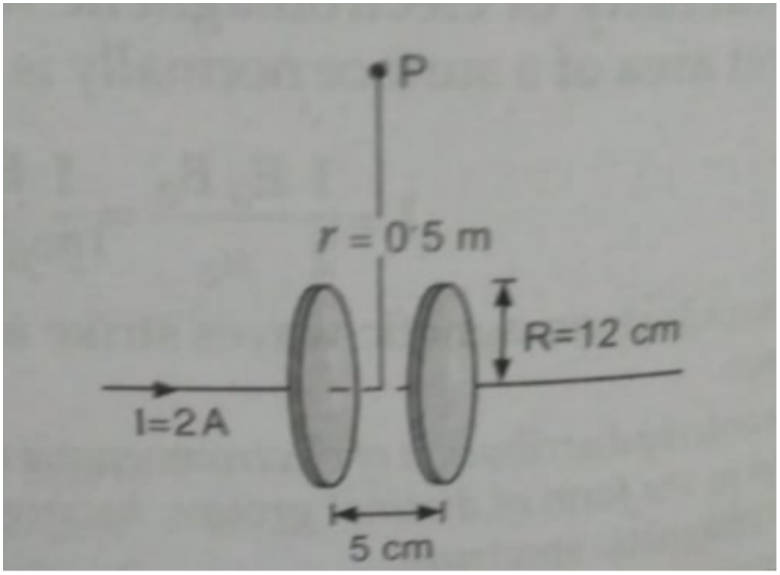
52. Fig.110 shows a capacitor made of two circular plates each of radius R=12 cm and

separated by 5 cm.The capacitor is being charged by an external source (not shown in the figure).Use modified Ampere's circuital law to determine magnetic field at the point P at a distance of 0.5 m from the centre of the plats in the plane midway between them,when the chargingg current is 2A?



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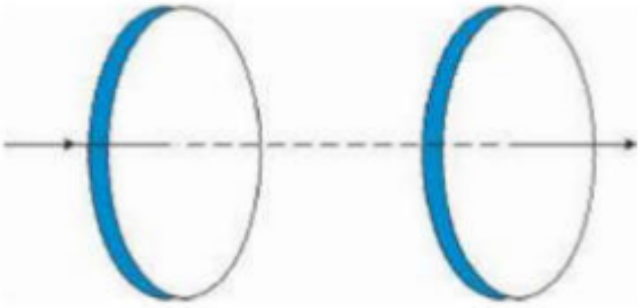
53. Figure shows a capacitor made of two circular plates each of radius 12 cm, and separated by 5.0 cm. The capacitor is being charged by an external source (not shown in the figure). The charging current is constant and equal to 0.15A. Obtain the displacement

current across the plates. :



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54. The wavelength of X-rays is $1\overset{\circ}{A}$.Calculate its frequency.

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55. A radar trnsmitter genrates waves,whose frequency is 3×10^9Hz.What is the wavelength of the waves?

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56. The medium wave(MW) band coresponds to wavelength range 200 m to 625 m.If a radio can tune to any station in this and,what is the corresponding frequency band?

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57. Electromagnetic waves of frequency 5×10^{14} Hz are passed through a liquid.The wavelength of the waves in liquid is measured to be $4.5 \times 10^{-7} m$.

Calculate

the wavelength of e.m. waves in vacuum,

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58. Electromagnetic waves of frequency 5×10^{14} Hz are passed through a liquid.The

wavelength of the waves in liquid is measured to be $4.5 \times 10^{-7} m$.

Calculate

velocity of e.m. waves in the liquid and

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59. Electromagnetic waves of frequency 5×10^{14} Hz are passed through a liquid.The wavelength of the waves in liquid is measured to be $4.5 \times 10^{-7} m$.

Calculate

the wavelength of e.m. waves in vacuum,

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60. In a plane e.m. wave, the magnetic field oscillates sinusodially with a frequency of $3 \times 10^{10} Hz$ and amplitude 128 nT.

What is the wavelength of the wave

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61. In a plane e.m. wave, the magnetic field oscillates sinusodially with a frequency of $3 \times 10^{10} Hz$ and amplitude 128 nT.

What is the amplitude of the oscillating electric field?

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62. The electric field in a plane electromagnetic wave is given by $E_y = 72 \sin\left[1.5 \times 10^3 x + 5 \times 10^{11} t\right]$ (in V

m^(-1))`

What are the amplitues of the electric and magnetic fiedls associated with the wave?

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63. The electromagnetic waves of intensity $4.5 \times 10^{-3} Wm^{-2}$ fall on a surface and are completely absobed.Find teh pressure exerted by the radiation.

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64. Light with enrgy flux of $9 \times 10^5 Wm^{-2}$ falls of a non - refleting surface at normal incidence.If trhe surface has an area of $50cm^2$,find average force exerted on the surface during an intervl of 10 minutes.How will the result get modified ,if the surface is a perfect reflector?

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65. The propagation vector of an electromagnetic wave is given by

$\overrightarrow{S} = 2\hat{i} + 4\hat{j} + \sqrt{5}\hat{k}$

Find the angle which the direction of propagation of the wave makes with X-axis.

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66. Show that average electric evergy density (u_E) of electic field is equal to average magnetic energy density (u_E) of magnetic field in electro magnetic wave.

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