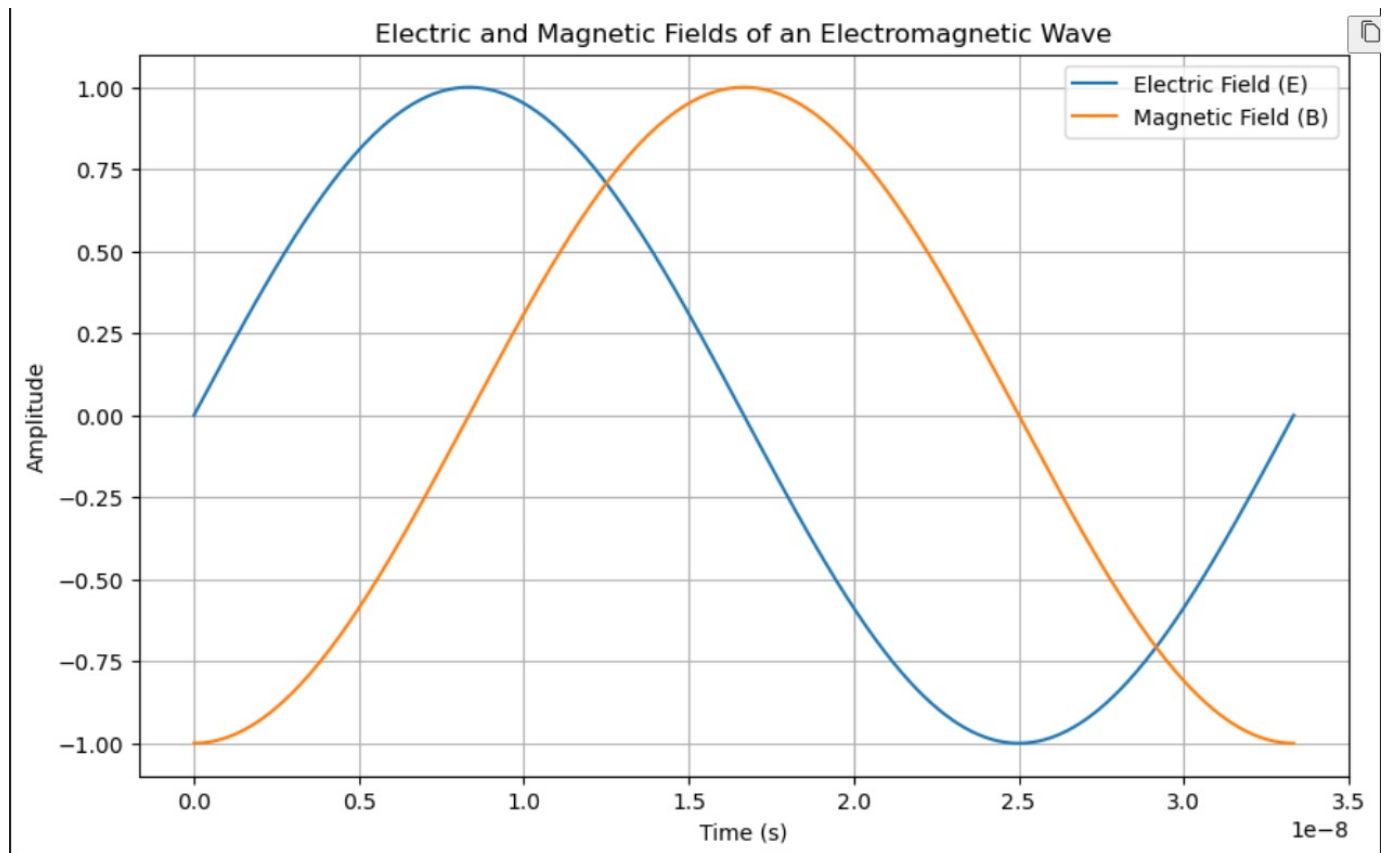


**Question:** A plane electromagnetic wave travels in vacuum along the  $z$ -direction. What can you say about the directions of its electric ( $\mathbf{E}$ ) and magnetic ( $\mathbf{B}$ ) field vectors? If the frequency of the wave is 30 MHz, what can you say about its wavelength?

**Solution:**

Symbol	Description	Value
$c$	Speed of light in vacuum	$3 \times 10^8$ m/s
$f$	Frequency of the electromagnetic wave	30 MHz
$\lambda$	Wavelength of the electromagnetic wave	?

TABLE I  
INPUT PARAMETERS



a) A plane electromagnetic wave travels in vacuum along the  $z$ -direction. The electric ( $\mathbf{E}$ ) and magnetic ( $\mathbf{B}$ ) field vectors are perpendicular to each other move in  $x$  and  $y$  direction respectively and they are perpendicular to each other

b) The relationship between frequency ( $f$ ), wavelength ( $\lambda$ ), and the speed of light ( $c$ ) is given by the formula:

$$\lambda = \frac{c}{f} \quad (1)$$

$$\lambda = \frac{3 \times 10^8 \text{ m/s}}{30 \times 10^6 \text{ Hz}} \quad (2)$$

$$= 10 \text{ m} \quad (3)$$

$$\Rightarrow \lambda = 10 \text{ m}$$