

# Assignment

## 12.8 - 6

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### QUESTION

A charged particle oscillates about its mean equilibrium position with a frequency of  $10^9$  Hz. What is the frequency of the electromagnetic waves produced by the oscillator?

### SOLUTION

An oscillating charged particle in space produces electromagnetic waves. The frequency of the generated electromagnetic waves is equal to the frequency of the oscillating charged particle.

$$f = f_{osc} \quad (1)$$

The oscillating frequency of charged particle is  $10^9$

$$f = 10^9 \quad (2)$$

The frequency of the electromagnetic waves produced by the oscillator is  $10^9$  Hz.

The equation for amplitude of electromagnetic wave is of the form

$$y = \cos\left(\frac{2}{\pi} f_c t\right) \quad (3)$$

Symbol	Value	Description
$f_c$	$10^9$	frequency of electromagnetic wave
$y$	time dependent	amplitude of electromagnetic wave

TABLE 0

VARIABLE DESCRIPTION

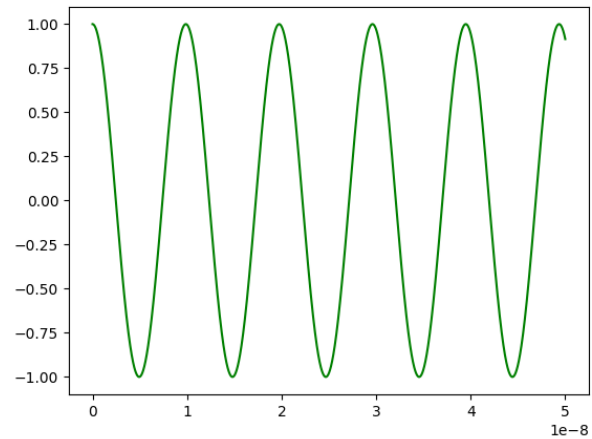


Fig. 0. Amplitude vs Time

For the electro-magnetic wave generated due to oscillation charged particle amplitude is related to time by

$$y = \cos\left(\frac{2}{\pi} \times 10^9 t\right) \quad (4)$$

Plotting the amplitude of the electromagnetic wave as a function of time