

Answer on Question #77149 Physics / Other

a) A particle undergoes simple harmonic motion with an angular velocity of $\omega = 5 \frac{\text{rad}}{\text{s}}$ and amplitude of $A = 50 \text{ cm}$. If it starts with maximum forward amplitude at $t = 0$, find:

i) The displacement at $t = 10 \text{ s}$;

ii) The acceleration at $t = 6 \text{ s}$.

iii) The velocity at $t = 2 \text{ s}$.

Solution:

The particle paw of motion

$$x(t) = A \cos \omega t = 0.5 \cos 5t$$

i) The displacement at $t = 10 \text{ s}$

$$x(10) = 0.5 \cos 50 = 0.48 \text{ m}$$

ii) The acceleration

$$a(t) = x''(t) = -25 \times 0.5 \cos \omega t$$

$$a(6) = -25 \times 0.5 \cos 30 = -1.93 \frac{\text{m}}{\text{s}^2}$$

iii) The velocity

$$v(t) = x'(t) = -5 \times 0.5 \sin \omega t$$

$$v(2) = -5 \times 0.5 \sin 10 = 1.36 \frac{\text{m}}{\text{s}}$$

Answers:

i) 0.48 m

ii) $-1.93 \frac{\text{m}}{\text{s}^2}$

iii) $1.36 \frac{\text{m}}{\text{s}}$

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