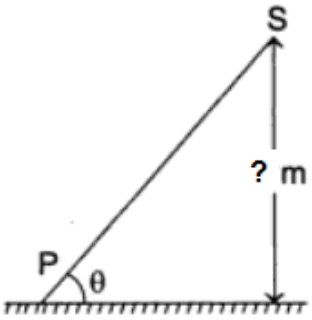
Answer on Question #40823, Physics, Mechanics

A spot light S rotates in a horizontal plane with a constant angular velocity. A spot of light P moves along wall. The velocity of spot along the wall is 6 m/s, when spot light is rotated by 45 degree. What is angular velocity of spot light??

(a) 1rad/s (b) 2rad/s (c)0.5rad/s (d)0.1rad/s

Solution:



The rate of change of angular displacement of the particle in a given time is called angular velocity. It is expressed as

$$\omega = \frac{\theta}{t}$$

Where θ is angular displacement and t is the time taken.

θ = 45°= 45°·π/180 rad = 45·3.14/180 = 0.785 rad.

The time t is

$$t = \frac{d}{v}$$

where d is linear displacement and v is the velocity of spot.

For our case (θ = 45°) the d is equal to the distance to a wall.

Thus,

$$\omega = \frac{\theta}{t} = \frac{\theta v}{d}$$

$$\omega = \frac{0.785 \cdot 6}{d} = \frac{4.71}{d} \text{ rad/s.}$$

Answer. $\omega = \frac{4.71}{d}$.