

8/29/11

Knowledge Probe

1)  $F = ma$   
Force

$E = \frac{1}{2}mv^2$   
Energy

$p =$   
momentum  $\textcircled{0}$

2)  $\lambda = \frac{h}{mv}$

$f = \frac{v}{\lambda}$   
 $\textcircled{0}$

3) Don't know

$\textcircled{0}$

$\frac{0}{10}$

# KNOWLEDGE PROBE

①  $\vec{p} = m\vec{v}$

$E = \frac{1}{2} m v^2$

$mE = p^2$  (2)

②  $\lambda = 1000 \text{ nm}$   
 $f?$

(FREE SPACE)

$f = \frac{c}{\lambda} = \frac{3 \times 10^8}{1000 \times 10^{-9}} = 3 \times 10^{14} \text{ Hz}$

A?? t?? x??

(2)

③ i)  $\frac{d^2 y(x)}{dx^2} = 10$

$y_h(x) = 0$       $y(x) = y_p(x)$

$\int \frac{d^2 y(x)}{dx^2} dx = \int 10 dx \Rightarrow \frac{dy(x)}{dx} = 10x + C$

$\int \frac{dy(x)}{dx} dx = \int (10x + C) dx \Rightarrow y(x) = 5x^2 + Ax + B$

ii)  $\frac{d^2 y(x)}{dx^2} + 2y(x) = 0$

CHAR. EQN

$\lambda^2 + 2 = 0$

$\lambda = \pm \sqrt{-2}$

$\lambda = \pm i\sqrt{2}$

$y(x) = A \cos(\sqrt{2}x) + B \sin(\sqrt{2}x)$

(2)

iii)  $\frac{d^2 y(x)}{dx^2} - 2y(x) = 0$

CHAR. EQN (2)

$\lambda^2 - 2 = 0$

$\lambda = \pm \sqrt{2}$

$y(x) = A e^{\sqrt{2}x} + B e^{-\sqrt{2}x}$

[6]

10/10

$$(1) \quad E = \frac{1}{2}mv^2 \quad p = mv \quad \boxed{p = \sqrt{2mE}}$$

$$2mE = 2m\left(\frac{1}{2}mv^2\right) = m^2v^2 = (mv)^2$$

$$\sqrt{(mv)^2} = mv = p$$

2

$$(2) \quad \lambda = \frac{c}{\nu} \Rightarrow \nu = \frac{c}{\lambda} = \frac{3 \times 10^8 \frac{m}{s}}{1 \times 10^{-6} m} = \boxed{3 \times 10^{14} \text{ Hz}}$$

1

$$(3) \quad \frac{d^2 y(x)}{dx^2} = 10 \Rightarrow y'' = 10$$

$$y' = 10x + C \Rightarrow \boxed{y = 5x^2 + Cx + \hat{C}}$$

$$\frac{d^2 y(x)}{dx^2} + 2y(x) = 0 \Rightarrow y'' + 2y = 0 \Rightarrow y'' = -2y$$

$$\frac{d^2 y(x)}{dx^2} - 2y(x) = 0 \Rightarrow y'' - 2y = 0 \Rightarrow y'' = 2y$$

2

0

0

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