

NCERT/CBSE PHYSICS CLASS 11 textbook

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Answers to NCERT/CBSE PHYSICS Class 11(Class XI)textbook

CHAPTER FOURTEEN

OSCILLATIONS

EXERCISES

(For simplicity in numerical calculations, take $g = 10 \text{ m s}^{-2}$)

Q. 14.16

(a) For simple pendulum

$$F = \frac{-mg}{l} y = -ky$$

$$k = \frac{mg}{l}$$

k = spring factor or force constant which is proportional to the mass of the particle.

$$\text{So } T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{m}{mg/l}} = 2\pi\sqrt{\frac{l}{g}} \text{ so independent of } m.$$

(b) The restoring force that brings the bob of the pendulum back to its mean position is $F = -mg \sin \theta$.

For very small θ , $\sin \theta \approx \theta$

and the expression for the time period = $2\pi\sqrt{\frac{l}{g}}$ and for larger

θ , $F = -mg \sin \theta$ $-mg \sin \theta < mg \theta$

So corresponding time period will also increase as a factor of $\sin \theta$ will be added with g in the denominator.

(c) Yes, it gives correct time during free fall. As gravity plays no roll in the functioning of wristwatch it works on the principle of spring action.

(d)) Frequency of oscillation = $\frac{1}{T}$

Please do not copy the answer given here

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$$T = 2\pi\sqrt{\frac{l}{g}}$$

in case of free falling Cabin, $g = 0$ so frequency = 0.

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