



## PHYSICS

# BOOKS - CHHAYA PHYSICS (BENGALI ENGLISH)

## NATURE OF VIBRATION

### Example Numerical Examples

1. A second pendulum is shifted 4 cm away from its equilibrium position and then

released. After 2s the pendulum is 3 cm away from its position of equilibrium. What will be the position of the pendulum after another 2 s?



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2. After 100 complete oscillations, a pendulum's amplitude becomes  $\frac{1}{3}rd$  of its initial value. What will be its amplitude after 200 complete oscillations? Express it as a fraction of the initial amplitude.



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Exercise Higher Order Thinking Skill Hots  
Questions

1. Why does an empty container emit a louder sound than a water-filled container when they are struck?



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2. Why building get demolished by earthquakes?



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3. A vibrating tuning fork is held at the mouth of a cylindrical tube. The tube is dipped into water. It is found that when the level of water rises to a definite height, a sound of large intensity is heard. Explain the reason behind it.



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4. In presence of a resonant body, the sound produced by a body is intensified, is the principle of conservation of energy violated here?



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**Mcqs**

1. In case of free vibration of a body, the quantity that remains constant is

A. velocity

B. acceleration

C. time period

D. phase

**Answer: C**



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2. During vibration, the restoring force is

A. directly proportional to the displacement

B. directly proportional to the velocity

C. directly proportional to the kinetic energy

D. directly proportional to the potential energy

**Answer: A**



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3. During damped oscillation of a body the force that acts is

A. only the restoring force

B. only the resistive force

C. the restoring force along with the resistive force

D. the restoring force along with the resistive force and the external periodic force



**Answer: C**



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4. During damped vibration, the quantity which gradually decrease is

A. velocity

B. phase

C. frequency

D. amplitude

**Answer: D**



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5. In case of resonance, the characteristic property which is the same for free vibration of the body and the external periodic force is

A. amplitude

B. phase

C. velocity

D. frequency

**Answer: D**



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**6. During forced vibration of a particle**

A. only the restoring force acts on the particle

B. both the restoring force and a dissipative force act on the particle

C. both the restoring force and an external periodic force act on the particle

D. the restoring force, a dissipative force and an external periodic force act on the particle

**Answer: D**



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7. During forced vibration, the frequency of the external periodic force is

A. equal to

B. less than

C. greater than

D. equal to, or greater than or, less than the frequency of free vibration of the body.

**Answer: D**



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8. During forced vibration, if the frequency of free vibration of a body is equal to the frequency of the external periodic force, then the phenomenon that occurs is called

A. beats

B. interference

C. resonance

D. reverberation

**Answer: C**



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9. If a vibrating tuning fork is held at the open end of a tube closed at one end, then for a particular length of the tube an intense sound is heard. This phenomenon is known as

A. beats

B. stationary wave

C. interference

D. resonance

**Answer: D**



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## Exercise Very Short Answer Type Questions

1. Under the influence of which force the oscillation of a pendulum gradually dies out?



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2. Which force acts on body during its free vibration?



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3. Which force acts on a body which vibrates freely?



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4. A man with a wrist watch falls from a tall building. Will the watch give correct time?



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5. Which quantity of vibration gradually decreases during damped vibration ?



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6. If a resistive force acts on a vibrating body, then its amplitude of vibration gradually\_\_\_\_\_ [Fill in the blank]



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7. What phenomenon will occur if the frequency of the free vibration of vibrating body becomes equal to the frequency of an external periodic force?



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8. Which characteristic of sound increases during resonance?



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9. A special case of \_\_\_\_\_ vibration is resonance. [Fill in the blank]



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**10.** What kind of external force has to act on a vibrating body, to occur forced vibration?



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## **Exercise Short Answer Type Questions I**

**1.** A vibrating tuning fork is held at the mouth of a cylindrical tube in which water is poured gradually. Then for a certain height of water-

level in the tube, an intense sound is heard.

What is the reason behind it?



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2. Under which condition does forced vibration produce resonance ?



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3. All resonances are forced vibrations but all forced vibrations are not resonances'—

explain.



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4. Two masses, one heavier than the other, are suspended from two identical springs. These are pulled a little and released. Which mass will vibrate faster and why?



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**Exercise Short Answer Type Questions li**

1. A simple pendulum, set into oscillation, comes to a stop ultimately. Explain with reason.



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## Exercise Problem Set I

1. In each following cases, the amplitude of the first two oscillations  $A_1$  and  $A_2$  of a damped pendulum are given. What will be the



amplitude of the pendulum in its third oscillation?

(i)  $A_1 = 3.0\text{cm}$ .  $A_2 = 2.4\text{cm}$

(ii)  $A_1 = 5.0\text{cm}$ ,  $A_2 = 4.9\text{cm}$

(iii)  $A_1 = 4.0\text{cm}$ ,  $A_2 = 2.0\text{cm}$



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2. For a damped oscillator. The mass of the block is  $200\text{ g}$ .  $k = 90\text{N} \cdot \text{m}^{-1}$  and the damping constant  $b$  is  $40\text{g} \cdot \text{s}^{-1}$ . Calculate the period of oscillation.



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## Exercise Entrance Corner Assertion Reason Type

1. Statement I : A vibrating body always moves to and fro about an equilibrium position.

Statement II : Due to inertia of motion a vibrating body does not stop at its equilibrium position.

A. Statement I is true, statement II is true ,  
statement II is a correct explanation for

statement I.

B. Statement I is true, statement II is true ,  
statement II is not a correct explanation  
for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

**Answer: B**



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2. Statement I : The sound gets amplified when a vibrating tuning fork is made to touch the surface of a table.

Statement II : Dimension of the table is more than that of the tuning fork.

A. Statement I is true, statement II is true , statement II is a correct explanation for statement I.

B. Statement I is true, statement II is true , statement II is not a correct explanation

for statement I.

C. Statement I is true, statement II is false.

D. Statement I is false, statement II is true.

**Answer: A**



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**Exercise Entrance Corner Integer Answer Type**

1. The amplitude of the first two oscillations of a damped pendulum are 9.0 cm and 3.0 cm

respectively. What will be the amplitude (in cm) of the pendulum in its third oscillation ?



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2. After 50 oscillations a pendulum's amplitude becomes  $\frac{1}{3}$  of its initial vibration. If its amplitude becomes  $\frac{1}{n^3}$  of its initial vibration after 150 complete oscillations. Then find the value of  $n$ .



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1. What do you understand by forced vibration ? Draw a graph to show how the amplitude of forced vibration depends on frequency. Obtain the condition for resonance from this graph.

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2. What is damped vibration ?

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## Exercise Cbse Scanner

1. (i) What do you mean by resonance ? (ii)  
Mention any two uses of its from your daily  
life.



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2. What do you mean by resonance?



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