PHYSICS

BOOKS - NCERT PHYSICS (HINGLISH)

WAVES

Multiple Choice Questions Mcqs

1. The waves produced by a motor boat sailing in water are :

A. neither longitudinal nor transverse

B. both longitudinal and transverse

C. only longitudinal and transverse

D. only transverse

Answer: B

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2. Sound waves of wavelength λ travelling in a medium with a speed of vm/s enter into another medium where its speed is $2vm/s$.

Wavelength of sound waves iin the second medium is

A. λ

B. $\frac{\lambda}{2}$

C. 2λ

D. 4λ

Answer: C

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3. Speed of sound waves in air

A. is independet of temperature

B. increases with pressure

C. increases with increases in humidity

D. decreases with increase in humidity

Answer: C

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4. Charge in temeprature of the medium changes

A. frequency of sound waves

B. amplitude of sound waves

C. wavelength of sound waves

D. loudness of sound waves

Answer: C

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5. With the propagation of a longitudinal wave through a material medium, the quantities transmitted in the propagation direction are

A. matter

B. energy

C. energy and matter

D. energy, matter and momentum

Answer: B

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6. Which of the following statements are true wave motion?

A. Mechanical transverse waves can propoagate through all mediums

B. Longitudinal waves can propagate through solids only

C. Mechanical transverse waves can propagate through solids only

D. Longitudinal waves can propagate through cacuum

Answer: C

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7. A sound wave is passing through air column in the form of compression and rerefactions. In consecutive compressions and rerefactions.

A. density remains constant

B. Boyle's law is obeyed

C. bulk modulus of air oscillates

D. there is no transfer of heat

Answer: D

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8. Equation of a plane progressive wave is given by $y = 0.6 \sin 2\pi\left(t - \frac{x}{2}\right)$. On reflection from a denser medium, its amplitude becomes $2/3$ of the amplitude of the incident wave. The equation of the reflected wave is

A. $y = 0.6 \sin 2\pi\left(t + \frac{x}{2}\right)$

B. $y = -0.4\sin 2\pi\left(t + \frac{x}{2}\right)$

C. $y = 0.4\sin 2\pi\left(t + \frac{x}{2}\right)$

D. $y = -0.4\sin 2\pi\left(t + \frac{x}{2}\right)$

Answer: B

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9. A string of mass 2.50kg is under a tension os 200N. The length of the stretched string is 20.0m. If the transverse jerk is struck at one

end of the string, how long does the disturbance take to reach the other end?

A. 1s

B. 0.5 s

C. 2s

D. data given is insufficient

Answer: B

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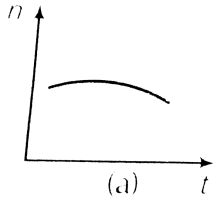
10. A train whistling at constant frequency is moving towards a station at a constant speed V. The train goes past a stationary observer on the station. The frequency n' of the sound as heard by the observer is plotted as a function of time t, figure. Identify the expected curve.

A.



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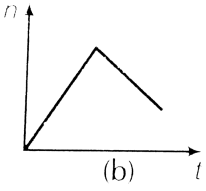

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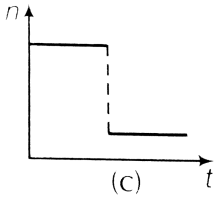

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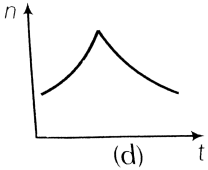

Answer: C

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Multiple Choice Questions More Than One Options

1. A transverse harmonic wave on a string is described by $y(x,t) = 3.0\sin(36t + 0.018x + \pi/4)$ where x, y are in cm, t in second. The positive direction of x is from left to right . (i) Is this a travelling or stationary wave ? If travellying, what are the speed and direction of its propagation ? (ii) what are its amplitude and frequency ? (iii) what is the inital phase at the origing ? (iv) What is the least distance between two successive creests in the wave?

A. the wave is travelling from right to left

B. the speed of the wave is 20 m/s

C. frequecny of the wave is 5.7 Hz

D. the least distance between two successive crests in the wave is 2.5 cm

Answer: A::B::C

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2. The displacement of a string is given by $y(x,t) = 0.06\sin(2\pi x/3)\cos(120\pi t)$ where x and y are in m and t in s. The lengthe of the string is 1.5m and its mass is $3.0 \times 10^{-2} kg$.

A. It represents a progresssive wave of frquency 60Hz

B. It represens a stationary wave of frequency 60Hz

C. It is the result superpositon of two waves of wavelength 3m , frequency 60

Hz each travelling with a speed of 180 m/s in ipposite direction

D. Amplitude of this wave is constant

Answer: B::C

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3. Speed of sound waves in a fluid depends

A. directly on density of the medium

B. square of Bulk modulus of the medium

C. inversly on the square root of density

D. directly on the square root of bulk modulus of the medium

Answer: C::D

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4. During propagation of a plane progressive mechanical wave,

A. all the particle are vibrating in the same phase

B. amplitude of all the particles is equal

C. particles of the medium excutes SHM

D. wave velocity depnds upon the nature of the medium

Answer: B::C::D

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5. The transverse displacement of a string (clamped at its both ends) is given by $y(x,t) = 0.06\sin(2\pi x/3)\cos(120\pi t)$.

All the points on the string between two consecutive nodes vibrate with

A. same frequeny

B. same phase

C. same enrgy

D. different amplitude

Answer: A::D

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6. A train, standing in a station yard, blows a whistle of frequency 400Hz in still air. The wind starts blowing in the direction from the yard to the station with a speed of 10m//s. Given that the speed sound in still air is `34om//s,

A. the frequency of sound as heard by an observer standing on the platform is 400 Hz

B. the speed of sound for the observed standing on the platform is 350 m/s

C. the frequency of sound as heard by the oberver standing on the platform will increases

D. the fequency of sound as heard by the observer standing on the platform will decreases

Answer: A::B

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7. Which of the following statements are true for a stationary wave ?

A. Every paticle has a fixed amplitude which is different from the amplitude of its nearest particle

B. All the particles cross their mean position at the same time

C. There are some particles which are alwayss at rest

D. There is not transfer of energy across any plane

Answer: A::B::D

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Very Short Answer Type Questions

1. A sonometer wire is vibrating is resonance with a tuning fork. Keeping the tension applied same, the length of the wire is

doubled. Under what conditions would the tuning fork still be in resonance with the wire?

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2. An organ pipe of length L open at both ends is found to vibrate in its harmonic when sounded with a tuning fork of 480Hz. What should be the length of a pipe closed at one end, so that it also vibrates in its first harmonic with the same tuning fork?

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3. A tuning fork A, marked 512 Hz, produces 5 beats per second, when sounded with another unmarked tuning fork B. If B is loaded with wax, the number of beats is again 5 per second. What is the frequency of tuning fork B when not loaded?

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4. The displacement of an elastic wave is given by the function $y = 3\sin\omega t + 4\cos\omega t$.

where y is in cm and t is in second. Calculate the resultant amplitude.

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5. A sitar wire is replaced by another wire of same length and material but of three times the earlier radius. If the tension in the wire remains the same, by what factor will the frequency change ?

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6. At what temperatures $(in^{\circ}C)$ will the speed of sound in air be 3 times its value at $O^{\circ}C$?

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7. When two waves of almost equal frequencies n_1 andn_2 reach at a point simultaneously, what is the time interval between successive maxima ?

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Short Answer Type Questions

1. A steel wire has a length of 12 m and mass of 23.10 kg . What will be the speed of a transverse wave on this when a tension of 2.06×10^4N is applied?

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2. A pipe 20 cm long is closed at one end. Which harmonic mode of the pipe is

resonantly excited by a soure of 1237.5 Hz? (sound velocity in air $= 330ms^{-1}$)

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3. A trian standing at the outer signal of a railway station belows a whistle of frequency 400 Hz still air. The train begins to move with a speed of $10ms^{-1}$ towards the platform. What is the frequecncy of the sound for and obeserver standing on the platform? (sound velocity in air $330ms^{-1}$)

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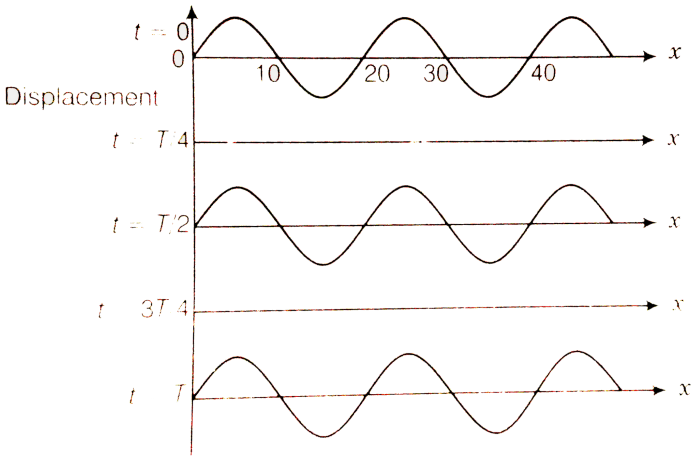
4. The wave pattern on a stretched string is shown in figure . Interpret what kind of wave this is and find its wavelength



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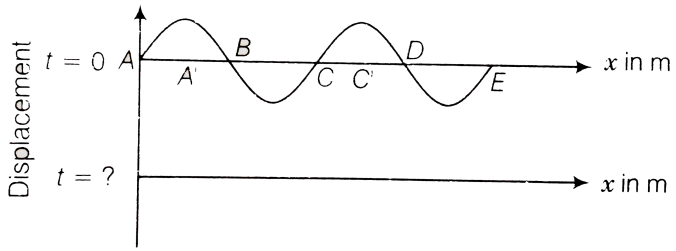
5. The pattern of standing waves formed on a stretched string at two in -stants of time are shown of time are shown in figure. The velocity of two waves superim-posing to form stationary waves is $360ms^{-1}$ and their frequencies are 256 Hz.



(a) Calculate the time at which the second curve is plotted.

(b) Mark nodes and antinodes on the curve.

(c) Calculate the distance between A' and C'

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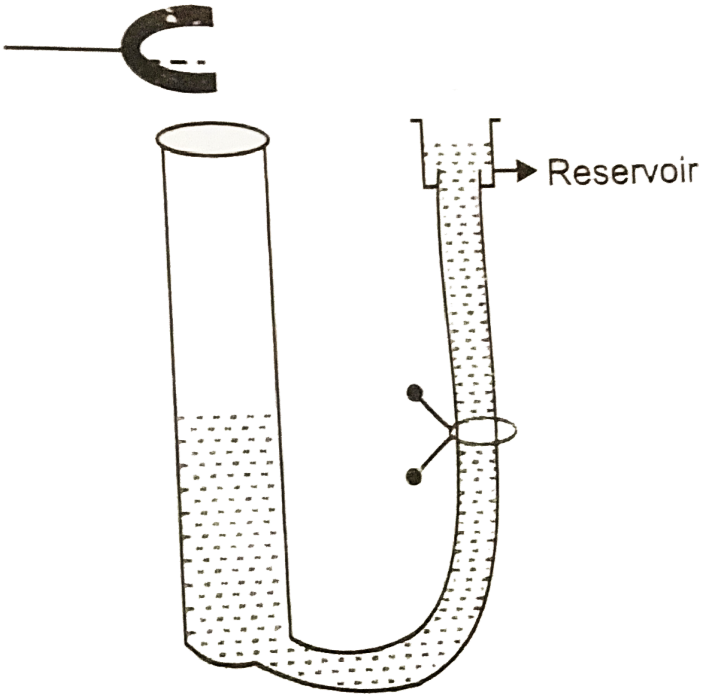
6. A tuning fork vibrating with a frequency of 512 Hz is kept close to the open end of a tube filled with water , figure. The water level in the tube is gradually lowerd. When the water level is 17cm below the open end, maximum intensity of sound in heard. If the room temperature is $20^{\circ} C$, calculate

(a) speed of sound in air at room temperature.

(b) speed of sound in air at $0^{\circ} C$

(c) if the water in the tube is replaced with

mercury, will there be any difference in your observations?



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7. Show that when a string fixed at its two ends vibrates in 1 loops, 2 loops , 3 loops and 4 loops , the frequencies are in the ratio $1:2:3:4$.

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Long Answer Type Questions

1. The earth has a radius of 6400km. The inner core of 1000 km radius is solid. Outside it,

there is a region from 1000 km to a radius of 3500km which is in molten state. Then again from 3500km to 6400 km, the earth is solid. Only longitudinal (P) waves can travel inside a liquid. Assume that the P wave has a speed of $8kms^{-1}$ in solid parts and of $5kms^{-1}$ in liquid parts of the earth. Calculate the time after which it will be recorded in a seismometer at a diametrically opposite point on earth if wave travels along diameter.

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2. If c is r.m.s speed of molecules in a gas and v is the speed of sound waves in the gas, show that c/v is constant and independent of temperature for all diatomic gases.

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3. Give below are some functions of x and t to represent the displacement of an elastic wave.

$(i) y = 5\cos(4x)\sin(20t)$

(ii) $y = 4\sin(5x - t/2) + 3\cos(5x - t/2)$

(iii)

$y = 10\cos[(252 - 250)\pi t]\cos[(252 + 250\pi t]$

(iv)$y = 100\cos(100\pi t + 0.5x)$

State which of these represent

(a) a travelling wave along-x direction

(b) a stationary wave

(c) beats

(d) a travelling wave along $+x$ direction

Give reasons for your answers.

A. a travelling wave along-xdirection

B. a stationary wave

C. beats

D. a travelling wave along -xdirection

Answer:

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4. In the given progressive wave $y = 5\sin(100\pi t - 0.4\pi x)$ where y and x are in m, t in s, what is the (a) amplitude (b) wavelength (c) frequency (d) wave velocity (e) particle velocity amplitude.

A. amplitude?

B. wavelength ?

C. frequency ?

D. wave velocity?

Answer:

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5. For the harmonic travelling wave y=2cos2pi(10t-0.0080x+3.5)` where x and y ar in cm and t is in second. What is the phase

diffference between the oscillatory motion at two points separated by a distance of

A. 4m

B. $0.5m$

C. $\frac{\lambda}{2}$

D. $\frac{3\lambda}{4}$ (at a given instant of time)

Answer:

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