PHYSICS

BOOKS - S CHAND PHYSICS (HINGLISH)

SOUND

Solved Examples

1. If 25 sound waves are produced per second, what is the frequency in hertz?

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2. What is the frequency of a sound wave whose time-period is 0.005s?

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3. The wavelength of sound emitted by a source is $1.7 \times 10^{-2} m$. Calculate frequency of the sound, if its velocity is $343.4 ms^{-1}$.

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4. Sound waves travel with a speed of about $330 m/s$. what is the wavelength of sound whose frequency is 550 hertz?

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5. A source is producing 1500 sound waves in 3 seconds. If the distance covered by a compression and an adjacent rarefaction be 68 cm, find: (a) frequency, (b) wavelength, and (c) velocity, of the sound wave.

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6. If a thunder is heared by a man 4 seconds after the lightning is seen, how far is the lighting from the man? (Speed of sound in air $= 330m/s$).

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7. A man claps his hands near a mountain and hears the echo after 4 seconds. If the speed of sound under these conditions be $330m/s$, calculate the distance of the mountain frm the man.

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Sample Problem

1. A sonar deivce attached to a ship sends. Ultrasomic waves in the sea. These waves are reflected from the bottom of the sea. If the ultrasonic waves take 4 seconds to travel from the ship to the bottom of the sea and back

to the ship (in the form of an echol), what is the depth of the sea? (Speed of sound in water $= 1500 m/s$).

A. In a hypothetical system , a partical of mass m and charge $-3q$ is moving around a very heavy partical chaRGE q. Assume that Bohr's model is applicable to this system , then velocuity of mass m in the first orbit is $\frac{3q^2}{2\varepsilon_0 h}$ $\frac{3q^2}{4\varepsilon_0 h}$ $\frac{3q}{2\pi\varepsilon_0 h}$ $\frac{3q^2}{4\pi\varepsilon_0 h}$ A

$$\frac{mv^2}{r} = \frac{3q^3}{4\pi\varepsilon_0 r^2} \Rightarrow mvr = \frac{3q^2}{4\pi\varepsilon_0 v} \text{ (i)}$$

and $\frac{nh}{2\pi} = mvr$ (ii)

Using Bohr's (i) and (ii) and putting $n = 1$

$$\frac{h}{2\pi} = \frac{3q^2}{4\pi\varepsilon_0 v} \Rightarrow v = \frac{3q^2}{2\pi\varepsilon_0 h}$$ The binding energy of nucei X and Y are E_1 and E_2, respectively. Two atoms of X fuse to give one atom of Y and an energy Q is

released. Then, $Q = 2E_1 - E_2$ $Q = 2E_2 - 2E_1$ $Q < 2E_1 - E_2$ $Q > 2E_2 - 2E_1$ b During fusion, binding energy of daughter nucleus is always greater than the total binding energy of the parent nuclei. The difference of binding energied is released. Hence, $Q = E_2 - 2E_1$. A boy is trying to start a fire by focusing sunlight on a piece of paper using an equiconvex lens of focal length $10cm$. The diameter of the sun is $1.39 \times 10^9 m$ and its mean distance from the earth is $1.5 \times 10^{11} m$. What is the diameter of the sun's image on the paper ? $9.2 \times 10^{-4} m$ $6.5 \times 10^{-4} m$ $6.5 \times 10^{-5} m$ $12.4 \times 10^{-4} m$ A From

the relation $\frac{I}{O} = \frac{v}{u}$

Here, $O = 1.39 \times 10^9$, $v = 0.1m$,

$u = 1.5 \times 10^{11}m$

$$\therefore I = \frac{0.1}{1.5 \times 10^{11}} \times 1.39 \times 10^9 = 9.2 \times 10^{-4}m$$

The temperature of an open room of volume $30m^3$ increases from $17^\circ C \rightarrow 27^\circ C$ due to sunshine. The atmospheric pressure in the room remains $1 \times 10^5 Pa$. If n_i and n_f are the number of molecules in the room before and after heating then n_f and n_i will be 2.5×10^{25} -2.5×10^{25} -1.61×10^{23} 1.38×10^{23} B Here,

$V_1 = 30m^3, T_1 = 17 + 273 = 290K$

$P_1 = 1 \times 10^5 Pa$

$V_2 = 30m^3, T_2 = 27 + 273 = 300K,$

$P_2 = 1 \times 10^5 Pa.$

Let N_1, N_2 be the no, of moles of a gas at

temperature T_1 and T_2 respectively. then

$$N_1 = \frac{P_1 V_1}{RT_1} = \frac{\left(1 \times 10^5\right) \times 30}{83 \times 290} = 1.24 \times 10^3$$

or $$N_2 = \frac{P_2 V_2}{RT_2} = \frac{\left(1 \times 10^5\right) \times 30}{83 \times 300} = 1.20 \times 10^3$$

ltbr. Change in the number of moles

$$N_2 - N_1 = (1.20 - 1.24) \times 10^3 = -0.04 \times 10^3$$

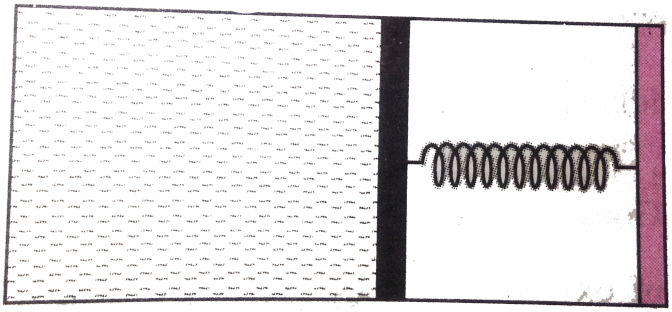
Change in the number of molecules

$$n_f - n_i = (N_2 - N_1) \times \left(6.023 \times 10^{23}\right)$$

$$= -\left(0.04 \times 10^3\right) \times \left(6.023 \times 10^{23}\right)$$

$= -2.5 \times 10^{25}$. An ideal monoatomic gas is confined in a horizontal cylinder by a spring loaded piston (as shown in the Fig.) Initially, the gas is at temperature $T_1, pressure P_1$ and $volume V_1$ and the spring is in its relaxed state. The gas is then heated very slowly to $temperature T_2, pressure P_2$ and $volume V_2$.

during this process, the piston moves out by a distance x. ignoring the friction between the piston and the cylinder, the correct statement(s) is (are)



If $V_2 = 2V_1$ and $T_2 = 3T_1$, then the energy stored in the string is $\frac{1}{4}P_1V_1$ If V_2 and $2V_1$ and $T_2 = 3T_1$, then the charge in iternal energy is $3P_1V_1$. If $V_2 = 3V_1$ and $T_2 = 4T_1$, then the work done by the gas is $\frac{7}{3}P_1V_1$ If $V_2 = 3V_1$ and $T_2 = 4T_1$, then the heat supplied to the gas is $\frac{17}{6}P_1V_1$. B From gas equation , $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} = nR$ or $P_2 = \frac{P_1V_1T_2}{V_2T_1}$ ...(i)

(a) when $V_2 = 2V_1, T_2 = 3T_1$, then

$$P_2 = \frac{P_1V_1 \times 3T_1}{2V_1 \times T_1} = \frac{3}{2}P_1$$

If A is the area of cross- section of the piston, then

$$P_2A = kx \text{ or } P_2Ax = kx^2$$

Energy in spring , $U = \frac{1}{2}kx^2 = \frac{1}{2}P_2Ax$

$$= \frac{1}{2}P_2(V_2 - V_1)$$

$$= \frac{1}{2} \times \frac{3P_1}{2}(2V_1 - V_1) = \frac{3}{4}P_1V_1$$

Thus, option (a) is wrong.

(b) When $V_2 = 2V_1 \text{ and } T_2 = 3T_1$, $P_2 = \frac{3}{2}P_1$ [from (i)]

Change in internal energy ,

$$dU = nC_vdT = m\left(\frac{3R}{2}\right)(T_2 - T_1)$$

$$= n \times \frac{3R}{2}[3T_1 - T_1] = 3nRT_1 = 3P_1V_1$$

Thus option (b) is true.

(c) when $V_2 = 3V_1$ and $T_2 = 4T_1$

$$P_2 = \frac{P_1V_1 \times 4T_1}{3V_1 \times T_1} = \frac{4}{2}P_1$$

Workdone , dW = energy in spring

$$\frac{1}{2}kx^2 = \frac{1}{2}P_2(V_2 - V_1)$$

$$\frac{1}{2} \times \frac{4}{3}P_1[3V_1 - C_1] = \frac{4}{3}P_1V_1$$

Thus option (c) is wrong.

(d) when $V_2 = 3V_1$ and $T_2 = 4T_1$, $P_2 = \frac{4}{3}P_1$

Heat supplied to the gas, $dQ = dU + dW$

$$dQ = n \times \frac{3R}{2}[T_2 - T_1] + \frac{1}{2}P_2(V_2 - V_1)$$

$$= \frac{3}{2}nR[4T_1 - T_1] + \frac{1}{2}\frac{4}{3}P_1[3V_1 - V_1]$$

$$= \frac{9}{2}nRT_1 + \frac{4}{2}P_1V_1 = \frac{9}{2}P_1V_1 + \frac{4}{2}P_1V_1 = \frac{35}{6}P_1V_1$$

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Thus, option (d) is wrong. Two rigid boxes containing different ideal gases are placed on a table. Box A contains one mole of nitrogen at T_0, while box B contains one mole of He at $7/3T_0$. The boxes are then put into thermal contact with eachother, and heat flows between them till the gases reach a common final temperature T_f. ignore the heat capacity of boxes. then $T_f \text{in terms of} T_0$ is $T_f = \frac{7}{3}T_0$

$T_f = \frac{3}{2}T_0$ $T_f = \frac{5}{2}T_0$ $T_f = \frac{3}{7}T_0$ B Here,

$n_1 \text{mole}, n_2 = 1 \text{mole}$

For nitrogen, $C_{p_1} = \frac{7}{2}R$

for helium, $C_{p_2} = \frac{5}{2}R$

$T_1 = T_0, T_2 = \frac{7}{3}T_0. T_f = ?$

when gases are put into thermal contact, heat is exchanged between them till final temperature T_f is reached.

Heat gained by nitrogen = Heat lost by He

$n_1 C_{P_1}(T_f - T_1) = n_2 C_{P_2}(T_2 - T_f)$

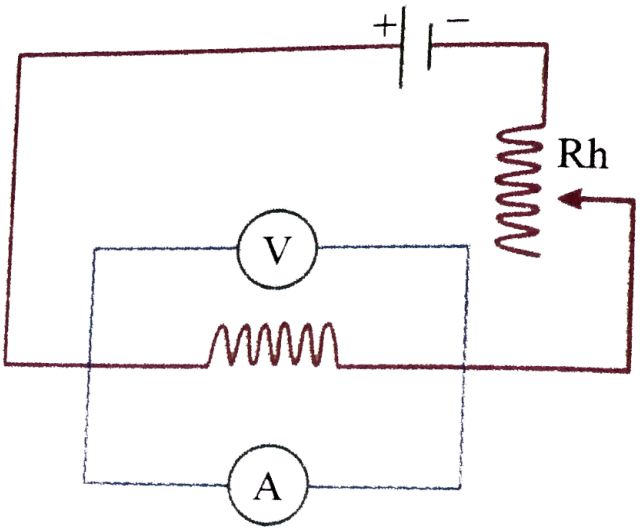
$(n_1 C_{P_1} + n_2 C_{p_2}) T_f = n_2 C_{p_2} T_2 n_1 C_{p_1} T_1$

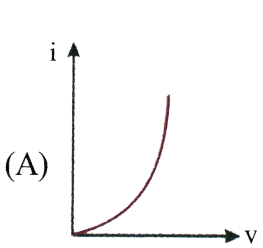
$\left(1 \times 7.2R + \frac{5}{2}R\right) T_f = 1 \times \frac{5}{2}R \times \frac{7}{3}T_0 + 1 \times \frac{7}{2}RT_0$

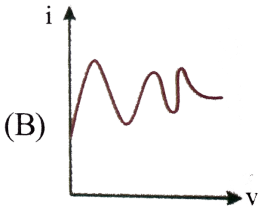
$6RT_f = \left(\frac{35}{6} + \frac{7}{2}\right) RT_0$

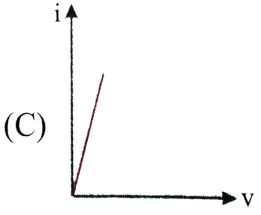
$T_f = \frac{56}{6 \times 6}T_0 \approx \frac{3}{2}T_0$. If by mistake Ammeter is connected parallel to the resistance then $i - V$

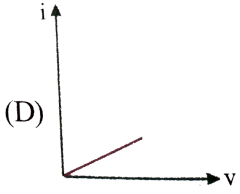
curve expected is (Here i= reading of ammeter, $V =$ reading of voltmeter)











C As ammeter has very low resistance most of current will pass through the

ammeter so reading of ammeter (i) will be very large. Voltmeter has very high resistance so reading of voltmeter will be very low. Unit of $\frac{CV}{\rho\varepsilon_0}$ are of ($C=$ capacitance, $V=$ potential, $\rho=$ specfic resistence and $\varepsilon_0=$ permittivity of free space) Charge current time frequency B $C=\frac{\varepsilon_0 A}{d}$ and $\rho=\frac{RA}{l}$

Substituting in $\frac{CV}{\rho\varepsilon_0}$ we get

$\frac{CV}{\rho\varepsilon_0}=\frac{\left(\frac{\varepsilon_0 A}{d}\right)(V)}{\left(R\frac{A}{l}\right)\varepsilon_0}\equiv \text{current.}$ Two separate monochromatic light beams A and B of the same intensity (energy per unit area per unit time) are falling normally on a unit area of a metallic surface.

Their wavelength are λ_A and λ_B respectively. Assuming that all the the incident light is used in ejecting the photoelectrons, the ratio of the number of photoelectrons from beam A to that from B is $\left(\frac{\lambda_A}{\lambda_B}\right)$ $\left(\frac{\lambda_B}{\lambda_A}\right)$ $\left(\frac{\lambda_A}{\lambda_B}\right)^2$ $\left(\frac{\lambda_B}{\lambda_A}\right)^2$ A The number of photo electron depends on the Number of photons

Number of photon $= \frac{I}{hc/\lambda} = \frac{\lambda . I}{hc} \propto \lambda$

Ratio of no. of photo electrons =$\frac{\lambda_A}{\lambda_B}$ The de Broglie wavelength of an neutron corresponding to root mean square speed at 927° is λ. What will be the de Broglie wavelength of the neutron corresponding to root mean square speed at $27^\circ C$? $\frac{\lambda}{2}$ λ 2λ 4λ C

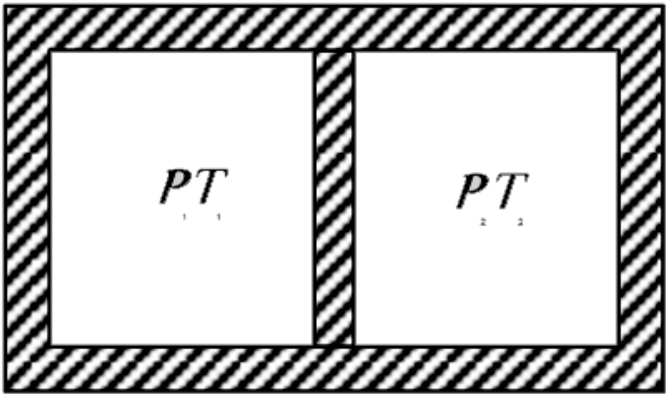
$K.E.$ of neutron $E = \frac{3}{2}KT$

$\lambda_d = \frac{h}{p} = \frac{h}{\sqrt{2mE}} = \frac{h}{\sqrt{2m \times \frac{3}{2}kT}}$

$\Rightarrow \lambda_2 = \lambda\sqrt{\frac{(927+273)}{27+273}} = 2\lambda$ A uniform metal rod is used as a bar pendulum. If the room temperature rises by $10^\circ C$, and the coefficient of linear expansion of the metal of the rod is 2×10^{-6} per $.^\circ C$, the period of the pendulum will have percentage increase of -2×10^{-3} -1×10^{-3} 2×10^{-3} 1×10^{-3} D If on heating throught $80^\circ C$, the mass expelled is $(1/100)^{th}$ of mass still remaining, the coefficient of apparent expansion of liquid is $1.25 \times 10^{-4}/^\circ C$ $12.5 \times 10^{-4}/^\circ C$

$1.25 \times 10^{-5} / ^{\circ} C$ None of these A Two identical containers A and B with frictionless pistons contain the same ideal gas at the same temperature and the same volume V . The mass of the gas in A is $m_A$and that in B is m_B. The gas in each cylinder is now allowed to expand isothermally to the same final volume 2 V . The changes in the pressure in A and B are found to be $\Delta P$and 1.5 ΔP respectively. Then $4m_A = 9m_B$ $2m_A = 3m_B$ $3m_A = 2m_B$ $9m_A = 3m_B$ C Following figure shows on adiabatic cylindrical container of volume V_0 divided by an adiabatic smooth piston (area of cross-section = A)

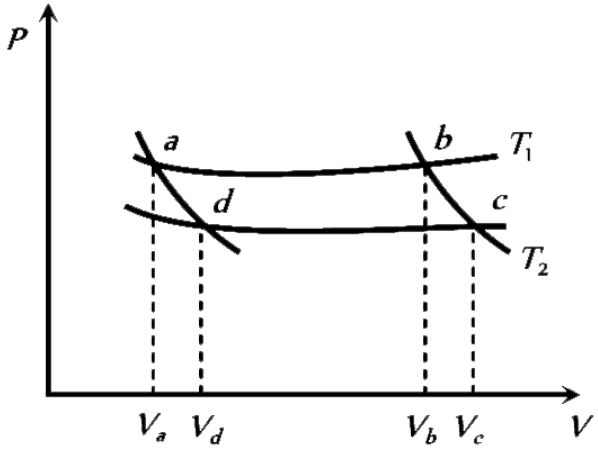
in two equal parts. An ideal gas $\left(C_p / C_y = \lambda\right)$ is at pressure P and temperature T in left part and gas at pressure P and temperature T in right part. The piston is slowly displaced and released at a position where it can stay in equilibrium. The final pressure of the two parts will be (Suppose x = displacement of the piston)



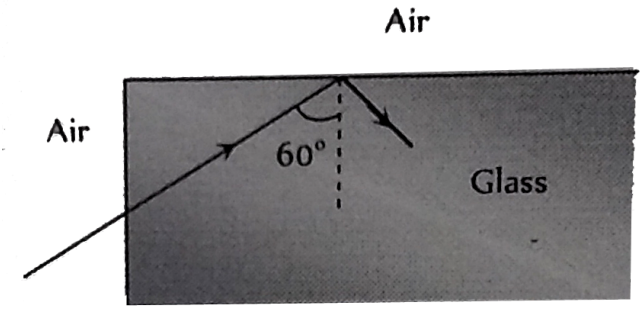
P_2 P_1

$\frac{P_1\left(\frac{V_0}{2}\right)^\lambda}{\left(\frac{V_0}{2}+Ax\right)^\lambda}$ $\frac{P_2\left(\frac{V_0}{2}\right)^\lambda}{\left(\frac{V_0}{2}+Ax\right)^\lambda}$ C In the following P-V

diagram two adiabatics cut two isothermals at temperatures T and T (fig).The value of $\frac{V_a}{V_d}$ will be



$\frac{V_b}{V_c}$ $\frac{V_c}{V_b}$ $\frac{V_d}{V_a}$ V_bV_e A A light ray from air is incident (as shown in figure) at one end of a glass fiber (refractive index $\mu = 1.5$) making an incidence angle of 60° on the lateral surface, so that it undergoes a total internal reflection. How much time would it take to traverse the straight fiber of length 1 km



3.33μ sec

6.67μ sec 5.77μ sec 3.85μ sec D N/A A combination of two thin lenses with focal lengths f_1 and f_2 respectively forms an image of distant object at distance 60 cm when lenses are in contact. The position of this image shifts by 30 cm towards the combination when two lenses are separated by 10 cm . The corresponding values of f_1 and f_2 are 30 cm, -60 cm 20 cm, -30 cm 15 cm, -20 cm 12 cm, -15 cm B N/A An optical instrument uses a 25 D objective and

20 D eyepeice with a tube length of 25 cm when eye is least strained The instrument is a telescope with angular magnification 20. The instrument is a microscope with angular magnification 20. The instrument is a telescope with angular magnification 24. The instrument is a microscope with angular magnification 24. B N/A The ratio of d-Brogile wavelength off mlecules of hydrogen and helium gas moving at arms speed in two gas jars kept sparately at temeperature 37° C and 127° C respectively is : $\frac{2}{\sqrt{3}}\sqrt{\frac{2}{3}}\ \frac{\sqrt{3}}{2}\sqrt{\frac{8}{3}}$ D At t=O, light of intensity 10^{12} photons/$s-m^2$ of energy 6eV per photon starts

falling on a plate with work founction $2.5eV$ If area of the plate is $2 \times 10^{-4} m^2$ and for every 10^5 photons one photoelectron is emitted, charge on the plate at t=25 s is $8 \times 10^{-15} C$ $4 \times 10^{-14} C$ $12 \times 10^{-10} C$ $16 \times 10^{-12} C$ A Radius of an electron moving in a circle in constant magnetic field is two times that of an α particle in the same field. Then de-Broglie wavelength of electrons is x-times of the α-particle Here x is 1 A telescope has an objective lens of $10cm$ diameter and is situated at a distance of one kilometre from two objects. The minimum distance between these two objects, which can be

resolved by the telescope, when the mean wavelength of light is $5000\tilde{A}...$, of the order of mm is : 5 Resolving limit of telescope is

$$\theta \propto \frac{x}{D} = \frac{\lambda}{d} \Rightarrow x = \frac{\lambda D}{d}$$

Given, $\lambda = 5000\tilde{A}... = 5000 \times 10^{-1} m$

$D = 1km = 1000m$

$d = 10cm = 0.1m$

Hence, $x = \frac{5000 \times 10^{-10} \times 1000}{0.1}$

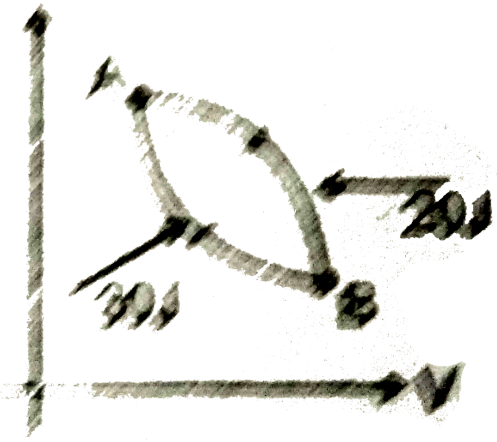
$= 5 \times 10^{-3} m = 5mm$ A spring is placed between the jaws of screw gauge such that the spring is not all compressed. The mai scale reads 2 division and circular scale reads 28 divisions. Now we turn the

circular scale by 18° such that the spring is compessed. The circular scale has 200 divisions and the least count of the main scale is $1mm$. the force exerted by the spring on the jaws in unit mN. (the spring constnat is $100N/m$) 5 Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two objects than human eye can resolve at 500nm wavelength is Xmm , so value of x is: 30

$$\sin\theta = \frac{0.25}{25} = \frac{1}{100}$$

Resolving power $= \dfrac{1.22\lambda}{2\mu\sin\theta} = 30\mu m$ In a cyclic process shown in the figure an ideal gas is

adiabatically taken from B and A, the work done on the gas during the process $B \rightarrow A$ is $30J$, when the gas is taken from $A \rightarrow B$ the heat absorbed by the gas is $20J$. The change in internal energy of the gas in the process $A \rightarrow B$ is given as $-X$, so value of X is - :



30 N//A

B.

C.

D.

Answer:

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Very Short Answer Type Questions

1. Can sound travel through (a) iron, and (b) water?

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2. Name one solid, one liquid and one gas through which sound can travel.

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3. What type of wave is represented:

(a) by density-distance graph?

(b) by displacement-distance graph?

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4. Is the speed of sound more in water or in steel?

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5. In which medium sound travels faster: air or iron?

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6. In which medium sound travels fastest: air, water or steel?

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7. Out of solids, liquids and gases:

(a) in which medium sound travels slowest?

(b) in which medium sound travels fastest?

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8. Which of the following is the speed of sound in copper and which in aluminium?

(a) $5100 m / s$ (b) $1500 m / s$ (c) $3750 m / s$

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9. What is the speed of sound:

(a) in air? (b) in water? (c) in iron?

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10. What name is gives to those aircrafts which fly at speeds greater than the speed of sound?

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11. What is meant by supersonic speed?

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12. State one observation from everyday life which shows that sound travels much more slow than light.

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13. Name the two types of waves which can be generated in a long flexible spring (or slinky).

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14. Name the type of waves produced when a tuning fork is struck in air.

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15. What should an object do to produce sound?

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16. What is the name of the strings which vibrate in our voice box when we talk?

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17. Name the device which is used to produced sound in laboratory experiments.

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18. What conclusion can be obtained from the observation that when the prongs of a sound making tuning fork touch the surface of water in a beaker, the water gets splashed?

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19. State whether the following statement is true or false: Sound produced by a vibrting body travels to our ears by the actual movement of air.

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20. Fill in the following blanks with suitable words:

(a) Sound is caused by.....

(b) A sound wave consists of places of higher pressure called.....and places of.....pressure called.....

(c) Wave speed in metres per second equals frequency in.....multiplied by.....in.....

(d) Sound cannot travel through.....

(e) The speed of sound in a solid is.....than the speed of sound in air.

(f) When the frequency of the sound is increased, the wavelength.....

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21. What name is given to the persistance of sound in a big hall or auditorium?

A. Reverberation

B. resonance

C. acoustics

D. articulation

Answer: A

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22. Name three devices which work on the reflection of sound.

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23. What is the other name of a lound-halider?

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24. Name the unit used to measure the loudness of sound. Also write its symbol.

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25. Name the characteristic which helps us distinguish between a man's voice and a woman's voice, even without seeing them.

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26. How does the pitch of a sound depend on frequency?

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27. Name the characteristic of sound which depends on (a) amplitude (b) frequency and (c) waveform.

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28. Name the characteristic of sound which can distinguish between the 'notes' (musical sounds) played on a flute and a sitar (both the notes having the same pitch and loundness).

A. amplitude

B. timbre

C. both

D. none

Answer: b

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29. Name that part of ear which vibrates when outside sound falls on it.

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30. From outer to inner side, the sequence of three bones present in the middle ear of mammals is

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31. Name the tube which connects the middle ear to throat.

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32. Name the nerve which carries electrical impulses from the cochlea of ear to the brain.

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33. What is the name of passage in outer ear which carries sound waves to the ear-drum?

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34. Why should we not put a pin or pencil in our ears?

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35. What type of scans are used these days to monitor the growth of developing baby in the uterus of the mother?

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36. What is the name of the device which is used to find the depth of sea (or ocean) by using ultrasonic sound waves?

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37. Name the principle on which a soundboard works.

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38. Name the device used by doctors to liste to our heartbeats.

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39. What is the shape of a soundboard kept behind the speaker on the stage of a big hall?

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40. What name is given to sound waves of frequencies higher than 20 kHz?

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41. What type of sound waves are produced by a vibrating simple pendulum?

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42. What happens to the pitch of a sound if its frequency increases?

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43. What happens to the loudness of a sound if its amplitude decreases?

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44. Fill in the following blanks with suitable words:

(a) An echo is simply a.....sound.

(b) Pitch of sound depends on.....

(c) Loudness of sound depends on.....

(d) Quality of sound depends on.....

(e) Echoes are caused by the .....of sound.

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Exercise

1. Can sound waves travel through vacuum ?

A. yes

B. no

C. none

D. both A and B

Answer: B

Watch Video Solution

2. Name the type of waves which are used by astronatus of communicate with one another on moon (or in outer space).

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3. Which of the following cannot transmit sound? Water, Vaccum, Aluminium, Oxygen gas

Watch Video Solution

4. Name the physical quantity whose SI unit is 'hertz'

Watch Video Solution

5. What is the SI unit of frequency?

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6. A jet aircraft flies at a speed of $410 m / s$. What is this speed known as?

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7. A stone is dropped on the surface of water in pond. Name the type of waves produced.

Watch Video Solution

8. What is the general name of the waves consisting of:

(a) compressions and rarefactions?

(b) crests and troughs?

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9. State the general name of the waves in which the particles of the medium vibrate:

(i) in the same direction as wave.

(ii) at right angles to the direction of wave.

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10. What type of waves are illustrated by the movement of a rope whose one end is fixed to a pole and the other end is moved up and down?

Watch Video Solution

11. Which of the following travels slowest in air and which one fastest? Supersonic aircraft, Light, Sound

Watch Video Solution

12. Which term is used to denote a speed greater than the speed of sound?

Watch Video Solution

13. A tuning fork has a number 256 marked on it. What does this number signify?

Watch Video Solution

14. What is the time-period of a tuning fork whose frequency is 200 Hz?

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15. Calculate the frequency of a wave whose time-period is 0.02s.

Watch Video Solution

16. What will be the change in the wavelength of a sound wave in air if its frequency is doubled?

Watch Video Solution

17. If 20 waves are produced per second, what is the frequency in hertz?

Watch Video Solution

18. What is vaccum? Explain why, sound cannot travel through vaccum?

Watch Video Solution

19. Explain the term amplitude of a wave. Draw the diagram of a wave and mark its amplitude on it.

Watch Video Solution

20. A cricket ball is seen to hit the bat first and the sound of hitting is heared a little later. Why?

Watch Video Solution

21. Which of the following terms apply to sound waves in air and which to water waves? Transverse, Rarefaction, Trough, Crest, Compression, Longitudinal

Watch Video Solution

22. (a) Name four ways in which sound can be produced.

(b) Calculate the speed of a sound wave whose frequency is 2kHz and wavelength 65 cm.

Watch Video Solution

23. A sound signal of 128 vibrations per second has a wavelength of 2.7m. Calculate the speed with which the wave travels.

Watch Video Solution

24. A wave is moving in air with a velocity of $340 m / s$. Calculate the wavelength if its frequency is 512 vibrations/sec.

Watch Video Solution

25. Define the 'frequency' and 'time-period' of a wave. What is the relation between the two?

Watch Video Solution

26. Explain why, a ringing bell suspended in a vacuum chamber cannot be heard outside.

Watch Video Solution

27. The frequency of the sound emitted by the loudspeaker is 1020 Hz. Calculate the wavelength of the sound wave in air in cm where its velocity is 340 m/s.

Watch Video Solution

28. (a) Define the terms frequency wavelength and velocity of a sound wave. What is the relation between them?

(b) A body vibrating with a time-period of $\frac{1}{26}s$ produces a sound wave which travels in air with a velocity of $350m/s$. Calculate the wavelength.

Watch Video Solution

29. Which of the following statement best describes frequency?

A. the maximum disturbance caused by a wave

B. the number of complete vibrations per second

C. the distance between one crest of a wave and the next one

D. the distance travelled by a wave per second

Answer: B

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30. If the speed of a wave is $340 m / s$ and its frequency is 1700 Hz, then λ for this wave in cm will be:

A. 2

B. 0.2

C. 20

D. 200

Answer: C

Watch Video Solution

31. A musical instrument is producing a continous note. This note cannot be heard by a person having a normal hearing range. This note must then be passing through:

A. water

B. wax

C. vaccum

D. empty vessel

Answer: C

Watch Video Solution

32. Which one of the following does not consist of transverse waves?

A. light emitted by a CFL

B. TV signals from a satellite

C. ripples on the surface of a pond

D. musical notes of an orchestra

Answer: D

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33. Sound travels in air if :

A. if particles of medium travel from one place to another

B. if there is no mositure in the atmosphere

C. it disturbance moves

D. it both, particles as well distrubance move from one place to another

Answer: C

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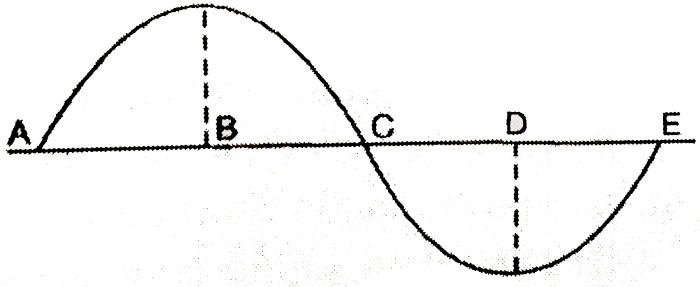
34. In the sound wave produced by a vibrating turning fork shown in the diagram, half the wavelength is represented by:



A. AB

B. BD

C. DE

D. AE

Answer: B

Watch Video Solution

35. The sound waves travel fastest:

A. in solids

B. in liquids

C. in gases

D. in vacuum

Answer: A

Watch Video Solution

36. When the pitch of note produced by a harmonium is lowered, then the wavelength of the note:

A. decreases

B. first decreases and then increases

C. increases

D. remains the same

Answer: C

Watch Video Solution

37. Draw the sketches of two waves A and B such that wave A has twice the wavelength and half the amplitude of wave B.

Watch Video Solution

38. Through which of the following materials can sound travel? Wood, air, water, steam, ice, hydrogen, steel, diamond.

Watch Video Solution

39. The longitudinal waves travel in a coiled spring at a rate of 4m/s. The distance between two consecutive compressions in 20cm. Find:

(i) Wavelength of the wave (ii) Frequency of the wave

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40. Which property of sound leads of the formation of echoes?

Watch Video Solution

41. What name is given to the repettion of sound caused by the reflection of sound waves?

Watch Video Solution

42. Name three characteristics of sound.

Watch Video Solution

43. What is the full form of the term 'SONAR' ?

Watch Video Solution

44. Can we hear (a) infrasonic waves (b) ultrasonic waves?

Watch Video Solution

45. What name is given to the sound waves of frequency too low for humans to hear?

Watch Video Solution

46. What name is given to sound waves of frequencies higher than 20 kHz?

Watch Video Solution

47. Explain how bats use ultrasound to catch a prey.

Watch Video Solution

48. Explain how defects in a metal block can be detected using ultrasound.

Watch Video Solution

49. What is the range of frequencies associated with

(a) infra sound

(b) ultrasound ?

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50. (a) What is the difference between infrasonic waves and ultrasonic waves?

(b) Choose the infrasonic waves and ultrasonic waves from the following frequencies:

(i) 10,000 Hz (ii) 30,000 Hz (iii) 18 Hz (iv) 50,000 Hz (v) 10 Hz

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51. The echo of a sound is heard after 5 seconds. If the speed of sound in air be 342m/s, calculate the distance of the reflecting surface.

Watch Video Solution

52. The speed of sound in water is 1500 metres per second. How far away from an under-sea rock should a deep sea dilver be so that he can hear his own echo?

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53. (a) What is sonar? Explain its use.

(b) A sonar station picks up a return signal after 3 seconds. How far away is the object? (Speed of sound in water $= 1440m/s$).

Watch Video Solution

54. In SONAR, we use :

A. ultraonic waves

B. infrasonic waves

C. radio waves

D. audible sound waves

Answer: A

Watch Video Solution

55. When we change feeble sound to loud we increase its :

A. frequency

B. amplitude

C. velocity

D. wavelength

Answer: B

Watch Video Solution

56. Earthquake produces which kind of sound before the main shock wave begins :

A. ultrasound

B. infrasound

C. audible sound

D. none of the above

Answer: B

Watch Video Solution

57. Before playing the orchestra in a musical concert, a sitarist tries to adjust the tension and pluck the string suitably. By doing so, he is adjusting :

A. intensity of sound only

B. amplitude of sound only

C. frequency of the sitar string with the frequency of other musical instruments

D. loudness of sound

Answer: C

Watch Video Solution

58. Note is a sound :

A. of a mixture of several frequencies

B. of mixture of only two frequencies

C. of a single frequency

D. always unpleasant to listen to

Answer: C

Watch Video Solution

59. An echo-sounder in a trawler (fishing boat) receives an echo from a shoal of fish 0.4s after it we sent. If the speed of sound in water is 1500 m/s, how deep is the shoal?

A. 150m

B. 300m

C. 600m

D. 7500m

Answer: B

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60. The speed of highly penetrating ultrasonic waves is:

A. lower than those of audible sound waves

B. higher than those of audible sound waves

C. much higher than those of audible sound waves

D. same as those of audible sound waves

Answer: D

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61. The ultrasound waves can penetrate into matter to a large extent because they have:

A. very high speed

B. very high freqquency

C. very high wavelength

D. very high amplitude

Answer: B

Watch Video Solution

62. The frequencies of four sound waves are given below. Which of these sound waves can be used to measure the depth of sea by the echo method?

A. 15,000 Hz

B. 10 kHz

C. 50 kHz

D. 10,000 Hz

Answer: C

Watch Video Solution

63. What type of waves are generated by SONAR device fixed to a fishing ship?

A. water waves

B. radio waves

C. sound waves

D. infrared waves

Answer: C

Watch Video Solution

64. A student takes some water in a beaker and heats it over a flame for determining its boiling point. He keeps on

taking its temperature reading. He would observe that the temperature of water :

A. keeps on increasing regularly

B. keeps on increasing irregularly

C. first increases slowly, then decreases rapidly and eventually becomes constant

D. first increases gradually and then becomes constant

Answer: D

Watch Video Solution

65. A student uses a spring balance of least count 10 g wt and range 500 g wt. He records the weight of a small iron

cube in air, in tap water and in a cancentrated solution of common salt in water, If his three reading taken in this order are $W_1(= 50gwt)$, W_2 and W_3 he is likely to observe that:

A. $W_1 > W_2 > W_3$

B. $W_3 > W_2 > W_1$

C. $W_1 > W_3 > W_2$

D. $W_2 > W_1 > W_3$

Answer: A

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66. While performing an experiment on verifying the laws of reflection of sound (Fig. 6.18), how can the reflected sound be detected better ?

A. near the end of the tube and keeping the other ear closed

B. near the end of the tube and keeping the other ear open

C. at about 5 cm from the end of the tube and keeping the other ear closed

D. at about 5cm from the end of the tube and keeping the other ear open

Answer: A

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67. When an object is fully immersed in a liquid, the apparent loss in weight:

A. is less than the weight of liquid displaced by it

B. is more than the weight of liquid displaced by it

C. is equal to the weight of liquid displaced by it

D. does not depend on the density of the liquid displaced by it

Answer: C

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68. How does the sound produced by a vibrating object in a medium reach your ear ?

Watch Video Solution

69. Explain how sound is produced by your school bell ?

Watch Video Solution

70. Why are sound waves called mechanical waves ?

Watch Video Solution

71. Suppose you and your friend are on the Moon. Will you be able to hear any sound produced by your friend ?

Watch Video Solution

72. Which wave property determines

(a) loudness

(b) Pitch ?

Watch Video Solution

73. Guess which has a higher pitch : a guitar or a car horn ?

Watch Video Solution

74. What are wavelength, frequency, time period and amplitude of a sound wave ?

Watch Video Solution

75. How are the wavelength and frequency of a sound wave related to its speed ?

Watch Video Solution

76. Calculate the wavelength of a sound wave whose frequency is $220Hz$ and speed is $440m/s$ in a given medium.

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77. A person is listening to a tone of $500Hz$ sitting at a distance of $450m$ from the source of the sound. What is the time interval between successive compressions from the source ?

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78. Distinguish between loudness and intensity of sound.

Watch Video Solution

79. In which of the three media : air, water or iron , does sound travel the fastest at a particular temperature ?

Watch Video Solution

80. An echo is returned in $3s$. What is the distance of the reflecting surface from the source, given that the speed of sound is $342m/s$.

Watch Video Solution

81. Why are the ceilings of concert halls curved ?

Watch Video Solution

82. What is the audible range of the average human ear ?

Watch Video Solution

83. What is the range of frequencies associated with

(a) infra sound

(b) ultrasound ?

Watch Video Solution

84. A submarine emits a sonar pulse, which returns from an underwater cliff in $1.02s$. If the speed of sound in water is $1531m/s$, how far away is the cliff ?

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85. What is sound and how is it produced ?

Watch Video Solution

86. Describe with the help of a diagram, how compressions and rarefactions are produced in air near a source of sound.

Watch Video Solution

87. Cite an experiment to show that sound needs a material for its propagation.

Watch Video Solution

88. Why is sound wave called a longitudinal wave ?

Watch Video Solution

89. The frequency of a source of sound is $100Hz$. How many times does it vibrate in a minute ?

Watch Video Solution

90. Does sound follow the same laws of reflection as light does ? Explain.

Watch Video Solution

91. Give two practical applications of reflection of sound waves.

Watch Video Solution

92. A stone is dropped from the top of a tower $500m$ high into a pond of water at the base of the tower. When is the splash heard at the top ? Given, $g = 10m/s^2$ and speed of sound $= 340m/s$.

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93. A sound wave travels at a speed of $339m/s$. If its wavelength is $1.5cm$, what is the frequency of the wave ? Will it be audible ?

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94. What is reverberation ? How can it be reduced ?

Watch Video Solution

95. What is loudness of sound ? What factors does it depend on ?

Watch Video Solution

96. Explain how bats use ultrasound to catch a prey.

Watch Video Solution

97. How is ultrasound used for cleaning ?

Watch Video Solution

98. Explain the working and application of a sonar.

Watch Video Solution

99. A sonar device on a submarine sends out a signal and receives an echo $5s$ later. Calculate the speed of sound in water if the distance of the object from the submarine is $3625m$,

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100. Explain how defects in a metal block can be detected using ultrasound.

Watch Video Solution

101. Explain how the human ear works.

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Short Answer Type Questions

1. Explain why, the flash of lightning reached us first and the sound of thunder is heard a little later.

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2. Explain why, the flash of a gun shot reaches us before the sound of the gun shot.

Watch Video Solution

3. If a ringing bicycle bell is held tightly by hand, it stops producing sound. Why?

Watch Video Solution

4. Which object is vibrating when the following sounds are produced?

(i) The sound of a sitar (ii) The sound of a tabla (iii) The

sound of a tuning fork

(iv) The buzzing of a bee or mosquito (v) The sound of a flute

Watch Video Solution

5. Describe a simple experiment to show that the prongs of a sound producing tuning fork are vibrating.

Watch Video Solution

6. When we open a gas tap for a few seconds, the sound of escaping gas is heard first but the smell of gas comes later. Why?

Watch Video Solution

7. What is the distance between a compression and its nearest rarefaction in a longitudinal wave?

Watch Video Solution

8. On which day, hot day or a cold day, an echo is heard sooner? Give reason for your answer.

Watch Video Solution

9. In which medium, air or water, an echo is heard much sooner? Why?

Watch Video Solution

10. What is reverberation? What will happen if the reverberation time in a big hall is too long?

Watch Video Solution

11. How can reverbrations in a big hall or auditorium be reduced?

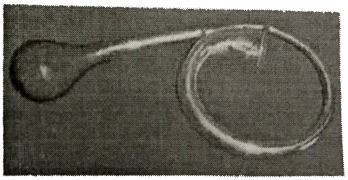
Watch Video Solution

12. Why do we hear more clearly in a room with curtains than in a room without curtains?

Watch Video Solution

13. What is a megaphone? Name the principle on which a megaphone works.

Megaphone



Bulb horn

Watch Video Solution

14. What is a bulb horn? Name the principle on which a bulb horn works.

Watch Video Solution

15. What is a stethoscope? Name the principle on which a stethoscope works.

Watch Video Solution

16. What is a soundboard? Explain the working of a soundboard with the help of a labelled diagram.

Watch Video Solution

17. (a) What is meant by the 'loudness' of sound? On what factor does the loudness of a sound depend?

(b) Draw labelled diagrams to represent (a) soft sound, and (b) loud sound, of the same frequency.

Watch Video Solution

18. (a) Explain the term 'pitch' of a sound. On what factor does the 'pitch' of a sound depend?

(b) Draw labelled diagrams to represent sound of (a) low pitch, and (b) high pitch, of the same loudness.

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19. What is meant by the quality (or timbre) of sound? On what factor does the quality (or timbre) of a sound depend?

Watch Video Solution

20. Explain why, if we strike a table lightly, we hear a soft sound but if we hit the table hard, a lound sound is heard.

Watch Video Solution

21. Give one use of ultrasound in industry and one in hospitals.

Watch Video Solution

22. How is it that bats are able to fly at night without colliding with other objects?

Watch Video Solution

23. Why are the ceilings of concert halls made curved? Draw a labelled diagram to illustrate your answer.

Watch Video Solution

24. Draw a labelled diagram to show the multiple reflections of sound in a part of the stethoscope tube.

Watch Video Solution

25. (a) What is the frequency range of hearing in humans?

(b) Which of the following sound frequencies cannot be heard by a human ear?

(i) 10 Hz (ii) 100 Hz (iii) 10,000 Hz (iv) 15Hz (v) 40,000 Hz

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Long Answer Type Questions

1. (a) What is sound? What type of waves are sound waves in air?

(b) Describe an experiment to show that sound cannot pass through vacuum.

Watch Video Solution

2. (a) How is sound produced? Explain with the help of an example.

(b) How does sound from a sound producing body travel

through air to reach our ears? Illustrate your answer with the help of a labelled diagram.

Watch Video Solution

3. (a) An electric bell is suspended by thin wires in a glass vessel and set ringing. Describe and explain what happens if the air is gradually pumped out of the glass vessel.

(b) Why cannot a sound be heard on the moon? How do astronauts talk to one another on the surface of moon?

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4. (a) What are longitudinal waves and transverse waves? Explain with the help of labelled diagrams.

(b) Give two examples each of longitudinal waves and transverse waves.

Watch Video Solution

5. (a) Explain the terms 'compression' and rarefactions of a wave. What type of waves consist of compressions and rarefactions?

(b) A worker lives at a distance of 1.32 km from the factory. If the speed of sound in air be $330 m / s$, how much time will the sound of factory siren take to reach the worker?

Watch Video Solution

6. (a) Explain the terms 'crests' and 'troughs' of a wave? What type of waves consist of crests and troughs?

(b) The flash of a gun is seen by a man 3 seconds before the sound is heard. Calculate the distance of the gun from the man (Speed of sound in air is $332 m / s$).

Watch Video Solution

7. (a) When we put our ear to a railway line, we can hear the sound of an approaching train even when the train is far off but its sound cannot be heared through the air. Why?

(b) How could you convince a small child that when you

speak, it is not necessary for air to travel from your mouth to the ear of a listener?

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8. (a) What is meant by 'reflection of sound'? What type of surfaces are the best for reflecting sound?

(b) Name any two objects which are good reflectors of sound.

(c) State the laws of reflection of sound.

Watch Video Solution

9. (a) What is an echo? How is echo formed?

(b) What is the minimum distance in air required from a

sound reflecting surface to hear an echo (at $20^{\circ} C$)?

(c) A man standing 825 metres away from a cliff (steep rock) fires a gun. After how long will he hear its echo? Speed of sound in air is $330 m / s$.

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10. (a) What is ultrasound? What is the difference between ordinary sound and ultrasound?

(b) Write any three applications (or uses) of ultrasound.

Watch Video Solution

11. (a) What are infrasonic waves? Name two animals which produce infrasonic waves.

(b) What are ultrasonic waves? Name two animals which can produce ultrasonic waves

Watch Video Solution

12. (a) Define the following terms: (a) Echolocation (b) Echocardiography, and (c) Ultrasonography.

(b) Name an animal which nevigates and finds food by ecolocation.

(c) Which of the two produces ultrasonic waves: porpoise or whale?

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13. Draw a neat and labelled diagram of the human ear. With the help of this diagram, explain the construction and working of the human ear.

Watch Video Solution

Multiple Choice Questions

1. Which of the following vibrates when a muscial note is produced by the cymbals in an orchestra?

A. stretched strings

B. stretched membranes

C. metal plates

D. air columns

Answer: C

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2. The maximum speed of vibrations which produce audible sound will be in:

A. dry air

B. sea water

C. ground glass

D. human blood

Answer: C

Watch Video Solution

3. The speeds of sound in four different media are given below. Which of the following is the most likely speed in m/s with which the two under water whales in a sea talk to each other when separated by a large distance?

A. 340

B. 5170

C. 1280

D. 1530

Answer: D

Watch Video Solution

4. The velocities of sound waves in four media P,Q,R and S are $18,000 km/h, 900 km/h, 0 km/h,$ and 1200 km/h respectively. Which medium could be a liquid substance?

A. P

B. Q

C. R

D. S

Answer: D

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5. Which of the following can produce longitudinal waves as well as transverse waves under different conditions?

A. water

B. TV transmitter

C. slinky

D. tuning fork

Answer: C

Watch Video Solution

6. A key of a mechanical piano is struck gently and then struck again but much harder this time. In the second case

:

A. second will be lounder but pitch will not be different

B. sound will be lounder and the pitch will also be higher

C. sound will be lounder but pitch will be lower

D. both loundness and pitch will remain unaffected

Answer: A

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7. One of the following can hear infrasound. This one is:

A. dog

B. bat

C. rhinoceros

D. humans

Answer: C

Watch Video Solution

8. Which of the following frequency of sound can be generated by a vibrating simple pendulum as well as by the vibrating vocal cords of a rhinoceros?

A. 5kHz

B. 25 Hz

C. 10 Hz

D. 15,000 Hz

Answer: C

Watch Video Solution

9. Which of the following device does not work on reflections of sound waves?

A. stethoscope

B. hydrophone

C. soundboard

D. megaphone

Answer: B

Watch Video Solution

10. We can distinguish between the muscial sounds produced by different signers on the basis of the characteristic of sound called:

A. frequency

B. timbre

C. pitch

D. loundness

Answer: B

Watch Video Solution

11. At $20^{\circ}C$, the minimum distance of a person from a sound reflecting surface to hear an echo is:

A. 12.2m

B. 17.2m

C. 15.2m

D. 34.4m

Answer: B

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12. While performing an experiment on verifying the laws of reflection of sound, a students is to choose between (i) a narrow or a wide tube, and (ii) is strong or a faint

source of sound. The observed experimental difference, between the values of angle of incidence and angle of reflection, is likely to be minimum when he chooses a:

A. narrow tube and a faint source

B. wide tube and a faint source

C. narrow tube and a strong source

D. wide tube and a strong source

Answer: C

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13. For verifying the laws of reflection of sound, a student has to choose from:

(i) a black polished metal sheet or a white thermocole sheet.

(ii) a 0.5 m long tube of diameter 3 cm or a 1.5m long tube of diamater 20 cm He should prefer to choose the:

A. metal sheet and the 0.5m long tube

B. metal sheet and the 1.5m long tube

C. thermocole sheet and the 0.5m long tube

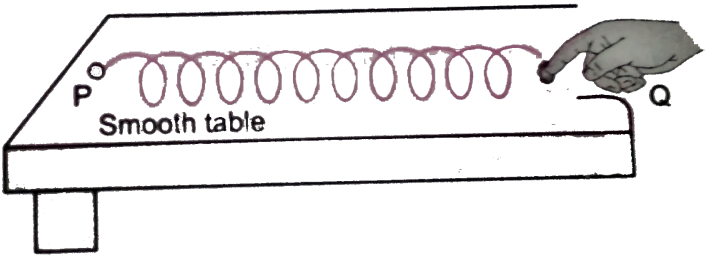
D. thermocole sheet and the 1.5m long tube

Answer: A

Watch Video Solution

14. A student sets up a slinky PQ on a smooth table top in the manner

How can he produce transverse waves in the slinky by moving its free end Q ?



A. at an angle of 45° with the table top

B. backward and forward along the length of the slinky

C. up and down

D. left and right

Answer: C

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15. A student lists the following precautions for the experiment on determining the velocity of a pulse propagated through a stretched string:

(A) The string should not be stretched too tight.

(B) The counting of the pilse journeys must start from zero and not from one.

(C) The string should be stretched straight in contact with the table.

(D) The amplitude of the pulse should be kept appreciably high.

The incorrect entry, in this list of precautions, is the precaution listed as:

A. A

B. B

C. C

D. D

Answer: C

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16. For plotting temperature time graph for a hot body as it cools to room temperature, a student is to choose one each from each of the following pairs.

A: Calorimeter

(i) blackened from outside (ii) polished from outside

B: Base for keeping the calorimeter

(i) insulated (ii) metallic

In order to get the correct graph he should prefer to choose:

A. A (i), B(ii)

B. A (ii), B(ii)

C. A (i), B(i)

D. A (ii), B (i)

Answer: C

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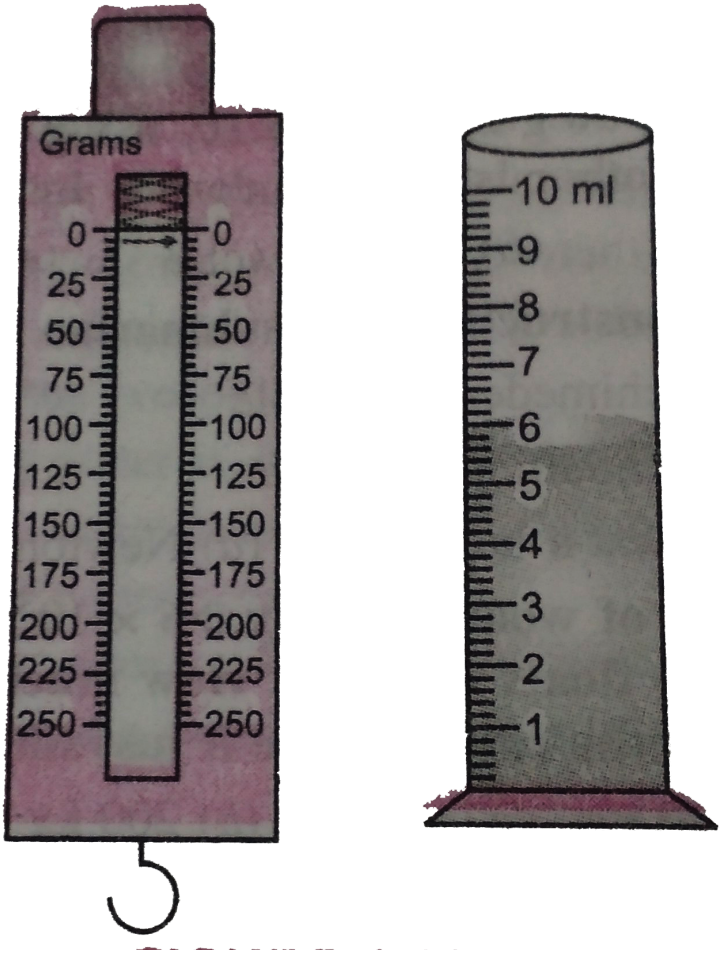
17. The magnitude of zero error of the spring balance and least count of the measuring cylinder



A. 2.5g and 0.1m

B. 5.0g and 0.1mL

C. 2.5g and 0.2mL

D. 5.0 and 0.2mL

Answer: D

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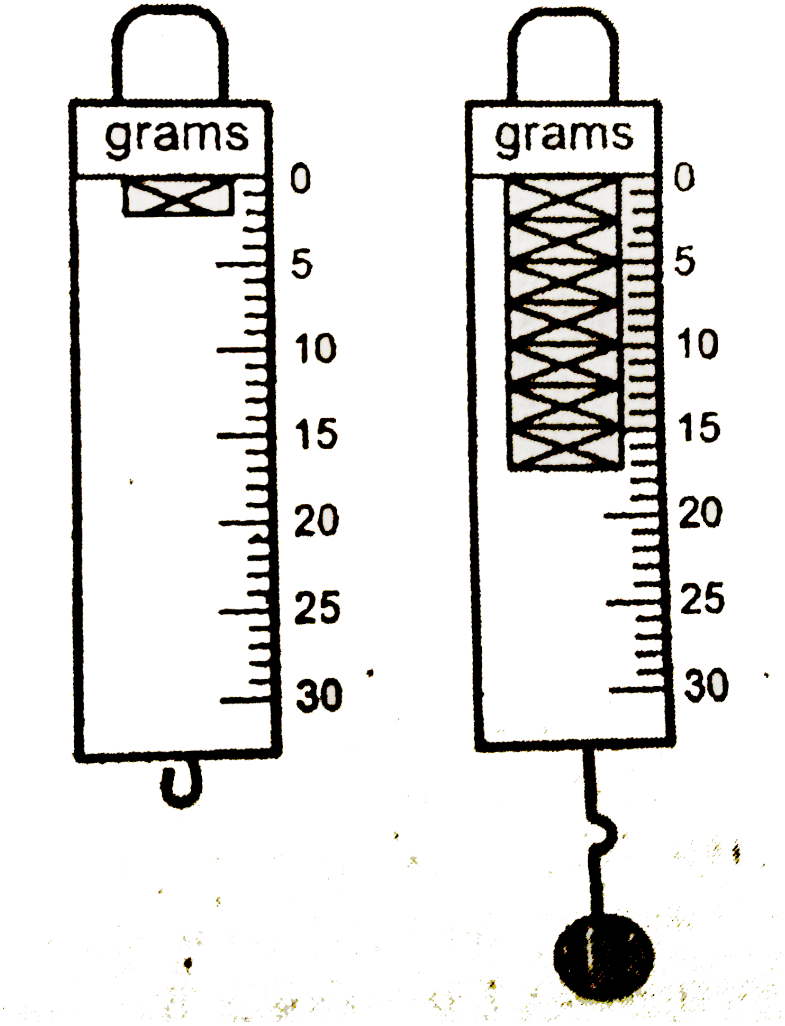
18. The zero-error in the spring balance shown and the correct weight of the solid, suspended from it, are equal,

respectively, to:



A. $+2g$ wt, 19 g wt

B. $+2g$ wt, 15g wt

C. $-2g$ wt, 19g wt

D. $-2g$ wt, 15g wt

Answer: B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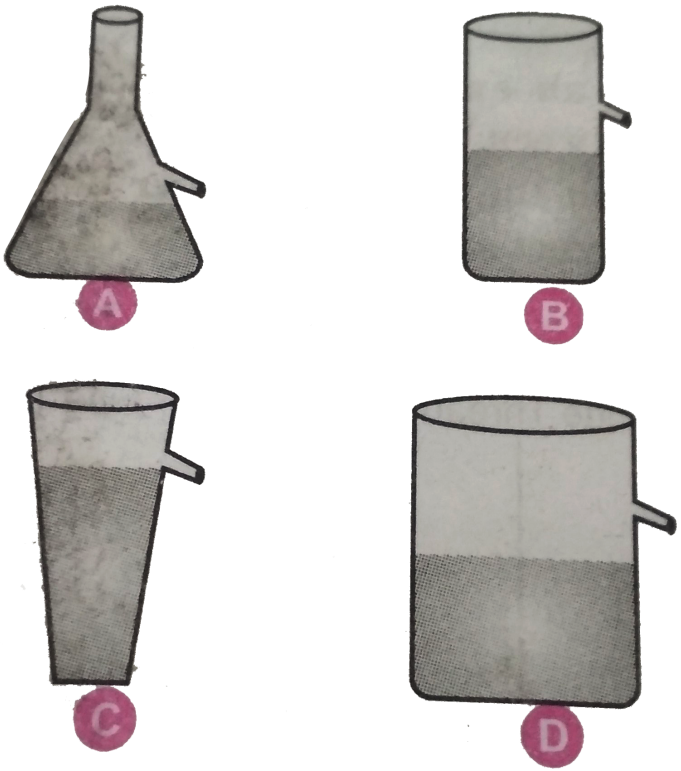


19.

Four students A, B, C and D while performing an experiment on establishing the relation between the loss of weight of a small solid when fully immersed In tap water and the weight of water displaced by it, used four different shapes of overflow-cans containing water

The arrangement, the would give correct results, is that of student:

A. A

B. B

C. C

D. D

Answer: C

Watch Video Solution

20. Two students X and Y have to do their experiment on plotting the temperature-time graph for a hot body as it cools to room temperature. They do their experiments in

the same lab, using completely identical apparatus, take equal amounts of tap water heated up to the same temperature, start their observations simultaneously and note the temperature values at identically spaced intervals of time. Their temperature-time graphs, plotted on a given graph paper, with the same given choices of scales along the axis, are however, as shown: The following could be the reason for this difference:

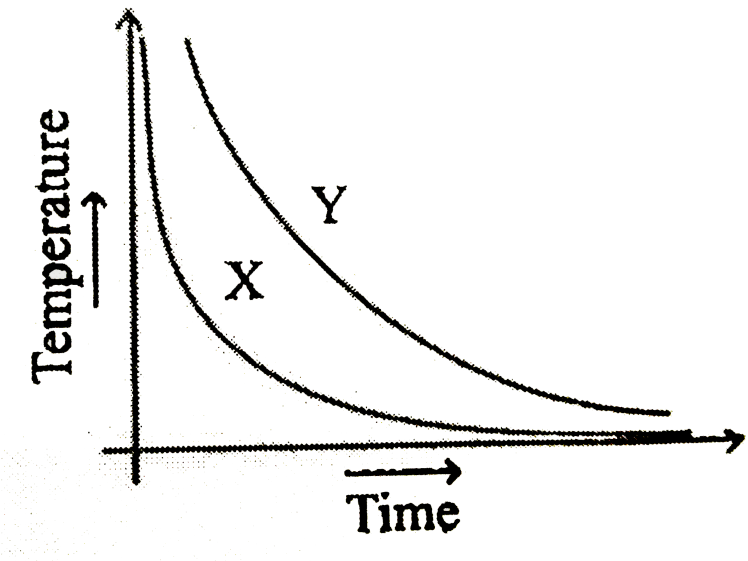
(A) Use of an overhead fan by student X.

(B) Use of an overhead fan by student Y.

(C) Less frequent stirring of water by student X.

(D) Less frequent stirring of water by student Y.

The most likely reason is:



A. A

B. B

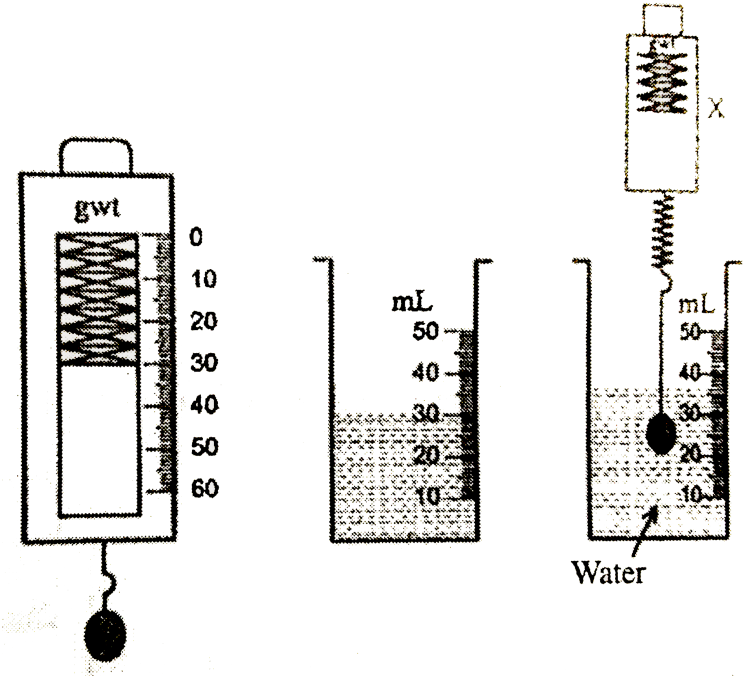
C. C

D. D

Answer: A

Watch Video Solution

21. In the setp up shown the weight of the body was measured in air and in water. The reading of mark X in the spring balance would be:



A. $36gwt$

B. $30gwt$

C. $24gwt$

D. $6gwt$

Answer: C

Watch Video Solution

22. In an experiment to determine the densities, four solids A,B,C and D are immersed in a liquid contained in a measuring cylinder one by one. The volume of water displaced by the solids A,B, C and D are $100cm^3$, $100cm^3$, $80cm^3$ and $80cm^3$, respectively. When weighed in air, the masses of solids A,B,C and D were found to be $80g$, $100g$, $100g$ and $80g$, respectively. The two solids having identical densities are:

A. A and C

B. B and D

C. C and D

D. A and D

Answer: B

Watch Video Solution

23. A student is given an iron cube of side 1cm, a measuring cylinder of range 100 mL and least count 1 mL, and a spring balance of range 100g wt and least count 1g wt. He can use these to measure:

A. both the mass and the volume of the given iron cube

B. neither the mass nor the volume of the given iron cube

C. only the mass of the given iron cube but not its volume

D. only the volume of the given iron cube but not its mass

Answer: A

Watch Video Solution

24. Four beakers are labelled as P,Q,R and S. A student puts salt solutions of different concentrations in the four beakers without spring balance gives a reading of 150g in

air. When this solid, while still suspended from the hook of spring balance, is fully immersed in beakers P,Q,R and S, the readings shown by the spring balance in the four beakers P,Q,R and S are 110g,130g, 140g and 120g respectively. The most concentrated solution is contained in the beaker labelled as:

A. P

B. Q

C. R

D. S

Answer: A

Watch Video Solution

25. While doing an experiment on plotting the temperaure-time graph of hot water as it cools, we can get a good graph:

A. only by noting the temperature of hot water every 30 seconds throughout

B. only by noting the temperature of hot water every 1 minute throughout

C. by noting the temperature of hot water every 1 minute to start with and every 2 minutes later on

D. by noting the temperature of hot water every 2 minutes to start with and every 1 minute later on

Answer: C

Watch Video Solution

26. A student heats some amount of tap water in a calorimeter to a temperature of nearly $50^{\circ}C$ above the room temperature. He then records the temperature of this water as it is cooling down at regular intervals of 2 minutes each. He tabulates his observations as follows:

$\text{Time(in minutes)} \rightarrow$	0	2	4	6	8	10
$\text{Temperature(in.}^{\circ}C) \rightarrow$	t_1	t_2	t_3	t_4	t_5	t_6

He is likely to observe that:

A. $(t_1 - t_2) > (t_3 - t_4) > (t_5 - t_6)$

B. $(t_1 - t_2) = (t_3 - t_4) = (t_5 - t_6)$

C. $(t_1 - t_2) < (t_3 - t_4) < (t_5 - t_6)$

D. $(t_1 - t_20 < (t_3 - t_4) > (t_5 - t_6)$

Answer: A

Watch Video Solution

27. For metal balls A,B,C and D having radius of 2.5 cm each are made of copper, aluminium, gold and iron respectively. The densities of copper, aluminium, gold and iron are $8.9g/cm^3$, $2.7g/cm^3$, $19.3g/cm^3$ and $7.8g/cm^3$ respectively. When the balls A,B,C and D are tied to threads, suspended from the hook of a spring balance and immersed completely in strong salty water, one by one, the apparent loss in weight will be:

A. maximum in ball B

B. maximum in ball C

C. minimum in ball B

D. same in all the balls

Answer: D

Watch Video Solution

28. A glass ball hanging from the hook of a sensitive spring balance is completely submerged in highly salty water and tap water, one. If the readings of spring balance when the ball is in highly salty water and tap water are x and y respectively, then:

A. $x < y$

B. $x > y$

C. $x = y$

D. $x = 2y$

Answer: A

Watch Video Solution

29. You are given four salt solutions W,X,Y ans X of different concentrations. W is a 20% salt solution, X is a 35% salt solution, Y is a 10% salt solution whereas Z is a 50% salt solution. When a solid suspeded from the hook of a spring balance is fully submerged in all these salt solutions, one by one, then the spring balance will show the minimum reading when the solid is immersed in:

A. solution W

B. solution X

C. solution Y

D. solution Z

Answer: D

Watch Video Solution

30. An aluminium ball is fully immersed in distilled water, well water, sea water and inland lake water, one by one. The aluminium ball will appear to suffer the maximum loss in weight when immersed in:

A. distilled water

B. sea water

C. well water

D. lake water

Answer: B

Watch Video Solution

31. When an object is fully submerged in strong salty water, it undergoes an apparent:

A. loss in mass

B. loss in volume

C. loss in density

D. loss in weight

Answer: D

Watch Video Solution

32. If a body tied to a spring balance is fully immersed in a liquid, the apparent loss in its weight:

A. in more in a denser liquid

B. is less in a denser liquid

C. does not depend on density of liquid

D. does not depend of density of liquid

Answer: A

Watch Video Solution

33. In an experiment on determining the velocity of a pulse propagating through a stretched string, the stopwatch should be started and stopped at instants corresponding

to the ones shown in:

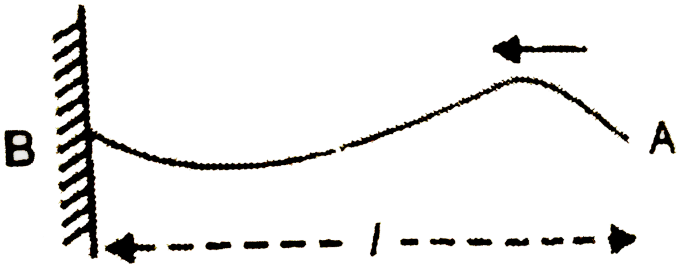


Fig. 1

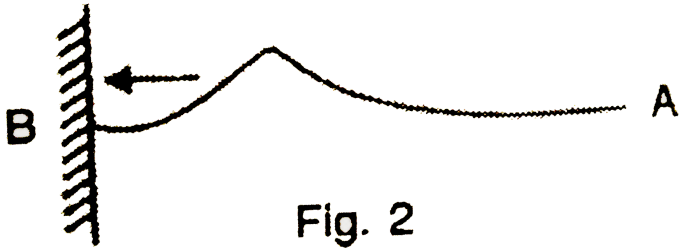
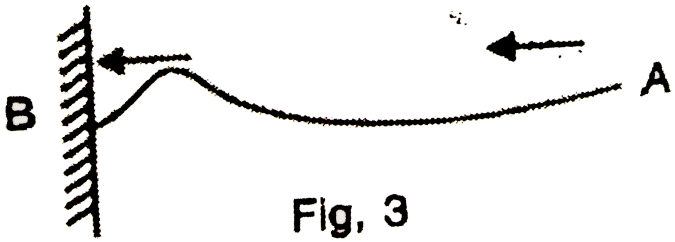


Fig. 2



Fig, 3

A. Fig 1 and Fig 2

B. Fig 1 and Fig 3

C. Fig 2 and Fig 1

D. Fig 2 and Fig 3

Answer: B

View Text Solution

34. When a fresh eggs is put into a beaker filled with water, it sinks. When the same egg is put in a strong salty water, then if floats. Which of the following is the incorrect statement in this context?

A. salt water enters into egg by osmosis and makes it lighter

B. salt water exerts more buoyant force

C. salt water is dense then tap water

D. upthrust exerted by a liquid depends on its density

Answer: A

Watch Video Solution

35. When two balls, one of iron and the other of aluminium, are completely immersed in strong salty water they undergo an equal loss in weight. This shows that iron and aluminium balls have:

A. the same densities

B. the same masses

C. the same volumes

D. the same weights

Answer: C

Watch Video Solution

36. When two solids are put in two pans of a beam balance, they exactly balance each other in air. When the two solids are completely immersed in water alongwith pans of balance, then they no longer balance each other. Which of the following is the incorrect statement about these balls?

A. they have equal masses in air

B. they have equal weights in air

C. they have equal volumes in air

D. they have unequal densities

Answer: C

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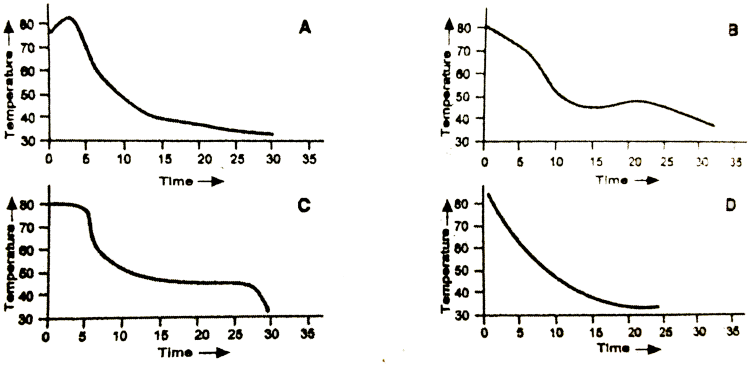
37. The temperature-time graph obtained when hot water is allowed to cool resembles the graph given in one of the following figures. The correct figure is:



A. A

B. B

C. C

D. D

Answer: D

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Hots

1. A device called oscillator is used to send waves along a stretched string. The string is 20cm long, and four complete waves fit along its length when the oscillator vibrates 30 times per second. For the waves on the string:

(a) what is their wavelength?

(b) what is their frequency?

(c) what is their speed?

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2. A sound producing body is at considerable distance from a man. There can be four different medium W,X,Y and Z between the sound producing body and the man. The medium X brings the sound to man most quickly whereas medium Z takes the maximum time. The time taken by medium W in bringing sound to man is less than that of X but more than that of Z. The medium Y, however, fails to bring the sound from the sound producing body to the man. Which medium could be the one:

(a) having no fixed shape and no fixed volume?

(b) having a fixed volume but no fixed shape?

(c) having the same composition as that on the moon?

(d) having a fixed shape and a fixed volume?

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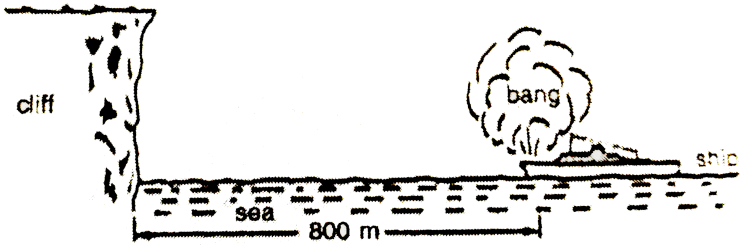
3. The drawing shows a ship 800 m from a cliff. A gun is fired on the ship. After 5 seconds the people at the front of the ship hear the sound of the gun again.



(a) What is the name of this effect?

(b) What happens to the sound at the cliff?

(c) How far does the sound travel in 5 seconds?

(d) Calculate the speed of sound.

Watch Video Solution

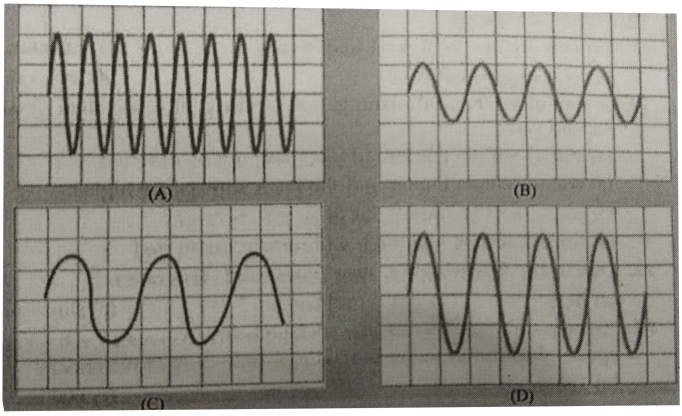
4. Consider the following sound waves marked A,B, C and D:

(a) Which two waves represent sounds of the same loudness but different pitch?

(b) Which two waves represent sounds of the same frequency but different loudness?

(c) State whether all these sound waves have been produced by the same vibrating body or different vibrating bodies?

(d) Which vibrating body/bodies could have generated the sound waves shown here?



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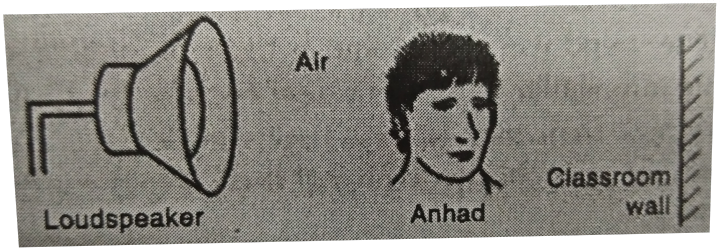
5. In an experiment, Anhad studies sound waves. He sets up a loundspeaker to produce sound as shown below:



Anhad adjuts the signal to the loudspeaker to given a sound of frequency 200 Hz.

(a) What happens to tha air in-between Anhad and the loudspeaker?

(b) Explain how Anhad receives sound in both ears.

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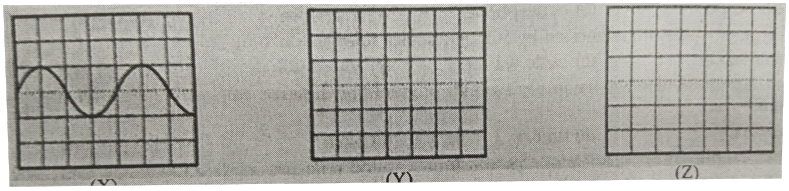
6. Figure X shows a trace of a sound wave produced by a particular tuning fork:



(a) On the graph paper given in Figure Y, draw a trace of the sound wave which has a higher frequency than that shown in Figure X.

(b) On the graph paper shown in Figure Z, draw a trace of the sound waves which has a large amplitude than that shown in Figure X.

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7. Three different vibrating objects produce three types of sounds X,Y and Z. sounds X and Y cannot be heard by a man having normal range of hearing but sound Z. can be heared easily. The sound X is used in hosphitals to break kidneys stones of a patient into fine grains which then get flushed out with urine. The sound Y is similar to that which is produced during an earthquake before the main shock wave is generated.

(a) What type of sounds are (i) X (ii) Y, and (iii) Z?

(b) Name one device which can produce sound like X.

(c) Name one device in a science laboratory which can produce sound like Y.

(d) Name one device in our homes which can produce sound like Z.

(e) What is the frequency range of sounds like Z?

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8. A man is kidnapped, blindfolded and imprisoned in a big room. How could the man tell if he was in:

(a) a city (b) a village (c) a bare room (d) a furnished room?

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Ncert

1. Which characteristic of the sound helps you to identify your friend by his voice while sitting with others in a dark room ?

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2. Flash and thunder are produced simultaneously. But thunder is heard a few seconds after the flash is seen, why ?

Watch Video Solution

3. A person has a hearing range from $20Hz$ to $20kHz$. What are the typical wavelength of sound waves in sir corresponding to these two frequencies ? Take the speed of sound in air as $344m/s$.

Watch Video Solution

4. Two children are at opposite ends of an aluminium rod. One strikes the end of rod with a stone. Find the ratio of times taken by sound wave in air and in aluminium to reach the second child (Given: Speed of sound in air $= 346m/s$, Speed of sound in aluminium $= 6420m/s$).

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5. When a sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound production remain the same. Do you hear echo sound on a hotter day ?

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Value Based Questions

1. There are two towns Ramgarh and Arjangarh which are separated by a hill. The people of one town have to travel on a zig-zag road which goes over the hill so as to reach the other town. Gaurav is a student of class IX in Ramgarh. Onnce Gaurav went from Ramgrah to Arjangarh on a scooter with his father. Driving at a constant speed of 50km/h on the hilly road, it took exactly 30 minute to reach Arjangarh. One day Gaura told his father that if a straight tunnel could be dug through the hill, then it would become very easy for the people of two towns to visit each other. keeping this is mind, Gaurav invited the people of both the towns and took a delegation to the Collector's office. This delegation demanded the construction of a

straight tunnel road through the hill. Gaurav explained the various advantages of connecting Ramgarh and Arjangarh through a tunnel road in the hill. The collector liked the idea and a straight tunnel road was constructed after some time. One day Gaurav went from Ramgarh to Arjangarh through the straight tunnel road on the scooter with his father. Driving at a constant speed of 50 km/h, it took them just 12 minutes to reach Arjangarh. Both, Gaurav and his father were very happy.

(a) What was the distance covered by Gaurav on going from Ramgarh to Arjangarh by travelling on road over the hill?

(b) What is the distance covered by Gaurav on going from Ramgarh to Arjangarh by travelling on straight tunnel road/

(c) How much less distance is to be covered now in going

through the tunnel than on going over the hill?

(d) What is the displacement of Gaurav from Ramgarh on reaching Arjangarh?

(e) State two advantages of construction of the tunnel road for the people of two towns.

(f) What values are displayed by Gaurav in this episode?

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2. Ram and Shyam were going from Delhi to Agra by car to see Taj Mahal. Ram was to drive the car. Before strating the car, Ram wore a safety device which is mandatory by law. But Shyam did not care to wear this safety device. The speed limit on the stretch of Delhi-Agra highway at which they were driving at the moment was 80 kilometres per

hout (80 kmph). Finding the road wide and free, Shyam asked Ram to drive at a high speed of 100 kmph to get a thrill. Ram, however, said no to overspeeding. He told Shyam that speed thrills but kills'. Just then Ram saw a bullock cart, which was going straight on the road till now, taking a right turn a little distance in front of his car. Noticing this, Ram applied the braked suddenly to stop the car quickly and prevent a collision with the bullock cart. Ram was able to stop his car just before it was to hit the bullock cart. When the car stopped suddenly due to emergency braking, Shyam's head hit the dashboard of car in front of him due to which he got a serious head injury. ram immediately took Shyam to a nearby hospital where he was admitted for treatment. Shyam's parents were also informed. Ram, who was driving the car, escaped unhurt.

(a) Why did Shyam's head hit the dashboard of the car

when the car stopped suddenly due to emergency braking? Explain your answer.

(b) Which law of motion is involved in this horrible accident? By which other name is this law sometimes called?

(c) Which safety device Shyam was not wearing at the time of accident which could have prevented head injury to Shyam ?

(d) What other safety device is increasingly being provided in the cars in India which is also very helpful in preventing serious inhuries during high speed accidents?

(e) What values are displayed by Ram in this episode?

View Text Solution

3. Arvind is a student of class IX. One day he had to visit a dentist in the morning because of severe toothache, so he reached late in the school. At that time, his classmates were doing physics experiments in the science laboratory. The science teacher, Mr. Bhatia, asked Arvind to stand alongside Rahul and observe carefully what he was doing. Rahul took a glass tumbler and placed a thick square card on its mouth. He then placed a coin above this card in middle. Rahul flicked the card hard with his fingers. On flicking, the card moved away but the coin dropped into the glass tumbler. After the experiment was over, Mr. Bhatia, asked Arvind to answer the following questions:

(a) What is the 'initial state' of the card? Why does the card move away when flicked with fingers?

(b) What is the 'initial state' of the coin? Why does coin not

move away when the card is flicked with fingers?

(c) Which property of coin is exhibited by the fact that the coin drops into glass tumbler when card is flicked away with fingers and moves away? Explain your answer.

(d) What was Rahul trying to illustrate by performing this experiment?

(e) What values are displayed by Arvind in this episode?

View Text Solution

4. Benny is a student of class IX in a city school but his brother John studies in class V. One day John was playing with his friends just outside the house. John had a ballon in his hands. John inflated the ballon by filling air into it. He did not tie the mouth of this air-filled ballon with a thread.

John just held the mouth of the inflated ballon tightly in the downward direction (towards the ground) and released it. When the inflated ballon (containing compressed air) was released with its mouth in the downward direction, then the ballon moved upwards on its own. Benny was observing this incident vert carefully. The upward going ballon reminded Benny of the principle of working of an important device. Benny also explained everything to his younger brother.

Name the device whose principle of working is demonstrated by the inflated ballon released by John?

(b) Name and state the principle (or law) on which the above device works.

(c) Explain and working of this device briefly.

(d) Which of the Newton's laws can also be said to be involved in the working of the above device?

(e) Name another device which also works on the same principle as this device.

(f) What values are displayed by Benny in this episode?

View Text Solution

5. Mohan and Sohan are two friends. Both study in class IX in different schools. They have recently studied the chapter on force and motion in their class. Mohan plays criket in the school team whereas Sohan learns karate. On the sports day celebrations in Sohan's school, there was also an item of karate competition. Sohan invited Mohan to attend the sports day function because he was also taking part in karate competition. For the karate competition, the sports teacher had placed a number of tiles one over the

other and supported them at both ends. There were five karate contestants. All the contestants were of almost the same age, same built and same weight. They were supposed to break all the tiles with just one blow of their hand. Each contestant was to be given only one chance for doing this. The first four contesting boys could not break the tiles with a single blow of their hand. They rather got their hands hurt badly. It was now Sohan's turn. Sohan hit the pile of tiles in the middle with a blow of his hand in such a way that all the tiles broke into pieces. All the people standing around started clapping. Mohan was very happy to see his friend win the competition.

(a) Which physical quantity is involved in exerting force which breaks the pile of tiles in this competition?

(b) Name two factors which multiply with each other to produce the above physical quantity.

(c) Explain why, Sohan was able to break the pile of tiles with a single blow of his hand.

(d) Why could the first four boys not break the pile of tiles with a single blow of their hand?

(e) What values are displayed by Sohan in this episode?

View Text Solution

6. Ankit and Rehman are two friends who live in the same colony. Ankit studies in class IX whereas Rehman is a student of class VII. One day, both Ankit and Rehman were playing cricket with other boys of the colony in the bid ground just outside their colony. At the moment, Ankit and Rehman were standing at two different fielding positions. When batsman hit the ball hard, it went very fast towards

Rehman. Rehman stopped and caught the fast moving cricket ball but his hands were hurt badly in stopping the ball. The severe pain in the hands of Rehman made him drop the catch. Next moment, th bastman again hit the ball hard. This time the fast moving ball went straight towards the direction of Ankit. Ankit stopped and caught the fast ball in a particular way without hurting his hands at all. While coming back home after playing cricket, Ankit explained the proper way of catching a fast cricket ball to Rehman without getting the hands hurt. Keeping this advice in mind, Rehman never hurt his hands again while playing cricket.

(a) Which physical quantity is vert large in a fast moving cricket ball having high speed?

(b) In what way do you think Rehman stopped and caught the fast cricket ball which hurt his hands?

(c) Why were Rehman's hands hurt in stopping and catching the fast cricket ball in this way?

(d) In what way do you think Ankit stopped and caught the fast cricket ball without hurting his hands?

(e) Why were Ankit's hands not hurt in stopping and catching the fast cricket ball in this way?

(f) Which law of motion is involved in catching a fast cricket ball?

(g) What values are displayed by Ankit in this episode?

View Text Solution

7. Rohan is a student of class iX in a city school. Rohan visited his ancestral village alongwith his grandmother during the summer holidays. One day a Baba came to the

village and told the villagers that he can perform a miracle by lying down on a bed of nails. So, a bed having thousands of nails was made for him. when all the village people had gathered, Baba recited a few mantras loudly and lay down on the bed of nails very, very carefully. The high poing og this so called miracle was that Baba was not hurt at all by the large number of nails below his body. All the village people were highly impressed by this miracle of Baba. Even Rohan's grandmother was greatly impressed by this feat. But Rohan, who studies science, was not impressed at all. In fact, Rohan told the gathered village people that it was no miracle. This feat of Baba was based on a well known scientific principle. He told the people that any person can lie on a bead of of nails unhurt, if there is a very large number of nails. Even he could lie on the same bed of nails without being hurt. He explained the

underlying scientific principle to all the people. Even Baba was surprised by the knowledge of a school boy like Rohan.

(a) Which concept of science is involved in the show put by Baba by lying down o a bed of nails?

(b) Define and explain the above concept.

(c) What happens if we step barefooted on a nail accidently? Explain.

(d) Why did Baba not get hurt by lying down on a bed of nails? Explain.

(e) What values are displayed by Rohan?

View Text Solution

8. Ravi is a student of class IX in a Delhi school. This year all the students of class IX were going to visit Kashmir during

the winter holidays alongwith some of their teachers. All the students were asked to pack heavy woolen clothes with them because winter in Kashmir is very severe. Ravi had recently studied a particular chapter in science. Keeping that in mind, Ravi also purchased a pair of special type of shoes from the market and packet it alongwith his luggage. When the students reached Srinagar, it was extremely cold. When the students got up in the morning next day, they were told that heavy snowfall is going on in this area since last night and that there were thick layers of snow all around their hotel. Most of the students had not seen snowfall before. So, all the students and teachers decided to walk and play on fresh falling snow. Ravi put on his special ordinary shoes while walking on snow. It was noticed that the feet of all other students and teachers wearing ordinary shoes were sinking into soft snow

making it very difficult for them to walk on soft snow. But this was not so with Ravi. Ravi could walk easily even on soft snow (without his feet sinking into it). All the students were very jealous of Ravi. But the teachers were all praise for Ravi.

(a) Which concept of science is involved in the incident which took place on soft snow?

(b) Why do the feet of a student wearing ordinary shoes sink into soft snow?

(c) What are the special shoes worn by Ravi called? How do they differ from ordinary shoes?

(d) Explain why, by wearing special shoes, Ravi could walk easily on soft snow (without his feet sinking into soft snow).

(e) What are a pair of long, narrow pieces of hard flexible material fastened under the feet for sliding very fast on

the slopes of snow covered mountains called (which work on the same principle as snow shoes)?

(f) What values are displayed by Ravi in this episode?

View Text Solution

9. Raman was waiting at a tyre puncture repair shop to get his bicycle tube repaired. There is a large pond of water a little distance away from this shop. Some children were playing near the pond. Raman saw a five year old child fall into the pond accidently while playing. The child was drowning in pond water and screaming for help. Raman took a big, inflated car rubber tube' which was lying in the shop and immediately threw it towards the drowning child in the pond. He shounted asking the child to cling to the

inflated tube and hold on to it strongly till the help arrived. Raman then made a telephone call to Fire Brigade from his mobile phone. The Fire Brigade reached within ten minutes and the firemen brought the drowning child out of the pond safely. Everybody praised the efforts the efforts of Raman and firemen.

(a) What happens when an inflated car tube is thrown in water of the pond? Why?

(b) Why did Raman throw an inflated car rubber tube towards the drowning child and ask him to hold on to it?

(c) Which principle is made use of by Raman in saving the drowning child? State this principle.

(d) What values are displayed by Raman in this episode?

View Text Solution

10. Abhishek lives in society flats alongwith his parents. He is studying in class IX. For the last few days, his mother has been complaning that the milk being supplied by the milkman is not pure. When she talked to other neighbours, they told her that they are also facing the same problem. Abhishek through over this problem for a while. He then went to the market and purchased a glass instrument to check the purity of milk being supplied by the milkman. when milkman brought milk the next day, Abhishek took this milk in a tall vessel and placed the instrument in it vertically. He explained to the milkman how this instrument indicated that the milk was not pure, it was adulterated. The milkman admitted his fault and promised to supply pure milk in future. Abhishek told about this incident to all his neighbours. Ultimately all the households in the society flats purchased the instrument to test the purity of milk.

(a) Name the instrument which was purchased by Abhishek to check the purity of milk.

(b) Name the principle on which the above instrument works.

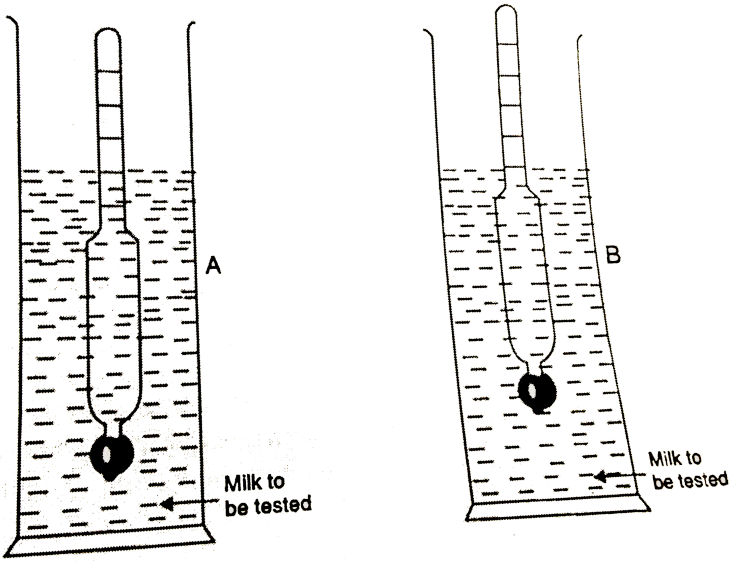
(c) What substance is usually mixed with pure milk by the dishonest milkmen to adulterate it and increase their profit?

(d) Which physical quantity of pure milk is used to detect the presence of the substance mixed in it (which is measured by the above instrument)?

(e) How does the instrument purchased by Abhishek show the presence of the substance mixed in pure milk by the milkman?

(f) Which position of the instrument placed in two containers of milk A and B (one by one) shows (i) pure milk, and (ii) adulterated milk?

(g) What values are displayed by Abhishek in this episode?



View Text Solution

11. One day all the students of class IX were performing physics experiments in the science laboratory. Just then, the physics teacher, Mr. Vinay, came to the laboratory with a sheet of tin weighing about half a kilogram. Mr. Vinay gathered all the students and in their presence put this

sheet of tin in a big tub of water. The sheet of tin sank in water and settled at the bottom of tub. Mr. Vinay now turned to the students and asked who could transform this sheet into the simplest form (or shape) which would float in water. He allowed them to use any other required tools/materials from the laboratory for this purpose. Mohan offered to make an appropriate object from this tin sheet which could float in water and not sink. He took just half an hour to make this object. The teacher placed this object in the same tub of water. It started to float in water. The teacher was very happy. He appreciated the effort made by Mohan.

(a) Why did the sheet of tin sink in water?

(b) What do you think is the simplest form of object made by Mohan from this tine sheet which could float in water?

(c) Why do you think the above object made from tin sheet

floats in water?

(d) Name two modes of transport used in rivers and seas which work on the same principle as the tin sheet object made by Mohan.

(e) The tine object made by Mohan was placed, turn by turn in a tub of oil and glycerine. In which of these two liquids, the tin object will float with a greater part of it immersed inside the liquid than water and why?

(f) What values are displayed by Mohan in this episode?

View Text Solution

12. Rajan went on a World Tour with his family during the summer holidays. Actually, it was a group tour consisting of 40 persons arranged by a leisure travel company.

Thomas Cook'. Today the whole group was taken to a sea that lies between Is real and Jordan, and has become a famous tourist spot. On reaching the seashore, everyone was surprised to see a person floating in this sea water in the sitting position and even reading a newspaper in this position. The Guide, Mr. Jose, who accompanied the group, asked if anyone could explain this strange observation. Rajan is a science student of class IX. Rajan took a little of sea water in his palm and put it into his mouth for a moment (and then spit it out). After thinking for a while, he could answer Mr, Jose's question. Rajan then explained everything very clearly to all the persons in the group. Everyone appreciated his knowledge of science.

(a) What is the name of the sea which lies between Isreal and Jordan?

(b) Why is this sea called by this name?

(c) What did Rajan find when he put a little of water from this sea into his mouth for a moment?

(d) Explain why, a person can float in this sea water in the sitting position.

(e) Why is it not possible to float in sitting position in the water of Indian sea?

(f) What values are displayed by Rajan in this episode?

View Text Solution

13. There is a four storeyed house in the neighbourhood of Rohan and Amit which has two types of staircases in it. One is a normal, stanting type staircase which is inside the house and the other one is a spiral type (vertical) staircase at the back side of the house. Both the staircases lead

from the ground floor to the roof of the house. Rohan and Amit are both students of class IX in different schools. Incidently, they are both of the same weight. Rohan said that a person using slanting staircase inside the house would do more work aganist a certain 'natural force' in goind from ground floor to the roof of the house (because the distance moved by the persin in using the slanting staircase is more). Rohan also said that the work done by the same person aganist the same natural force in going from ground floor to roof of the house would be less by using the spiral type (vertical) staircase (because the distance moved by him in this case will be less). Amit, however, did not agree with Rohan. Amit said that whether this person uses slanting staircase or spiral type (vertical) staircase, work done by him aganist the natural force in goind from ground floor to roof of the house would be the

same. Rohan then decided to go from the ground floor to the roof top by slanting staircase and tool 90 seconds for doing this job. On the other hand, Amit went from ground floor to the roof top by spiral type (vertical) staircase and took 2 minutes for this job.

(a) Name the natural force aganist which work has to be done in going from ground floor to the roof top of the house.

(b) What supplies energy for doing work when Rohan and Amit climb up to the roof of the house?

(c) Whose statement about the amount of work doen aganist the natural force in going from ground floor to roof top is correct and why?

(d) Who has more power in terms of physics in climbing to roof top: Rohan or Amit? Why?

(e) What value are displayed by Amit in this episode?

View Text Solution

14. Jagdish is a student of class IX in a city where electricity supply comes from a thermal power house. The state Government has recently raised electricity tariff substantially due to which the electricity bill received by Jagdish's family this month is very high. Jagdish's family was worried about heavy electricity bills to be paid every month from now onwards. Jagdish was worried too. Jagdish thought over the problem and came out with some suggestions. He explained the various steps to be taken to reduce the electricity bill to some extent to his parents. His father and mother liked his ideas. Even his younger sister promised to cooperate in cost-cutting measures. When the suggestions made by Jagdish were put into practice, the

next month's electricity bill was substantially lower than expected. Everyone in the family was happy. Because 'money saved' is 'money earned'

(a) What is meant by a thermal power house?

(b) What fuels are usually used in thermal power houses?

(c) How is electricity produced at a thermal power house?

(d) What energy transformations take place at a thermal power house?

(e) What steps do you think were suggested by Jagdish to reduce the consumption of electricity in his house?

(f) What values are displayed by Jagdish in this episode?

View Text Solution

15. Ram is a college student in Delhi. Ram and his family are going by car to visit a hill station. Ram himself is driving the car. Ram drives the car very carefully. Before starting to drive, Ram has fastened the car seat belt himself properly. He has also made his father, mother and younger brother fasten their car seat belts. on the flat highwat road, Ram is keeping the car speed within a range of 50 to 60 kmph (which is well within the prescribed speed limit on this highway). He does nto accelerate the car unnecessarily. After driving for about five hours continuously on a flat road, there is a sight of hills in view. On approaching the hilly road, Ram increases the speed of his car. Ram's younger brother Anish, who is a student of class VI, is surprised to see his brother increasing the speed of car suddenly. Anish asks Ram why the speed of car has been

increased. Ram explains the reason for increasing the speed of car to everyone.

(a) What type of energy is possessed by the car while running on the flat road?

(b) What type of energy transformation take place in a car engine?

(c) When the car is moving on the flat road, it has to do work to overcome mainly two types of forces. Name these two types of forces.

(d) When the car is moving on an uphill road, it has to do work to overcome three types of forces. Name these three types of forces.

(e) Why does Ram increase the speed of his car on approaching the hilly road?

(f) What types of energy is possessed by the car going up

on the hilly road?

(g) What values are displayed by Ram in this episode?

View Text Solution

16. Saurabh is a student of class IX whereas his younger brother Ashu studies in class VI. During the summer holidays, Saurabh and Ashu went to visit their uncle who lives in a village. Their uncle has a big mango orchard near the village which has produced a bumper crop of mangoes this year. On the way to village, Saurabh purchased a catapult (gulel) from a shop because he enjoys felling ripe mangoes from the mango trees of orchard with the help of catapult. On reaching his uncle's mango orchard, Saurabh gave a tiny piece of stone to Ashu and asked him to put it

in the catapult and hit any mango on the tree. Ashu tried to throw away the stone with catapult without stretching the rubber strings of catapult. Due to this, the piece of stone fell down to the ground instead to reaching the mango on the tree. Saurabh then taught Ashu how to use the catapult properly. By using this catapult any tiny pieces of stones, Ashu was now able to fell many ripe mangoes from the orchard trees. Ashu then saw a beautiful bird sitting on the branch of a mango tree. When Ashu was aiming the catapult at the bird, Saurabh snatched the catapult from his hands quickly and scolded him. Meanwhile, Saurabh's uncle also reached to orchard. He was happy to see Saurabh and Ashu enjoying the mangoes which they had felled from the orchard trees.

(a) Which types of energy is possessed by the stretched rubber strings of a catapult?

(b) How do the catapult strings get this energy?

(c) What energy transformation takes place when the stretched rubber strings of catapult throw away a piece of stone?

(d) Why did the piece of stone just fall down when Ashu tried to throw it away without stretching the rubber strings of catapult?

(e) When a mango attached to the trees is hit by a piece of stone thrown by catapult, the mango falls down. Which force causes mango to fall down?

(f) Why did Saurabh prevent his brother Ashu from aiming catapult at the bird?

(g) What values are displayed by Saurabh in this episode?

View Text Solution

17. Veena's elder sister Rashmi, who is four months pregnant, has come to stay with them for a weak. Veena's mother, Mrs. Nirmala, wanted to take Rashmi to a gynaecologist for a prenatal (before birth) medical check-up. Veena also accompanied them to the hospital. The gynaecologist carried out the required physical examination of Rashmi and then recommended a particular scan to be done. While going to the Imaging Department of the hospital, Mrs. Nirmala said that after the scan is done, she would ask the doctor doing the scan a specific question aboyt the foetus. Veena is a student of class X who has studied the reproductive systems of humans in the class. She could make out what her mother was going to ask the doctor about the developing foetus. Veena asked her mother not to ask any irrelevent question based on the scan to be done and explained the reason for

it. Mrs, Nirmala agreed to what Veena had said. After the required scan was done, all of them visited the gynaecologist again. The gynaecologist studied the scan carefully and said that everything was okay. Everyone was happy. While coming back home, Mrs. Nirmala said that instead of going to a far off hospital the same purpose could have been served by setting an X-ray done on Rashmi at the neighbourhood X-ray clinic. Veena did not agree with her mother. She said a firm 'No' to X-ray on Rashmi at this stage.

(a) What type of scan was recommended by gynaecologist for Rashmi? Name the machine used for this purpose.

(b) Why was the above scan recommended?

(c) Describe the principle of working of the scanning machine briefly. What is this technique known as?

(d) What do you think was the irrelevent question which

Mrs. Nirmala wanted to ask the doctor after the scan was done?

(e) Why did Veena tell her mother not to ask such a question?

(f) Why did Veena say 'No' to X-ray for Rashmi?

(g) What values are displayed by Veena in this episode?

View Text Solution

18. Kunal has just appeared in class IX examination. All this examination papers are over. But Kunal's younger brother Rakesh, who is a student of class VII, is still preparing for his final examination. Yesterday, a man entered their colony in the afternoon. This man was a 'zip-repairer'. He was shounting through a large, cone-shaoed, battery-less,

amplifyig device to make announcements for getting customers for his work. The hand-held device was making his voice too loud. As Rakesh was studying for his examination, he got disturbed by the loud announcements being made by this man. Rakesh told about this noise pollution problem to his elder brother Kunal because many other students living in the colony were also preparing for their examination and must be getting disturbed in their studies. Rakesh also asked Kunal about the amplifying device being used by this man. Kunal then went out of the house and talked to the man who was making announcements. The man ummediately stopped using the device for making further announcements. Kunal also went to the security incharge at the entry gate of the colony and lodged a complaint regarding this incident.

(a) What do you think was the device being used by the

man to amplify his voice?

(b) State the principle on which this device works.

(c) Why did Rakesh get disturbed?

(d) What do you think Kunal must have told the 'zip-repairer' man?

(e) What complaint do you think Kunal must have lodged with the security incharge of the colony?

(f) Name one very useful instrument which works on the same principle as the device discussed in this episode. For what purpose is it used?

(g) What values are displayed by Kunal in this episode?

View Text Solution

19. Ramesh and Sandeep are two very close friends who study in classes IX and X respectively. One day Ramesh and Sandeep had to go to a neighbouring twon on their bicycles for some work. They had to cross a railway line on the way to the neighbouring town. when Ramesh and Sandeep were going in the afternoon, the railway crossing barrier was open, so they did not have to wait for going across it. Their work in the neighbouring town kept Ramesh and Sandeep bust till late in the evening. On their way back home, when Ramesh and Sandeep reached the same railway crossing, it was quite dark in the night and the railway crossing barrier was down (or closed) indicating that some train was expected to pass through soon. Ramesh was in a hurry to go back home. Ramesh told Sandeep that since he could not hear the sound of

approaching train, so they did not know when the train would pass through the crosing and barrier would open. He suggested that instead of keeping on waiting, they should cross the railway tracks by going below the closed barrier by tilting their bicycles and lowering their heads. Sandeep did not agree with Ramesh. Sandeep said that they would not cross the railway tracks as long as the barrier was closed. Suddenly, Ramesh slipped through the barrier and put his ear on the railway track. Sandeep pulled him away from the railway track quickly. As soon as Ramesh was pulled away from the railway track, a super-fast train passed through the same track in the darkness of night without blowing any horn. Sandeep was very angry with Ramesh and scolded him for the risk he had taken. After the train passed through the crossing, the barrier was opened by railway staff. Ramesh and Sandeep then crossed

the railway track alongwith their bicycles and reached home safely.

(a) How many times more is the speed of sound in railway track then the speed of sound in air?

(b) Why did Sandeep not allow Ramesh to cross the closed barrier of railway crossing?

(c) Why did Ramesh put his ear to the railway track?

(d) Why did Sandeep pull Ramesh away from the railway track?

(e) What values are displayed by Sandeep in this episode?

View Text Solution

20. Radha is a student of class IX in a school in Ambala city in Haryana. Radha's father, Mr. Vijat Kumar, is the Deputy

Commissioner of Police in Ambala zone. Radha's family including her father, mother and five year old brother Pulkit, were invited for the celebrations of Air Force Day at the Ambala Air Force Base. During these celebrations, the final item was a fly-past by the fighter jet planes of Indian Air Force. Suddenly there was a loud, explosive noise in the sky over the celebration venue. All the eyes turned up towards the sky. Everybody saw the Indian Air Force's fighter jet planes flying at tremendous speed in a special formation. All the people started clapping for this beautiful and daring fly-past by Indian Air Force pilots. The thunderous sound produced by the speeding fighter planes was so loud that all the birds sitting on the nearby trees flew away. Radha's brother Pulkit was already undergoing treatment for some ear ailment. So, Pulkit got too much pain in his ears due to this intolerable explosive

sound. Pulkit was carrying two sharpened pencils with him at that time. He tried to put these pencils inside his ears to get relief from severe pain in the ears. Radha snatched the pencils from Pulkit and warned him not to do it again. Radha was carrying some cotton ear buds in her purse. So, she put cotton ear buds into the ears planes thoroughly. Everyone was praising Indian Air Force for putting up a great show. Jai Ho!

(a) What term is used for the extremely loud burst of sound produced by extremely fast, low flying fighter jet planes?

What can you say about the speed of fighter jet planes which produce loud bursts of sound (or explosive noise) when the fly? What special name is given to this speed?

(c) A fighter jet is flying low at a speed of 1100 km/h. State whether it will produce extremely loud burst of sound or

not. Give reason for your answer.

(d) Why did Radha prevent Pulkit from putting sharpened pencils into his ears?

(e) Why did Radha put cotton ear buds into Pulkit's ears?

(f) Name one object which travels at a speed greater than that of fighter jet plane producing loud burst of sound.

(g) What values are displayed by Radha in this episode?

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