Exercise Detailed Solutions
8th - SOUND

Level - I

Q1 In compression, the particles of the medium come closer to each other, hence density of the medium increases.

Ans (c)

Q2 In Rarefaction, the separation between the particles increases which results in a decrease in density.

Ans (d)

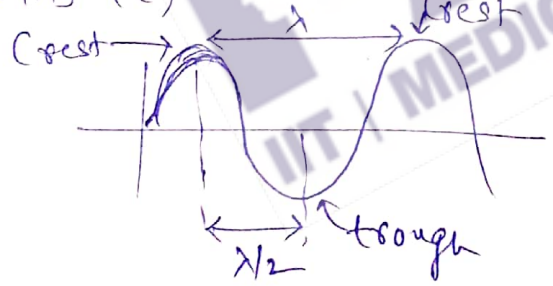
Q3. Energy is transferred with a wave from one place to another.

Ans (d)

Q4. Mechanical waves are those waves which required a material medium for their propogation, and can not travel through vaccum.

Ans (c)

Q5.



The distance between a crest and a (the next) trough is half of the wavelength.

Ans (b)

Q6. The minium distance between two crests is called wavelength.

Ans (a)

Q7. If a sound wave changes the medium of propogation then the speed of the sound wave changes, while frequency remains unchanged because frequency depends on the source of sound and not on medium.

Ans (b)

Q8. Given that,

$f = 20\,Hz$

Speed of sound in air $v = 340\,m/s$

$v = \lambda f$

$340 = \lambda \times 20$

$\lambda = 17\,m$

Ans (d)

Q9. Given that,

for first medium

$v_1 = v_0$, $\lambda_1 = \lambda$

for second medium,

$v_2 = 4v_0$, $\lambda_2 = ?$

frequency remains unchanged as the medium changes, hence,

$v_1 = \lambda_1 f$ — i)

$v_2 = \lambda_2 f$ — ii)

On deviding $\frac{v_2}{v_1} = \frac{\lambda_2}{\lambda_1}$

$\frac{4v_0}{v_0} = \frac{\lambda_2}{\lambda}$

$\lambda_2 = 4\lambda$

Ans (c)

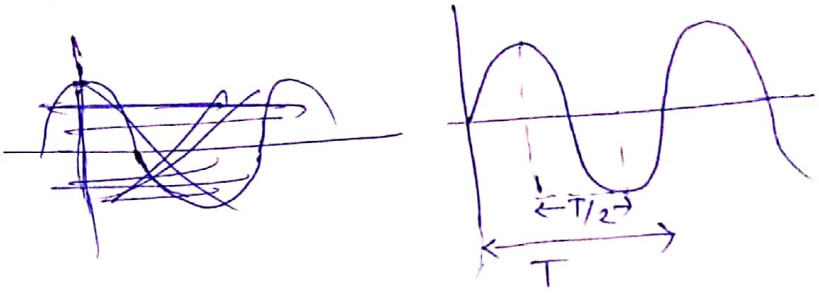
Q10. Sound is a longitudinal, mechanical wave.

(d)

Level-II

Q1. Given that,

$T = 0.02$ sec



The duration between a crest and a trough is half of the time period, as crest occur at $t = 0$ then trough will occur at $T/2 = 0.01$ sec.

Ans (b)

Q2: Sound is a wave, which is a disturbance hence, sound travelling in a medium (air) at a speed of 334 m/s means the disturbance travels through the medium (air) by 334 m distance in one second.

Ans (d)

Q3. Given,

$\lambda = 100$ m, $V = 25$ m/s

The waves strikes the boat after a time equal to time period of wave

$$V = \frac{\lambda}{T}, \quad T = \frac{\lambda}{V} = \frac{100}{25} = 4 \text{ sec}$$

Ans (d)

Q4. Given,

$f = 500$ Hz, $\lambda = 0.2$ m

$$V = \lambda f = 0.2 \times 500 = 100 \text{ m/s}$$

$$v = \frac{d}{t}$$

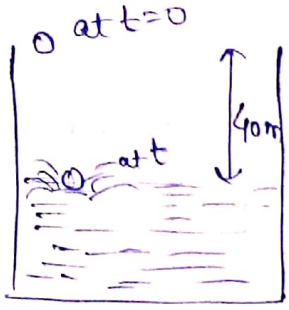
$$t = \frac{d}{V} = \frac{300}{100} = 3 \text{ sec}$$

Ans (d)

Q 5. The speed of a sound wave depends on the medium of propogation. For the same medium the speed of two different sound waves will be the same.
Hence, $v_1 = v_2 = v_3$

Ans (a)

Q 6.



Let, Time taken by stone to reach the surface of water after droping is t_1 then,

by 1st eqn $s = ut + \frac{1}{2}gt^2$

$s = 40m$, $u = 0$ (release freely), $g = 9.8\ m/s^2$

$40 = 0 + \frac{1}{2}(9.8)t_1^2$

$t_1^2 = 8.1632$

$t_1 = 2.857$

If the time taken by sound to reach the top of the well after splashing is t_2, then,

total time $= t_1 + t_2 = 2.95$ (given)

$t_2 = 2.95 - 2.857$

$t_2 = 0.093$ sec

Hence, the speed of sound

$v = \frac{d}{t_2} = \frac{40}{0.093} = 430.10$

$v \simeq 430\ m/s$

nearby ans is (b)

Q7. Given,

$t = 4.5$ sec.

$v = 340$ m/s

$d = vt = 340 \times 4.5 = 1530$ m

Ans(a)

Q8. Given,

$f = 400$ Hz, $v = 350$ m/s

It takes 1 sec to complete 400 vibration as $f = 400$ Hz,

hence time taken to complete 16 vibration is $t = \frac{16}{400} \times 1$

$t = 0.04$ sec.

Now, the distance travels by sound in this time is

$d = vt$

$d = 350 \times 0.04 = 14$ m

Ans(c)

Q9. Given,

$f = 280$ Hz, $v = 336$ m/s

time required to travels through 18 m by sound wave is

$$t = \frac{d}{v} = \frac{18}{336} = \frac{3}{56} \text{ sec.}$$

$f = 280$ Hz means, in 1 sec it completes 280 vibrations

Hence in 1 sec $\rightarrow$ 280 vibrations

So in $\frac{3}{56}$ sec $\rightarrow \frac{3}{56} \times 280$ vibrations

$\Rightarrow$ 15 vibrations

Ans (c)

Subjective questions

Q9. Given,

$t = 4\,sec,\ v = 330\,m/s$

$d = vt = 330 \times 4 = 1320\,m$

Ans 1320 m

Q10. Given, $f = 256\,Hz$

That means in 256 vibrations in 1 sec,

hence, 1 vibration in $\frac{1}{256}$ sec

so, 32 vibrations will completed in $32 \times \frac{1}{256}$ sec

$\Rightarrow \frac{1}{8}\,sec = 0.125\,sec$

Ans $\Rightarrow$ 0.125 sec

Q12. Given,

for medium A

$\lambda_A = 0.2\,m$

$v_A = 280\,m/s$

for medium B

$\lambda_B = 0.25\,m$

$v_B = ?$

The two sound waves are producing by same vibrating body hence, frequency for both will be the same. Let say it is f

then, $v_A = \lambda_A f$ and $v_B = \lambda_B f$

on deviding, $\frac{v_B}{v_A} = \frac{\lambda_B f}{\lambda_A f}$

$v_B = v_A \frac{\lambda_B}{\lambda_A} = 280 \times \frac{0.25}{0.2} = 350\,m/s$

Ans 350 m/s