DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 2

Topic :-WAVES

2 **(b)**

With temperature rise frequency of tuning fork decreases. Because, the elastic properties are modified when temperature is changed

Also, $n_1 = n_0(1 - 0.00011t)$

Where n_t = frequency at t°C, n_0 = frequency at 0°C

3 **(c)**

Since solid has both the properties (rigidly and elasticity)

4 **(c)**

Given $y = 5\sin\frac{\pi x}{3}\cos 40\pi t$

Comparing with $y = 2a\cos\frac{2\pi vt}{\lambda}\sin\frac{2\pi x}{\lambda} \Rightarrow \lambda = 6\ cm$

$\therefore$ The separation between adjacent nodes $= \frac{\pi}{2} = 3\ cm$

5 **(c)**

For open pipe $f_1 = \frac{v}{2l}$ and for closed pipe

$$f_2 = \frac{v}{4 \times \left(\frac{l}{4}\right)} = \frac{v}{l} = 2f_1 \Rightarrow \frac{f_1}{f_2} = \frac{1}{2}$$

6 **(d)**

From Doppler's effect in sound,

$$v' = v_o\left(\frac{v \pm v_o}{v \pm v_s}\right)$$

In the given case, $v_s = 0.5v, v_o = 0, v_o - 3kHz$

$$\therefore v' = 3 \times \frac{v}{v - 0.5v} = 6kHz$$

7 **(c)**

When piston moves a distancex_1, path difference change by 2 xs.

$\therefore$the path difference between maxima and consecutive minima=$\lambda/2$

$\therefore 2x = \lambda/2$

Or

λ=4x=4×9 cm=36cm=0.36m

$$n = \frac{v}{\lambda} = \frac{360}{0.36} = 1000\ Hz$$

8 **(a)**

Frequency of closed pipe

$$\mathrm{n_1} = \frac{\mathrm{v}}{4\iota_1} \Longrightarrow \iota_1 = \frac{\mathrm{v}}{4\mathrm{n_1}}$$

Frequency of open pipe,

$$\mathrm{n_2} = \frac{\mathrm{v}}{2\iota_1} \Longrightarrow \iota_2 = \frac{\mathrm{v}}{2\mathrm{n_2}}$$

When both pipes are joined then length of closed pipe

$$\iota = \iota_1 + \iota_2$$

$$\frac{\mathrm{v}}{4\mathrm{n}} = \frac{\mathrm{v}}{4\mathrm{n_1}} + \frac{\mathrm{v}}{2\mathrm{n_2}}$$

Or

$$\frac{1}{2\mathrm{n}} = \frac{1}{2\mathrm{n_1}} + \frac{1}{2\mathrm{n_2}}$$

Or

$$\frac{1}{2\mathrm{n}} = \frac{\mathrm{n_2} + 2\mathrm{n_1}}{2\mathrm{n_1 n_2}}$$

Or

$$\mathrm{n} = \frac{\mathrm{n_1 n_2}}{\mathrm{n_2} + 2\mathrm{n_1}}$$

9 **(b)**

$$n_1 = \frac{\omega_1}{2\pi} = \frac{400\pi}{2\pi} = 200\ Hz$$

$$n_2 = \frac{\omega_2}{2\pi} = \frac{400\pi}{2\pi} = 202\ Hz$$

$\therefore$ Number of beats per sec $\mathrm{n} = \mathrm{n_2} - \mathrm{n_1} = 2$

Again, $A_1 = 4\ and\ A_2 = 3$

$$\frac{I_{\max}}{I_{\min}} = \frac{(A_1 + A_2)^2}{(A_1 - A_2)^2} = \left(\frac{4+3}{4-3}\right)^2 = \frac{49}{1}$$

10 **(a)**

Here ,$T_1 = 16\ N, T_2 = ?$

As per the choice given, $T_2 > T_1$

$$\therefore n_2 > n_1, (n_2 - n_1) = 3 \qquad \dots (i)$$

As $\quad n \propto \sqrt{T}$

$$\therefore \ \frac{n_2}{n_1} = \sqrt{\frac{T}{16}} = \sqrt{\frac{T}{4}}$$

If n_1 corresponds to $4 : n_2$ corresponds to $3 + 4 = 7$, which is $\sqrt{T}$. Therefore, $T = 49$ N

11 **(b)**

Apparent frequency in this case $n' = \frac{n(v+v_o)}{v}$

$\because \dfrac{v+v_o}{v} > 1 \Rightarrow \dfrac{n'}{n} > i.e. n' > n$

12 **(b)**

Speed =360 revolutions per min

=360/60 revolutions per sec=6

∴ frequency =6×60=360

13 **(a)**

Sending wave mode arises from the combination of reflection and impedance such that the reflected wave interfere and impedance such that the reflected waves interfere constructively with the incident wave.

Wave $z_1 = A\sin(kx - \omega t)$ is travelling along positive x-direction, $z_2 = A\sin(kx + \omega t)$ is travelling along positive y-direction. Hence, $z_1 + z_2$ produce standing wave because they travel along same axis but in opposite direction.

14 **(a)**

From doppler's effect, perceived frequency

$$v' = v\left(\frac{v - v_o}{v - v_s}\right)$$

$$\frac{9}{8} = \frac{340}{340 - v_s}$$

$$\Longrightarrow 9(340 - v_s) = 8 \times 340$$

$$\Longrightarrow v_s = 37.7 ms^{-1} = 40 ms^{-1}$$

15 **(b)**

From the given equation amplitude $a = 0.04m$

Frequency $= \frac{\text{Co-efficient of t}}{2\pi} = \frac{\pi/5}{2\pi} = \frac{1}{10} Hz$

Wave length $\lambda = \frac{2\pi}{\text{Co-efficient of } x} = \frac{2\pi}{\pi/9} = 18m$

Wave speed $v = \frac{\text{Co-efficient of } t}{\text{Co-efficient of } x} = \frac{\pi/5}{\pi/9} = 1.8m/s$

16 **(a)**

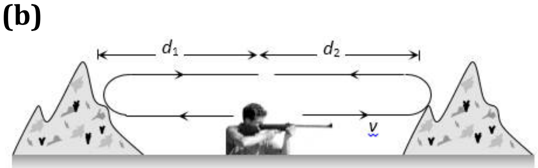
Frequency of waves remains same, $i.e.$ 60 kHz

and wavelength $\lambda = \frac{v}{n} = \frac{330}{60\times10^3} = 5.5\ mm$

18 **(a)**

Speed of sound $v = \sqrt{\frac{\gamma P}{d}} \Rightarrow \frac{v_1}{v_2} = \sqrt{\frac{d_2}{d_1}}$ [$\because$ P-constant]

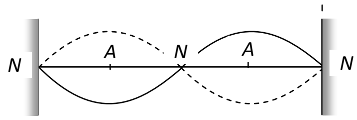
19 **(b)**



$$2(d_1 + d_2) = v(t_1 + t_2) \Rightarrow d_1 + d_2 = \frac{330 \times (3 + 5)}{2} = 1320\ m$$

20 **(d)**

When plucked at one fourth it gives two loops, and hence 2^{nd} harmonic is produced.



ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	B	C	C	C	D	C	A	B	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	B	A	A	B	A	B	A	B	D