DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 1

Topic :-WAVES

1 **(c)**

Resultant amplitude $= \sqrt{a_1^2 + a_2^2 + 2a_1a_2 \cos\phi}$

$= \sqrt{0.3^2 + 0.4^2 + 2 \times 0.3 \times 0.4 \times \cos\frac{\pi}{2}} = 0.5\ cm$

2 **(d)**

Infrasonic waves have frequency less than $(20\ Hz)$ audible sound and wavelength more than audible sound

3 **(c)**

Apparent frequency

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

$= 165\left(\frac{355 + 5}{355 - 5}\right)$

$(\because v_L = -5ms^{-1}, v_s = 5ms^{-1})$

$= 165 \times \frac{340}{330} = 170\ Hz$

Therefore, the number of beats heard

=170-165=5

4 **(c)**

Maximum velocity $v_{\max}\ fa = 2 \times 300 \times 0.1$

$= 60\pi\ \text{cms}^{-1}$

5 **(c)**

String vibrates in five segment so $\frac{5}{2}\lambda = l \Rightarrow \lambda = \frac{2l}{5}$

Hence $n = \frac{v}{\lambda} = 5 \times \frac{v}{2l} = 5 \times \frac{20}{2\times10} = 5\ Hz$

7 **(a)**

Energy is not carried by stationary waves

8 **(b)**

By using $v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow v \propto \sqrt{T}$

$$\frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{T + 600}{T}} = \sqrt{3} \Rightarrow T = 300\ K = 27°C$$

9 **(a)**

For closed pipe $n = \frac{v}{4l} \Rightarrow n = \frac{332}{4 \times 42} = 2Hz$

10 **(a)**

Here$n_1 = 200$ Hz.

Number of beats s^{-1}; m = 4

$\therefore\ n_2 = 200 \pm 4 = 204\ or\ 196$ Hz

On loading fork 2, its frequency decreases. And number of beats s^{-1} increases to 6. Therefore m is negative.

$n_2 = 200 - 4 = 196$ Hz

11 **(d)**

It a is amplitude of each wave,

$I_0 = k(a + a)^2 = 4ka^2$

Let ϕ be the phase difference to obtain the intensity$I_0/2$.

$\therefore \frac{I_0}{2} = ka_r^2 = k(a^2 + a^2 + 2aa \cos \phi)$

$= k2a^2(1 + \cos \phi) = k4a^2 \cos^2 \frac{\phi}{2}$

$= I_0 \cos^2 \phi/2$

$\cos \frac{\phi}{\sqrt{2}} = \frac{1}{\sqrt{2}} = \cos 45° \therefore \phi = 90°$.

If Δx is path difference between the two waves, then

$$\Delta x = \frac{\lambda}{2\pi} \phi = \frac{\lambda}{2\pi} \left(\frac{\pi}{2}\right) = \frac{\lambda}{4}$$

Therefore, displacement of sliding tube $\frac{1}{2}(\Delta x) = \lambda/8$

12 **(b)**

Given that, two waves

$y = a \sin(\omega t - ka)$

And y = a cos (ωt-kx)

Here, the phase difference between the two waves is $\frac{\pi}{2}$.

So, the resultant amplitude

$$A=\sqrt{a_1^2+a_2^2+2a_1a_2\cos\Phi}$$

$$\left(Here\ a_1=a, a_2=a, \Phi=\frac{\pi}{2}\right)$$

$$\therefore \mathrm{A}=\sqrt{\mathrm{a}^2+\mathrm{a}^2+2\mathrm{a}\,\mathrm{a}\cos\frac{\pi}{2}}$$

or $\mathrm{A}=\sqrt{\mathrm{a}^2+\mathrm{a}^2+0}$

$\Longrightarrow \mathrm{A}=\sqrt{2}\mathrm{a}$

13 **(a)**

For the end correction x,

$$\frac{l_2+x}{l_1+x}=\frac{3\lambda/4}{\lambda/4}=3$$

$$\Longrightarrow \quad x=\frac{l_2-3l_1}{2}$$

$$=\frac{70.2-3\times 22.7}{2}=1.05\text{cm}$$

14 **(d)**

$$\frac{dy}{dt}=y_0\cos 2\pi\left[ft-\frac{x}{\lambda}\right]\times 2\pi f$$

$\therefore$ maximum particle velocity $=\left(\frac{dy}{dt}\right)_{max}=2\pi f y_0\times 1$

Wave velocity $=f\lambda$

As $2\pi f y_0=4f\lambda$, $\therefore\ \lambda=\frac{2\pi y_0}{4}=\frac{\pi y_0}{2}$

15 **(c)**

If the temperature changes then velocity of wave and its wavelength changes. Frequency amplitude and time period remain constant

16 **(c)**

Intensity=energy/sec/area=power/area.

From a point source, energy spreads over the surface of a sphere of radius$r$.

Intensity $=\frac{P}{A}=\frac{P}{4\pi r^2}\propto\frac{1}{r^2}$

But Intensity $=(\text{Amplitude})^2$

$\therefore (\text{Amplitude})^2\propto\frac{1}{r^2}$ or Amplitude $\propto\frac{1}{r}$

At distance $2r$,amplitude becomes $A/2$

17 **(d)**

Reverberation time $T=\frac{kV}{\alpha S}\Rightarrow T\propto V$

18 **(a)**

As the string vibrates in n loops, therefore,

$$l = \frac{n\lambda}{2}$$

Therefore, v would become $\frac{1}{2}$ times.

As $v \propto \sqrt{T}$

Therefore, to make v half time, T must be made $\frac{1}{4}$time *ie* M/4.

19 **(c)**

Both listeners, hears the same frequencies

20 **(d)**

Speed of sound, doesn't depend upon pressure and density medium at constant temperature

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