DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 7

Topic :-WAVES

1 **(b)**
Speed of sound in gases is given by

$$v=\sqrt{\frac{\gamma RT}{M}} \Rightarrow v \propto \frac{1}{\sqrt{M}} \Rightarrow \frac{v_1}{v_2}=\sqrt{\frac{M_2}{M_1}}$$

2 **(a)**
From the given equation $k=\frac{2\pi}{k}=$ Co-efficient of $x=\frac{\pi}{4} \Rightarrow \lambda=8m$

3 **(c)**
When train is approaching frequency heard by the observer is
$n_a=n\left(\frac{v}{v-v_S}\right) \Rightarrow 219=n\left(\frac{340}{340-v_S}\right)$ ...(i)
When train is receding (goes away), frequency heard by the observer is
$n_r=n\left(\frac{v}{v+v_S}\right) \Rightarrow 184=n\left(\frac{340}{340+v_S}\right)$ ...(ii)
On solving equation (i) and (ii) we get $n=200Hz$ and $v_S=29.5m/s$

4 **(d)**
First overtone for closed pipe $=\frac{3v}{4l}$
Fundamental frequency for open pipe $=\frac{v}{2l}$
First overtone for open pipe $=\frac{2v}{2l}$

6 **(c)**
Frequency of 2^{nd} overtone $n_3=5n_1=5\times 50=250Hz$

7 **(a)**
Number of extra waves received $s^{-1}=\pm u/\lambda$

$\therefore$ Number of beats $s^{-1}=\frac{u}{\lambda}-(-u/\lambda)=\frac{2u}{\lambda}$

8 **(a)**
Maximum pressure at closed end will be atmosphere pressure adding with acoustic wave

pressure

So $\rho_{\max} = \rho_A + \rho_0$ and $\rho_{\min} = \rho_A - \rho_0$

Thus $\frac{\rho_{\max}}{\rho_{\min}} = \frac{\rho_A + \rho_0}{\rho_A - \rho_0}$

9 **(a)**

$v = \sqrt{\frac{\gamma RT}{M}} \Rightarrow v \propto \sqrt{\frac{\gamma}{M}}$. Since $\frac{\gamma}{M}$ is maximum for H_2 so sound velocity is maximum in H_2

10 **(b)**

Path difference between the wave reaching at D

$\Delta x = L_2P - L_1P = \sqrt{40^2 + 9^2} - 40 = 41 - 40 = 1m$

For maximum $\Delta x = (2n)\frac{\lambda}{2}$

For first maximum $(n = 1) \Rightarrow 1 = 2(1)\frac{\lambda}{2} \Rightarrow \lambda = 1m$

$\Rightarrow n = \frac{v}{\lambda} = 330Hz$

11 **(a)**

Velocity of sound $v \propto \sqrt{T}$

Time

$t \propto \frac{1}{\sqrt{v}}$

$\therefore t \propto \frac{1}{\sqrt{T}}$

$\frac{t_1}{t_2} = \sqrt{\frac{T_1}{T_2}}$

$\frac{2}{t_2} = \sqrt{\frac{273 + 30}{273 + 10}}$

$\frac{2}{t_2} = \sqrt{\frac{303}{283}} = 1.03$

$t_2 = \frac{2}{1.03} = 1.9s$

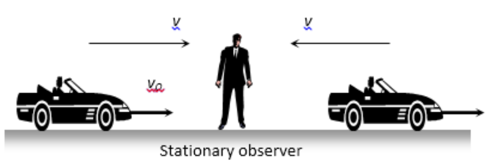
12 **(c)**

Frequency of $p\ th$ harmonic

$n = \frac{pv}{2l} \Rightarrow p = \frac{2ln}{v} = \frac{2 \times 0.33 \times 1000}{330} = 2$

13 **(a)**

$n_{Before} = \frac{v}{v - v_c} n$ and $n_{After} = \frac{v}{v + v_c} . n$



$$\frac{n_{Before}}{n_{After}} = \frac{11}{9} = \left(\frac{v + v_c}{v - v_c}\right) \Rightarrow . v_c \Rightarrow \frac{v}{10}$$

14 **(c)**

Since frequency remains unchanged

V=v'

$$\frac{v}{\lambda} = \frac{v'}{\lambda'}$$

$$\frac{v}{\lambda} = \frac{2v}{\lambda'}$$

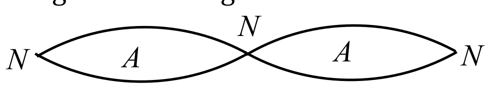
$$\lambda' = \frac{2v}{v}\lambda$$

$$\lambda' = 2\lambda$$

Hence, its wavelength will become twice.

16 **(d)**

The given standing wave is shown in the figure



As length of loop or segment is

$$\frac{\lambda}{2}$$

So length of 2 segments is

$$2\left(\frac{\lambda}{2}\right)$$

$$\therefore 2\frac{\lambda}{2} = 1.21\text{Å}$$

$$\Longrightarrow \lambda = 1.21\text{Å}$$

17 **(b)**

$$n_1 - n_2 = 6$$

$$\Rightarrow \frac{1}{2l}\sqrt{\frac{T'}{m}} - \frac{1}{2l}\sqrt{\frac{T}{m}} = 6$$

$$\Rightarrow \frac{1}{2l}\sqrt{\frac{T'}{m}} - 600 = 6$$

$\frac{1}{2l}\sqrt{\frac{T'}{m}} = 606 =$ Fundamental frequency ...(i)

Given,

$\frac{1}{2l}\sqrt{\frac{T}{m}} = 600$ ...(ii)

Dividing Equation (i) by Equation (ii), we get

$$\frac{\frac{1}{2l}\sqrt{\frac{T'}{m}}}{\frac{1}{2l}\sqrt{\frac{T}{m}}} = \frac{606}{600}$$

$$\Rightarrow \sqrt{\frac{T'}{T}} = (1.01) \Rightarrow \frac{T'}{T} = (1.02)$$

$$\Rightarrow T' = T(1.02)$$

Increase in tension

$$\Delta T' = T \times 1.02 - T = (0.02\text{T})$$

Hence, $\frac{\Delta T'}{T} = 0.02$

18 **(a)**

Since sources of frequency x gives 8 beats per second with frequency 250 Hz, it's possible frequencies are 258 or 242. As source of frequency x gives 12 beats per second with a frequency 270 Hz, it's possible frequencies are 282 and 258 Hz. The only possible frequencies of x which gives 8 beats with frequency 250 Hz also 12 beats per second with 270 Hz is 258 Hz

19 **(a)**

Due to rise in temperature, the speed of sound increases. Since $n = \frac{v}{\lambda}$ and λ remains unchanged, hence n increases

20 **(c)**

$$n = \frac{1}{2l}\sqrt{\frac{T}{\pi r^2 \rho}} \propto \sqrt{\frac{T}{r^2 \rho}}$$

$$\Rightarrow \frac{n_1}{n_2} = \sqrt{\left(\frac{T_1}{T_2}\right)\left(\frac{r_2}{r_1}\right)^2\left(\frac{\rho_2}{\rho_1}\right)} = \sqrt{\left(\frac{1}{2}\right)\left(\frac{2}{1}\right)^2\left(\frac{1}{2}\right)} = 1$$

$$\therefore n_1 = n_2$$

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