DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 9

Topic :-WAVES

1 **(a)**

Here, $\frac{ct}{\lambda}$ is dimensionless and unit of ct is same as that of x. Also unit of λ is same as that of A, which is also the unit of x

2 **(a)**

Y=2cos 2π(330 t-x)

$\omega = 2\pi \times 330$

$T = \frac{1}{330} s$

3 **(c)**

Resonance occurs when amplitude is maximum*ie*, when the denominator of this equation is minimum.

4 **(d)**

Number of waves per minute $= 54$

$\therefore$ Number of waves per second $= 54/60$

Now $v = n\lambda \Rightarrow n = \frac{54}{60} \times 10 = 9 m/s$

5 **(a)**

$v_{\max} = a\omega = 3 \times 10 = 30$

6 **(c)**

Resultant amplitude

$A_R = 2A \cos\left(\frac{\theta}{2}\right) = 2 \times (2a) \cos\left(\frac{\theta}{2}\right) = 4a \cos\left(\frac{\theta}{2}\right)$

8 **(b)**

Let the base frequency be n for closed pipe then notes are $n, 3n, 5n$ ....

$\therefore$ note $3n = 255 \Rightarrow n = 85$, note $5n = 85 \times 5 = 425$ note $7n = 7 \times 85 = 595$

9 **(b)**

$y_1 = 10^{-6} \sin[100\, t + (x/50) + 0.5]$

$y_2 = 10^{-6} \sin\left[100t + \left(\frac{x}{50}\right) + \left(\frac{\pi}{2}\right)\right]$

Phase difference ϕ

$= [100t + (x/50) + 1.57] - [100t + (x/50) + 0.5]$
$= 1.07\ radians$

11 **(d)**

In n is frequency of first fork, then frequency of the last (10th fork)$= n + 4(10-1) = 2\,n$

$\therefore n = 36$ and $2\,n = 72$

12 **(a)**

Phase difference is 2π means constrictive interference so resultant amplitude will be maximum

13 **(a)**

At nodes pressure change (strain) is maximum

14 **(d)**

According to Laplace, the speed of sound in gas is given by

$$v = \sqrt{\frac{\gamma RT}{M}},$$

Where γ is ratio of specific heats, M the molecular weight, R the gas constant and T the temperature,

$$\therefore \ \frac{v_o}{v_H} = \sqrt{\frac{M_H}{M_o}}$$

$$\therefore \frac{v_O}{v_H} = \sqrt{\frac{1}{16}} = \frac{1}{4}$$

$$\therefore \quad v_O : v_H = 1:4$$

15 **(a)**

Here, $u_s = 50\text{ms}^{-1}, v_L = 0, v = 350\text{ms}^{-1}$

When source is moving towards observer,

$$v' = 1000$$

$$v' = \frac{u \times v}{u - u_s}$$

$$v = \frac{(u - u_s)v'}{u}$$

$$= \frac{(350-50)1000}{350} = \frac{6000}{7}\text{Hz}$$

When source is moving away from observer,

$$v' = \frac{u \times v}{u + v_s}$$

$$= \frac{350}{(350+50)} \times \frac{6000}{7}$$

$$= 750 \text{ Hz}$$

16 **(d)**

Frequency is decreasing (becomes half), it means source is going away from the observe.
In this case frequency observed by the observer is

$$n' = n\left(\frac{v}{v+v_S}\right) \Rightarrow \frac{n}{2} = n\left(\frac{v}{v+v_S}\right) \Rightarrow v_S = v$$

17 **(a)**

From $n = \frac{1}{lD}\sqrt{\frac{T}{\pi\rho}}$

When radius of string is doubled, Diameter D becomes twice. As T and ρ are same, n becomes $1/2$, ie, $n/2$.

18 **(d)**

Here, $A_1 = A, A_2 = A, \phi = 120°$

The amplitude of the resultant wave is

$$A_R = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos\phi}$$

$$= \sqrt{A^2 + A^2 + 2AA\cos 120°}$$

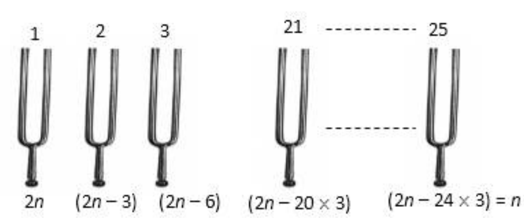
$$= \sqrt{A^2 + A^2 - A^2} \qquad \left[\because \cos 120° = -\frac{1}{2}\right]$$

$$\therefore A_R = A$$

19 **(c)**

According to the question frequencies of first and last tuning forks are $2n$ and n respectively.

Hence frequency is given arrangement are as follows



$\Rightarrow 2n - 24 \times 3 = n \Rightarrow n = 72\ Hz$

So, frequency of 21st tuning fork

$n_{21} = (2 \times 72 - 20 \times 3) = 84\ Hz$

20 **(c)**

$$\frac{I_1}{I_2} = \frac{4}{1} = \frac{a^2}{b^2} \therefore \frac{a}{b} = \frac{2}{1}$$

$$\therefore \frac{I_{max}}{I_{min}} = \frac{(a+b)^2}{(a-b)^2} = \frac{(2+1)^2}{(2-1)^2} = 9$$

Now, $L_1 - L_2 = 10\log\frac{I_{max}}{I_0} - 10\log\frac{I_{mim}}{I_0}$

$$= 10\log\frac{I_{max}}{I_{min}} = 10\log 9$$

$$L_1 - L_2 = 10\log 3^2 = 20\log 3$$

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