QUESTIONS FROM COMPETITIVE EXAMS

6.1 Introduction
6.2 Progressive Waves

(MHT-CET 2002)

1. The equation of a progressive wave is $y = 8 \sin\left[\pi\left(\frac{t}{10} - \frac{x}{4}\right) + \frac{\pi}{3}\right]$, where all quantities are in SI units. Then the wavelength of the wave is
   a) 8 m b) 4 m c) 2 m d) 10 m

(MHT-CET 2003)

2. Pitch of a musical note depends upon
   a) amplitude of sound b) the frequency of sound
   c) the instrument d) none of these

3. The equation of a progressive wave is given by, $y = 3 \sin \pi \left(\frac{t}{0.02} - \frac{x}{20}\right)$m. Then the frequency of the wave is
   a) 100 Hz b) 25 Hz c) 50 Hz d) 20 Hz

(MHT-CET 2005)

4. Ultrasonic, infrasonic and audio frequency waves travel through a medium with speeds v_u, v_i and v_a respectively, then
   a) $v_u = v_i = v_a$ b) $v_u > v_a > v_i$ c) $v_u < v_a < v_i$ d) $v_a < v_u$ and $v_u = v_i$

(MHT-CET 2007)

5. The relation between wave velocity and maximum particle velocity is (Where v_p= Particle velocity, v = Wave velocity)
   a) $v_p = v$ b) $v_p = \frac{\lambda}{2\pi} v$ c) $v_p = \frac{2\pi A}{\lambda} v$ d) $v = \frac{\lambda}{2\pi} v_p$

6. The phase difference between two particles in a medium separated by a distance x is $\pi/6$. If the frequency of the oscillation is 50 Hz and the velocity of propagation of the wave is 100 m/s, then x =
   a) 1/3 m b) 1/4 m c) 1/6 m d) 1/12 m

(MHT-CET 2008)

7. If the maximum particle velocity is 4 times the wave velocity, then the relation between wavelength and amplitude is
   a) $\lambda = A / 2\pi$ b) $\lambda = \pi A / 2$ c) $\lambda = \pi / 2A$ d) $\pi = \lambda A / 2$

8. $y = 3 \cos 100\pi (2t - x)$. The value of λ is
   a) 4 cm b) 6 cm c) 2 cm d) 1 cm

(MHT-CET 2010)

9. The equation of a simple harmonic progressive wave is given by $y = A \sin (100\pi t - 3x)$. Find the distance between 2 particles having a phase difference of $\frac{\pi}{3}$.
   a) $\frac{\pi}{9}$ m b) $\frac{\pi}{18}$ m c) $\frac{\pi}{6}$ m d) $\frac{\pi}{3}$ m

(MHT-CET 2011)

10. A progressive wave is, $y = 12 \sin (5t - 4x)$, where all the quantities are in SI units. On this wave, how far away are the two points having a phase difference of $\pi/2$?

a) $\pi/4$ b) $\pi/8$ c) $\pi/16$ d) $\pi/32$

(MHT-CET 2012)

11. The maximum particle velocity in a progressive wave is 4 times of the wave velocity. If the amplitude of the particle is 'A', then the wavelength of the wave is

a) $4\pi/A$ b) $\pi A/2$ c) $2\pi/A$ d) $A/2\pi$

(MHT-CET 2014)

12. When a wave travels in a medium, displacement of a particle is given by $y = a \sin 2\pi (bt - cx)$ where a, b, c are constants. The maximum particle velocity will be twice the wave velocity if

a) $b = ac$ b) $b = \frac{1}{ac}$ c) $c = \pi a$ d) $c = \frac{1}{\pi a}$

13. When a wave travels in a medium, displacement of a particle is given by $y = a \sin 2\pi (bt - cx)$ where 'a', 'b', 'c' are constants. The maximum particle velocity will be twice the wave velocity if

a) $b = ac$ b) $b = \frac{1}{ac}$ c) $c = \pi a$ d) $c = \frac{1}{\pi a}$

(MH-CET 2015)

14. The equation of a progressive wave is,

$y = a \sin 2\pi \left(nt - \frac{x}{5}\right)$. The ratio of maximum particle velocity to wave velocity is

a) $\frac{\pi a}{5}$ b) $\frac{2\pi a}{5}$ c) $\frac{3\pi a}{5}$ d) $\frac{4\pi a}{5}$

(MH-CET 2016)

15. A progressive wave is represented by $y = 12 \sin (5t - 4x)$ cm. On this wave, how far away are the two points having phase difference of 90° ?

a) $\frac{\pi}{2}$ cm b) $\frac{\pi}{4}$ cm c) $\frac{\pi}{8}$ cm d) $\frac{\pi}{16}$ cm

(MH-CET 2017)

16. The equation of a progressive wave is $y = 3 \sin \left[\pi\left(\frac{t}{3} - \frac{x}{5}\right) + \frac{\pi}{4}\right]$ where x and y are in metres and time in seconds. Which of the following is correct?

a) velocity V = 1.5 m/s b) amplitude A = 3 cm

c) frequency F = 0.2 Hz d) wavelength λ = 10 m

(MHT-CET 2019)

17. A simple harmonic progressive wave travelling through a medium is represented by $y = a \sin 2\pi \left(nt - \frac{x}{\lambda}\right)$. If the maximum velocity of particle of medium is 'P' times the wave velocity, then the wavelength 'λ' of the wave is given by

a) $\frac{\pi a}{2P}$ b) $P\pi a$ c) $\frac{2\pi a}{P}$ d) $\frac{\pi a}{P}$

(MHT-CET 2020)

18. The wave described by $y = 0.35 \sin (2\pi t - 10\pi x)$, where x and y are in metres and t in seconds, is a wave travelling along the
a) negative x-direction with amplitude 0.35 m and wavelength $\lambda = 0.5$ m
b) positive x-direction with frequency 1 Hz and wavelength $\lambda = 0.2$ m
c) positive x-direction with frequency 1 Hz and amplitude 3.5 m
d) negative x-direction with frequency π Hz and wavelength $\lambda = 0.5$ m

19. A simple harmonic progressive wave is given by $Y = Y_0 \sin 2\pi \left(nt - \frac{x}{\lambda}\right)$. If the wave velocity is $\left(\frac{1}{8}\right)^{th}$ of the maximum particle velocity, then the wavelength is
a) $\pi Y_0 / 2$ b) $\pi Y_0 / 16$ c) $\pi Y_0 / 8$ d) $\pi Y_0 / 4$

(MHT-CET 2021)

20. A wave travelling along x-axis is given by the equation $y = 0.005 \cos (\alpha x - \beta t)$. If the wavelength and time period of the wave are 0.08 m and 2.0 seconds respectively then the values of α and β are
a) $\alpha = 12.50\pi, \beta = 2.0\pi$ b) $\alpha = \frac{0.04}{\pi}, \beta = \frac{1.0}{\pi}$
c) $\alpha = \frac{0.08}{\pi}, \beta = \frac{2.0}{\pi}$ d) $\alpha = 25.00\pi, \beta = \pi$

(MHT-CET 2022)

21. The displacement of a wave travelling in the x direction is $y = 10^{-4} \sin [600t - 2x + \frac{\pi}{3}]$m where x is in metres and t in seconds. The speed of the wave is
a) 150 m/s b) 300 m/s c) 200 m/s d) 600 m/s

22. In a medium, the phase difference between two particles separated by a distance 'x' is $\left(\frac{\pi}{5}\right)^c$. If the frequency of the oscillation of particles is 25 Hz and the velocity of propagation of the wave is 75 m/s, then the value of x is
a) 0.3 m b) 0.1 m c) 0.2 m d) 0.4 m

23. The amplitude of a wave represented by displacement equation,
$$Y = \frac{1}{\sqrt{a}} \sin \omega t \pm \frac{1}{\sqrt{b}} \cos \omega t \text{ will be}$$
a) $\frac{\sqrt{a} + \sqrt{b}}{ab}$ b) $\frac{\sqrt{a} - \sqrt{b}}{ab}$ c) $\frac{a+b}{ab}$ d) $\sqrt{\frac{a+b}{ab}}$

6.3 Reflection of Waves

(MHT-CET 2003)

24. When a sound wave gets reflected from denser medium phase changes by
a) 2π b) $\pi/2$ c) π d) no phase change

(MHT-CET 2004)

25. What is the phase difference between two successive crests in the transverse wave ?
a) π b) $\pi/2$ c) 2π d) 4π

(MHT-CET 2005)

26. Wavelength of wave is the distance between two successive positions of particles which are differing in phase by
a) π b) $2\pi/3$ c) 2π d) $\pi/3$

(MHT-CET 2007)

27. When sound is reflected from a denser medium
a) crest is reflected as a trough b) crest is reflected as a crest
c) compression is reflected as a rarefaction d) compression is reflected as a compression

6.4 Superposition of Waves

(MHT-CET 2001)

28. What is phase difference between two waves, if the resultant amplitude due to their superposition is same as that of the waves ?
a) $\pi/2$ b) π c) $2\pi/3$ d) $\pi/4$

(MHT-CET 2004)

29. The amplitudes of two waves are in ratio 5 : 2. If all other conditions for the two waves are same, then the ratio of their energy densities will be
a) 5 : 2 b) 10 : 4 c) 2.5 : 1 d) 25 : 4

(MH-CET 2018)

30. Two light waves of intensities 'I_1' and 'I_2' having same frequency pass through same medium at a time in same direction and interfere. The sum of the minimum and maximum intensities is
a) $(I_1 + I_2)$ b) $2(I_1 + I_2)$ c) $\left(\sqrt{I_1} + \sqrt{I_2}\right)$ d) $\left(\sqrt{I_1} - \sqrt{I_2}\right)$

6.5 Standing Waves or Stationary Waves

(MHT-CET 2020)

31. A stationary wave is represented by $y = 10 \sin \frac{\pi x}{4} \cos 20\pi t$ where 'x' and 'y' are expressed in cm and 't' in seconds. Distance between two consecutive nodes is
a) 1 cm b) 2 cm c) 4 cm d) 8 cm

(MHT-CET 2022)

32. The equation of stationary wave on a string clamped at both ends and vibrating in third harmonic is $y = 0.5 \sin(0.314x) \cos(600\pi t)$ where x and y are in cm, t in seconds. The length of the vibrating string is
a) 20 cm b) 30 cm c) 40 cm d) 10 cm

6.6 Free and Forced Vibrations

(MHT-CET 2002)

33. In a resonance tube experiment, two successive resonances are heard at 15 cm and 48 cm. Then the end correction will be
a) 1.5 cm b) 3 cm c) 2.5 cm d) 1 cm

(MHT-CET 2003)

34. Transverse position in Melde's experiment is changed to parallel position, if length of string remaining the same and tension is made half. If in perpendicular position 4 loops are formed, then the number of loops formed in parallel position is :
a) 1 b) 2 c) 3 d) 4

(MHT-CET 2004)

35. In resonance,
a) the energy released by the vibrating body is maximum
b) energy absorbed by the vibrating body is maximum
c) neither is energy absorbed by the vibrating body nor is energy released.
d) cannot be predicted

36. In Melde's experiment, the string vibrates in 4 loops when a 50 gm weight is placed in a pan of weight 15 gm. To make the string to vibrate in 6 loops, the weight that has to be removed from the pan is
a) 0.0007 kg wt b) 0.0021 kg wt
c) 0.036 kg wt d) 0.0029 kg wt

(MHT-CET 2006)

37. The acceleration of a body executing free damping vibration is
a) constant b) changes c) increasing d) decreasing

(MHT-CET 2009)

38. The cause of damping in an oscillatory motion is
a) restoring force b) friction c) both d) none of these

(MHT-CET 2011)

39. The phenomenon of setting a body into vibrations by a strong periodic force is called
a) free vibrations b) forced vibrations
c) resonant vibrations d) none of these

(MHT-CET 2012)

40. If oil of density higher than that of water is used in place of water in a resonance tube, its frequency will
a) decrease b) increase c) remain the same d) cannot say

(MHT-CET 2013)

41. Sonometer is based on the principle of
a) forced vibration b) free vibration
c) resonance d) all of the above

(MHT-CET 2020)

42. In Melde's experiment, when wire is stretched by empty pan, four loops are obtained and when six gram weight is added in the pan, the number of loops becomes one. The mass of pan is
a) 1.2 gram b) 1.5 gram c) 0.8 gram d) 0.4 gram

43. In Melde's experiment, when the tension decreases by 0.009 kg-wt, the number of loops changes from 4 to 5. The initial tension is
a) 0.025 kg-wt b) 0.036 kg-wt
c) 0.009 kg-wt d) 0.018 kg-wt