Physics English Classified MCQ Oscillations & Waves 1992 - 2016

Advanced Level

Physics

UNIT 03 - OSCILLATIONS & WAVES

Classified m.c.q questions

1992-2016

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OSCILLATIONS & WAVES

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ANSWERS

Oscillations & Waves

01. Simple Harmonic Motion

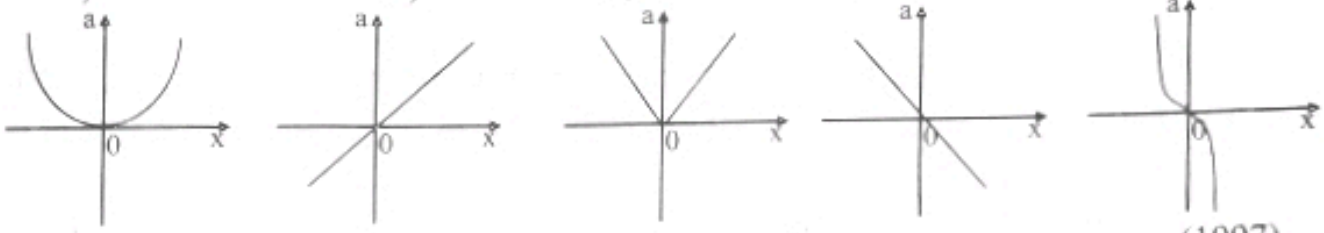
01) A simple pendulum swings through an angle of 1^0 in one second {figure (i) }. The same pendulum is made to swing through an angle of 2^0 {figure (ii) }. The time taken to swing through the angle of 2^0 is,

1) 0.25 s 2) 0.5 s 3) 1 s
4) 1.5 s 2) 2 s

(1992)

02) Which of the following sketches best represents the relation between the acceleration (a) of a body executing simple harmonic motion and the displacement (x) of the body from its equilibrium position ?

1) 2) 3) 4) 5)



(1997)

03) A certain mass performs simple harmonic motion about a point O with amplitude a and period T. Its displacement form O at time $t = \frac{T}{4}$ after passing through O is,

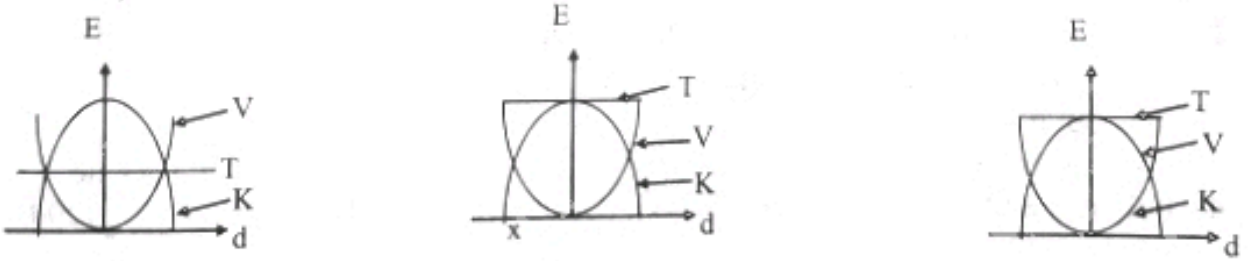
1) 0 2) $\frac{a}{4}$ 3) $\frac{a}{2}$ 4) a 5) $\frac{5a}{4}$ (1998)

04) An elastic string with spring constant k is cut into two parts of equal length. The spring constant of one part is,

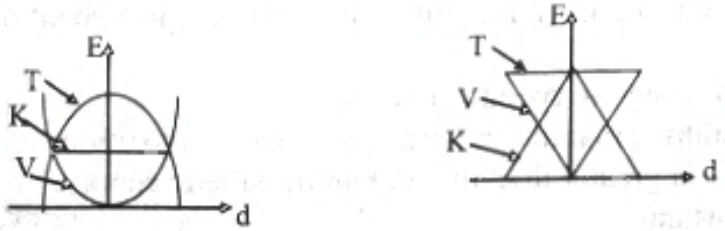
1) $\frac{k}{2}$ 2) $\frac{1}{\sqrt{2}}$ k 3) k 4) $\sqrt{2}$ k 5) 2k (1999)

05) Which one the following energy (E) – displacement (D) graphs best represents the variation of the kinetic energy K, the potential energy V and the total energy T with displacement d of a particle performing simple harmonic motion?

1) 2) 3)

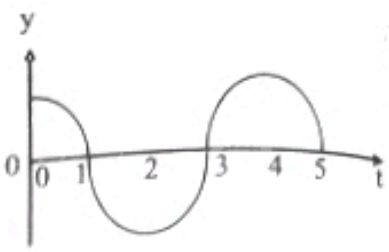


4) 5)

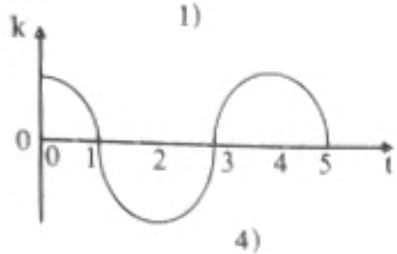


(2000)

06) The graph shows the variation of displacement (y) of an object with time (t) Which one of the following graphsbest represents the variation of kinetic energy (K) of the object with time (t)?



1)



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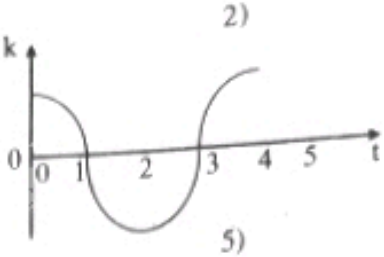

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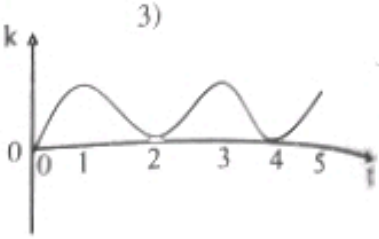
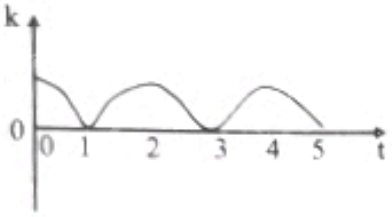
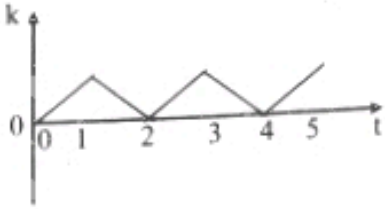


4)

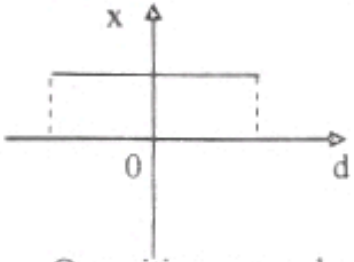


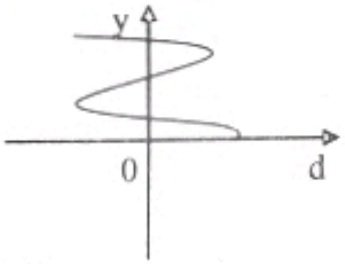
5)

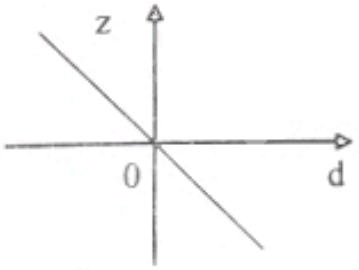


(2001)

07) The following graph show how certain quantities x,y and z very with the displacement d of a particle undergoing a simple harmonic motion.







Quantities x, y and z represent

1) kinetic energy, momentum , and acceleration respectively
2) total energy time and force respectively
3) potential energy, time and acceleration respectively
4) total energy, acceleration, and force respectively
5) total energy, time and momentum respectively. (2002)

08) The period of an object performing a simple harmonic motion depends on,

A) the amplitude of the oscillation.
B) the speed of the object at the equilibrium point
C) the initial position of the object.

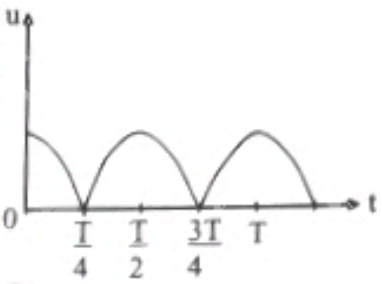
Of the above statement,

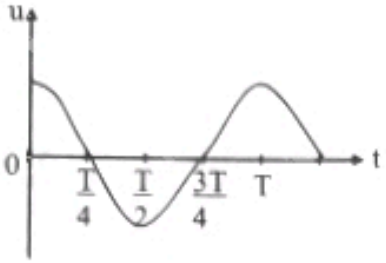
1) only (A) is true 2) only (B) is true. 3) only (C) is true
4) only (B) and (C) are true 5) all (A), (B) and (C) are false. (2005)

09) For an object undergoing simple harmonotic motion

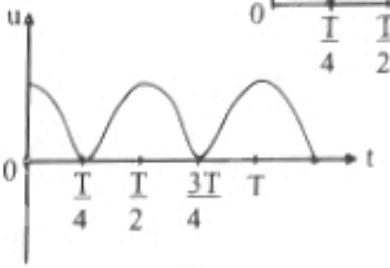
1) the magnitude of the acceleration is maximum when the displacement is maximum.
2) the displacement is maximum when the speed is maximum.
3) the magnitude of the acceleration is maximum when the speed is maximum.
4) the maximum potential energy is greater than the maximum kinetic energy.
5) the acceleration is always constant (2006)

10) The variation of the speed u, with time t of a simple harmonic oscillator is shown in the figure. The variation of its velocity υ with time t best represented by

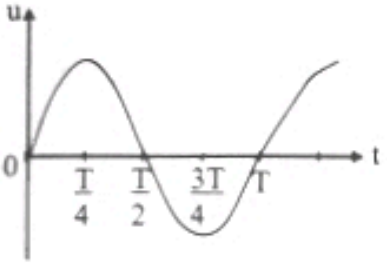




1)



2)



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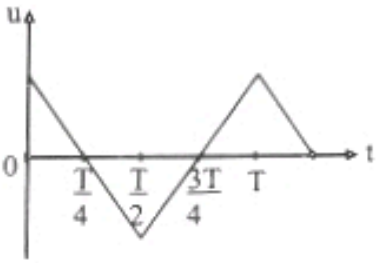
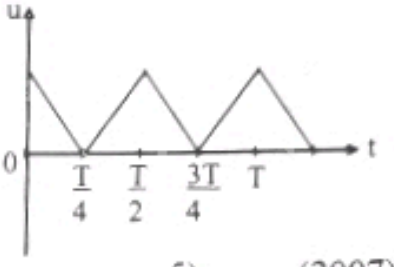


4)



5) (2007)

11) A mass attached to one end of a vertical spring whose other end is fixed to a ceiling, is made to execute simple harmonic motion with amplitude a and maximum speed υ. When the amplitude of the motion is increased to $2a$, the maximum speed will become,

1) 4υ 2) 2υ 3) υ 4) $\frac{\upsilon}{2}$ 5) $\frac{\upsilon}{4}$ (2008)

12) A simple pendulum hung from the ceiling of an elevator has a period T when the elevator is at rest. Period of this pendulum when the elevator is moving upwards with an acceleration of $5\ ms^{-2}$.

1) $\sqrt{2}\,T$ 2) $\sqrt{\frac{3}{2}}\,T$ 3) $\frac{T}{2}$ 4) $\sqrt{\frac{2}{3}}\,T$ 5) $2T$ (2009)

13) A simple pendulum of period T on the earth is brought to the moon. If the ratio of the acceleration due to gravities of the earth and the moon is 6, the period of oscillation of the pendulum on the moon is,

1) T 2) 6T 3) $\sqrt{6}T$ 4) $\frac{T}{\sqrt{6}}$ 5) $\frac{T}{6}$ (2011NS)

14) Variation of the displacement (x) with time (t) for a particle executing a simple harmonic motion over a period (T) is shown in figure (a). The variation of the kinetic energy (K) of the particle with time (t) over the period is best represented by,

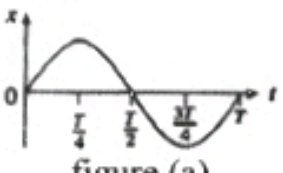
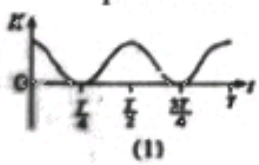
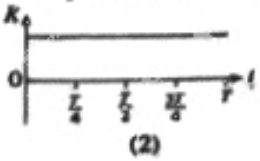


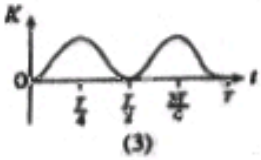
figure (a)



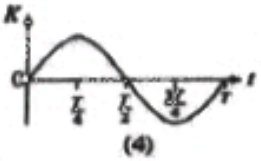
(1)



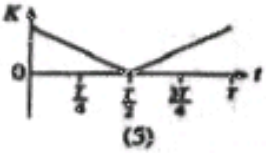
(2)



(3)



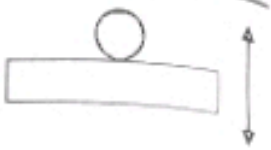
(4)



(5)

(2015)

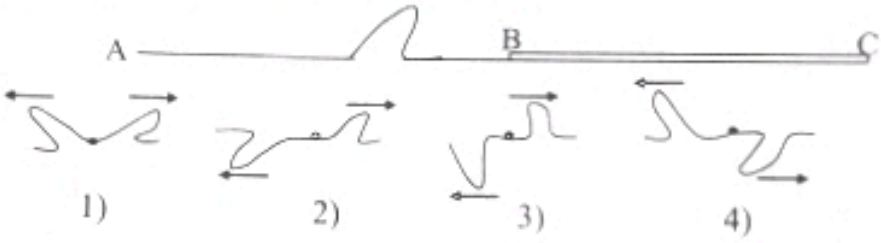
15) A mass is resting on a horizontal surface which moves up and down performing simple harmonic motion with amplitude A is shown in figure. The maximum frequency with which the surface can move while keeping the mass always in contact with the surface is,



1) $2\pi\sqrt{\frac{g}{A}}$ 2) $\sqrt{\frac{g}{A}}$ 3) $\frac{1}{2}\sqrt{\frac{g}{A}}$ 4) $\frac{1}{2\pi}\sqrt{\frac{g}{A}}$ 5) $\frac{1}{\pi}\sqrt{\frac{g}{A}}$ (2016)

02. Wave Properties

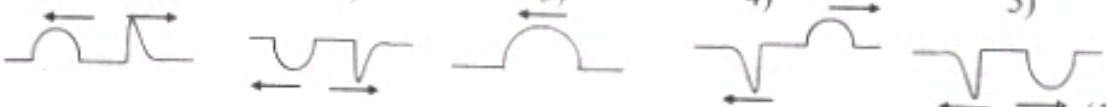
01) A composite string which consists of two parts AB and BC with different mass per unit length is stretched to a given tension. The mass per unit length of AB is much smaller than that of BC. A pulse is set up in the string and it moves to the right along AB as shown in the figure. After the pulse has reached the junction B, the resulting pulses in the strikes look like,



1) 2) 3) 4) 5) (1992)

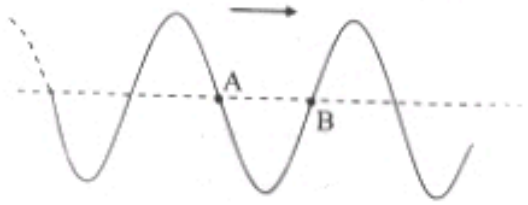
02) Figure shows, two wave pulses traveling in opposite directions along a stretched string. Which of the following diagrams best represents the shape of the pulse / pulses in the subsequent motion after they meet together.

1) 2) 3) 4) 5)



(1995)

03) Figure shows the instantaneous position of a transverse wave traveling to the right on a water surface A and B are two small floating objects. As the wave travels away from this position to the right,

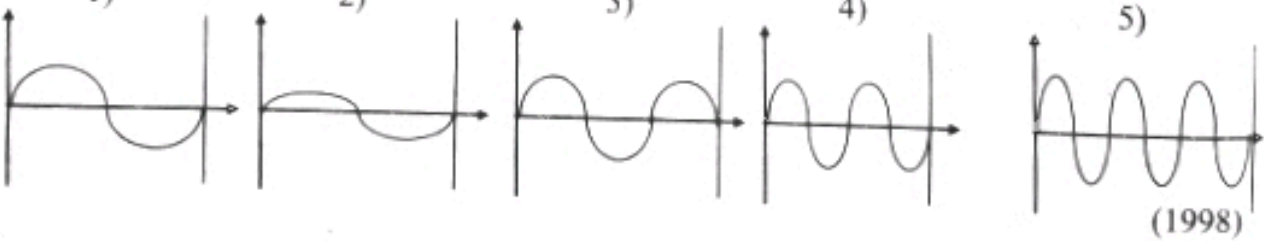


1) both A and B begin to move to the right
2) both A and B begin to move to the left
3) both A and B begin to move to the right
4) A begins to move upwards and B begins to move downwards
5) A begins to move downwards and B begins to move upwards

(1997)

04) Which of the following waveforms has the highest frequency?

1) 2) 3) 4) 5)



(1998)

05)

As shown in the figure two pulses of identical shape with amplitude 2cm are traveling along a string in opposite directions with the same speed 2cms^{-1} if the pulses are 8cm apart initially, wave pattern after 2s in given by,a

1) 

2) 

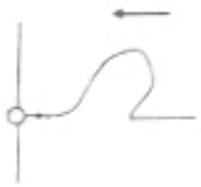
3) 

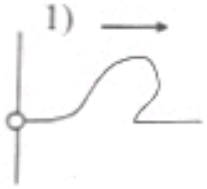
4) 

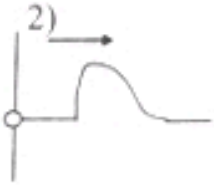
5)

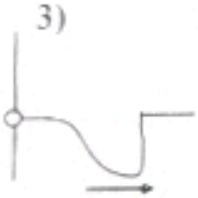
(1999)

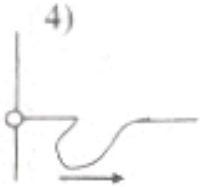
06) A transverse pulse is traveling on a stretched string as shown in the figure. The left end of the string is tied to a light ring that could slides on a frictionless rod perpendicular to the string. The reflected pulse is best represented by,

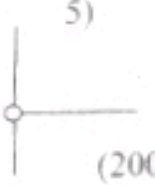


1) 

2) 

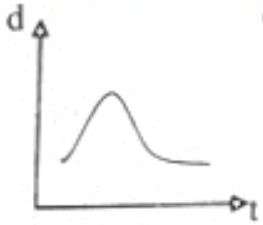
3) 

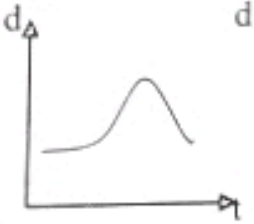
4) 

5) 

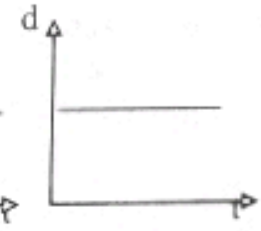
(2000)

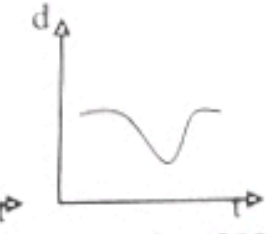
07) A pulse propagates with a uniform speed along a stretched string as shown in the figure. Which of the following best represents the displacement (d) of the point (p) of the string with time (t)?

1) 

2) 

3) 

4) 

5) 

(2002)

08) Consider the following statements made regarding longitudinal and transverse waves,

(A) Only transverse waves can undergo refraction

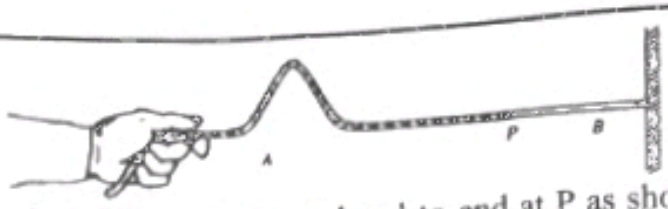
(B) Both types of waves can undergo interference and diffraction

(C) Both types of waves can produce beats.

1) Only (A) is true 2) Only (B) is true 3) Only (A) and (B) are true

4) Only (B) and (C) are true 5) all (A), (B) and (C) are true (2003)

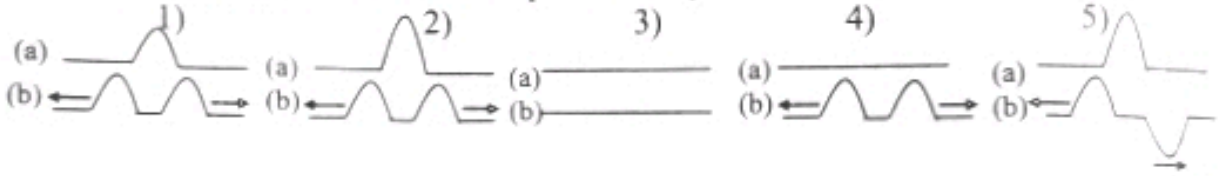
09)



Two strings A and B are connected end-to-end at P as shown in the figure and the free end of the lighter string B is attached to a rigid vertical wall. The masses per unit length of A and B are 0.04 kg m^{-1} and 0.01 kg m^{-1} respectively. The composite string is first pulled by hand to create a tension of 1N and then a pulse is created at the free end of A. After the pulse has reached the point P

1) a non - inverted pulse would have traveled along B to the right with speed 10 ms^{-1}
2) an inverted pulse would have traveled along B to the right with speed 10ms^{-1}
3) a non-inverted pulse would have traveled to the left along A with speed 10ms^{-1}
4) an inverted pulse would have traveled to the left along A with speed 10ms^{-1}
5) no pulse would have traveled along A to the left. (2004)

10) Figure shows two identical pulses moving towards each other along a string. The two instants where (a) the two pulses overlap completely and (b) some time after the overlapping occurs are best represented by,



(2005)

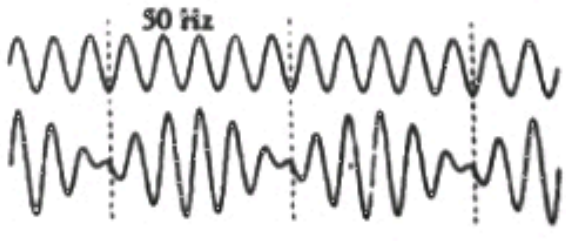
11) As a mechanical wave propagates in a medium, the energy of the wave dissipates gradually. This will gradually,

1) decrease the speed of the wave
2) decrease the amplitude of the wave
3) decrease the frequency of the wave
4) decrease the wavelength of the wave
5) increase the the wavelength of the wave (2006)

12) An earthquake which occured at a certain location generates a transverse wave (*S* - wave) and a longitudinal wave (*P* – wave). Both waves travel through the earth and the *P* – wave arrives 3 minutes before the *S* – wave at a certain point on the earth. The average speeds of the *S* and *P* waves between the point and the location of the earthquake are 4 km s^{-1} and 8 km s^{-1} respectively. How far away from the point did the earthquake occur?

1) 40 km 2) 540 km 3) 720 km 4) 1440 km 5) 2400 km (2006)

13) An oscilloscope is connected to a microphone which received simultaneously a 50 *Hz* signal and another signal of frequency *f* (f > 50 *Hz*). The figure (A) shows the trace withe 50 *Hz* signal alone while the figure (B) shows the trace due to the combined signal.

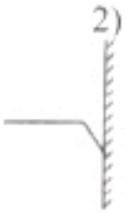


The value of *f* is,

1) 50 Hz 2) 55 Hz 3) 60 Hz 4) 65 Hz 5) 70 Hz (2006)

14) A student vibrated a tunning fork and listened to its sound while keeping it in air. Then he vibrated this tunning fork again with the same amplitude and listened to the sound while placing to handle against a larger wooden board.
1) sound intensity heard by him in both cases is the same.
2) sound intensity heard when the tunning fork goes on vibrating is higher than when it is held against the wooden board.
3) The time during which the tunning fork goes on vibrating is the same in both cases.
4) The time during which the tunning fork goes on vibrating is higher when it is kept on the board than is air.
5) The time during which the tunning fork goes on vibrating is higher when it is kept in air than on the board. (2007)

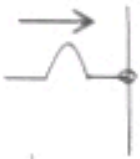
15) A symmetrical pulse shown in the figure is moving along a string towards a rigid boundary. Which of the following figures correctly shows the resultant pulse at the instant when exactly half of the pulse is reflected from the rigid boundary ?

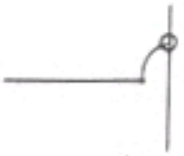
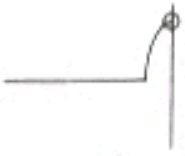
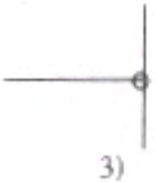
1) 
2) 
3) 
4) 
5) 

(2008)

16) The motion of an insect living on sand generates transverse waves traveling at 50 ms^{-1} and longitudinal waves traveling at 150 ms^{-1} along the sand surface. A scorpion can estimate the location of the insect from the difference Δt in the arrival times of these waves. If $\Delta t = 4.0 \times 10^{-3}$ s the distance from the scorpion to the insect is,
1) 0.05 m 2) 0.10 m 3) 0.20 m 4) 0.30 m 5) 0.40 m (2009)

17) The figure shows a wave pulse travelling along a string towards its end which is connected to a small light ring that can move along a vertical wire. Which of the following figures best represents the shape of the wave pulse at the instant when the peak of the pulse reaches the ring ?



1) 
2) 
3) 
4) 
5) 

(2010)

18) Which of the following waves requires a physical medium for travelling?
1) Light waves 2) Radio waves 3) Sound waves 4) X-rays 5) Gamma rays (2013)

19) Which of the following propagates in the form of longitudinal waves?
1) Laswer light 2) X – rays 3) Ultrasonicwaves
4) Microwaves 5) Radio waves (2014)

03. Transverse Waves

01) A string vibrates with a fundamental frequency. The fundamental frequency could be doubled by,

1) halving the tension
2) doubling the tension
3) doubling the length
4) halving the length
5) doubling the diameter of the wire

(1992)

02) Two vibrating strings under the same tension would produce beats if,

(A) the wavelengths of their sounds differ only slightly
(B) their lengths differ slightly but linear densities are the same
(C) their linear densities differ slightly but lengths are same

Of the above statements,

1) Only (A) and (B) are true
2) Only (B) and (C) are true
3) Only (A) and (C) are true
4) all (A) , (B) and (C) are true.
5) all (A) , (B) and (C) are false

(1993)

03) Consider the following statements made about transverse waves in a string.

(A) They are associated with compressions and rarefactions
(B) They are associated with troughs and crests.
(C) The shortest distance between two particles in the identical state of motion is one wave – length.

Of the above statements,

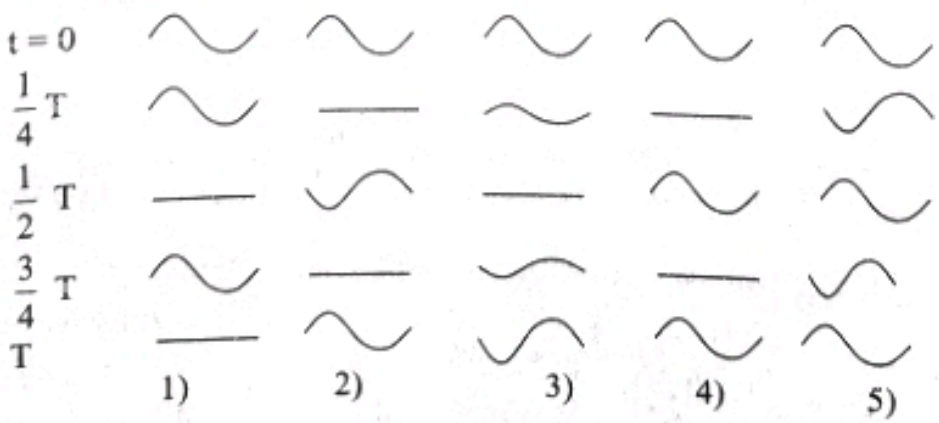
1) Only (A) is true
2) Only (B) is true
3) Only (C) is true
4) Only (A) and (B) are true.
5) Only (B) and (C) are true

(1993)

04) A certain length of a sonometer wire when vibrated with another sonometer wire produced 2 beats per second in two separate instances for lengths of 122 cm and 120 cm of this second sonometer wire. The tension of the second wire was the same for both occasions and they were made to vibrate at the same overtone. The frequency of vibration of the first wire is,

1) 238 Hz 2) 240 Hz 3) 242 Hz 4) 244 Hz 5) 246 Hz (1994)

05) Which of the following diagrams best represents the wave pattern at successions of time t of a stretched string fixed at both ends and vibrating at its first overtone? The period of the vibration is equal to T.



(1995)

06) A violin string of length 0.04 m is tuned to a fundamental frequency of 480Hz. By how much the string must be shortend to raise the fundamental frequency to 600 Hz?

1) 10 cm 2) 8 cm 3) 6 cm 4) 4 cm 5) 2 cm (1995)

07) Two steel violin strings A and B of the same length and subjected to the same tension have fundamental frequencies of f_1 and f_2 respectively. The ratio diameter of A is, diameter of B

1) $\frac{f_1}{f_2}$ 2) $\sqrt{\frac{f_1}{f_2}}$ 3) $\frac{f_1^2}{f_2^2}$ 4) $\frac{f_2}{f_1}$ 5) $\frac{f_2^2}{f_1^2}$ (1996)

08) The velocity of transverse waves in a stretched string depends upon,

1) frequency of vibration
2) wavelength of the wave
3) amplitude of the wave
4) tension in the string
5) length of the string

(1997)

09) The frequency of the fundamental note of a transverse vibration of a stretched wire 1 m long, is 320 Hz. The fundamental frequency of a second wire of the same material of length 1 m under the same tension but having a diameter 4 times larger is,

1) 80 Hz 2) 160 Hz 3) 320 Hz 4) 640 Hz 5) 1280 Hz (1998)

10) A string is stretched between two fixed supports 0.5 m apart and the tension is adjusted until the fundamental frequency of the string is 440Hz. The speed 0f transverse waves along the string is,

1) 110 ms^{-1} 2) 220 ms^{-1} 3) 330 ms^{-1} 4) 440 ms^{-1} 5) 880 ms^{-1} (1999)

11) One end of a stretched string is attached to a wall. When the other end of the string vibrates with frequency f_1 a standing wave is set up along the string. The tension in the string is now tripled while maintaining the same number of loops in the string. If the new frequency of vibration of the string is f_2 the ratio $\frac{f_2}{f_1}$ is,

1) $\frac{1}{\sqrt{3}}$ 2) $\frac{1}{3}$ 3) $\sqrt{3}$ 4) 3 5) 9 (2000)

12) The frequency of a tuning fork is 256Hz. When it sounded with a sonometer wire, 3 beats per second were head. When the tension of the wire was reduced, again 3 beats per second were heard. The frequency of the sonometer wire after reducing the tension is,

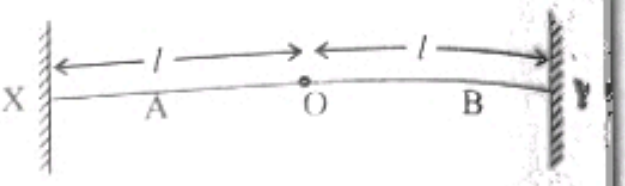
1) 250 Hz 2) 253 Hz 3) 256 Hz 4) 259 Hz 5) 262 Hz (2001)

13) The frequencies of the fundamental and the first overtone of a stretched string fixed at both ends are f_1 and f_2 respectively. The ratio of $\frac{f_1}{f_2}$ is,

1) 0.5 2) 1 3) 2 4) 4 5) 6 (2002)

14) A string is stretched between two fixed supports. It is observed to have two consecutive resonant frequencies at 300 Hz and 400Hz. The lowest resonant frequency of the string is,
1) 50 Hz 2) 100 Hz 3) 150 Hz 4) 200 Hz 5) 300 Hz (2003)

15) Two strings (A and B) having equal lengths (l) and equal cross sectional areas but different densities (d_A and d_B) are connected together, and the composite string is stretched across fixed walls as shown in the figure. Two pulses simultaneously sent along A and B from the two ends X and Y at t = 0 are found to pas through the centre O of the string at times t_A and t_B. If $d_A = 4d_B$, then



1) $t_B = \frac{1}{4} t_A$ 2) $t_B = \frac{1}{2} t_A$ 3) $t_B = t_A$ 4) $t_B = 2t_A$ 5) $t_B = 4t_A$ (2003)

16) One end of a string of mass per unit length m is connected to a prong of a tuning fork and the other end is connected to a mass M after passing over a frictionless pulley as shown in the figure. When the tuning fork is vibrated, the string vibrates forming a standing wave as shown. The frequency of the tuning fork is,

1) $\frac{2}{L}\sqrt{\frac{Mg}{m}}$ 2) $\frac{2}{L}\sqrt{\frac{M}{m}}$ 3) $\frac{4}{L}\sqrt{\frac{Mg}{m}}$ 4) $\frac{1}{L}\sqrt{\frac{Mg}{m}}$ 5) $\frac{2}{L}\sqrt{\frac{m}{Mg}}$ (2004)

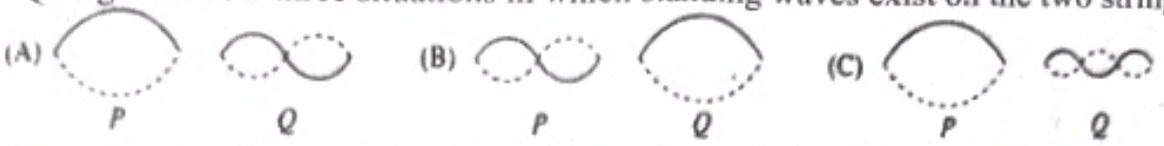
17) A violin string of length of 0.5 m is tuned to a fundamental frequency of 440 Hz. To obtain a fundamental frequency of 550 Hz, from this string at what distance the finger be placed from the sound box end ?
1) 0.1 m 2) 0.2m 3) 0.3 m 4) 0.4 m 5) 0.5 m (2005)

18) When the tension in a guitar string is doubled without changing its length the frequency of a given tone will,
1) increase by a factor of 2. 2) decrease by a factor of 2.
3) increase by a factor of $\sqrt{2}$ 4) decrease by a factor of $\sqrt{2}$.
5) be the same. (2008)

19) Both modes and antinodes of a standing wave of period T have zero vertical displacements at time t_0. This will happen next at – time
1) $t_0 + \frac{T}{4}$ 2) $t_0 + \frac{T}{2}$ 3) $t_0 + \frac{3T}{4}$ 4) $t_0 + T$ 5) $t_0 + \frac{3T}{2}$ (2008)

20) When a guitar string sounds together with a tuning fork of frequency 191 Hz, at the room temperature, five beats per second are heard. When the tuning fork is heated up to a certain temperature, the beat frequency heard increased to eight per second. Frequency of the note produced by the guitar string at the room temperature is,
1) 181 Hz 2) 186 Hz 3) 191 Hz 4) 196 Hz 5) 201 Hz (2009)

21) Two strings P and Q are identical, and string P is under greater tension than string Q. Figures show three situations in which standing waves exist on the two strings



Which of the above situation / s could represent / s the strings vibrating at the same frequency ?

1) (A) only 2) (A) and (B) only 3) (A) and (C) only
4) (B) and (C) only. 5) All (A), (B) and (C) (2009)

22) Two guitar wires A and B identical in all respects except that the diameter of A is twice the diameter of B, and are subjected to same tension.

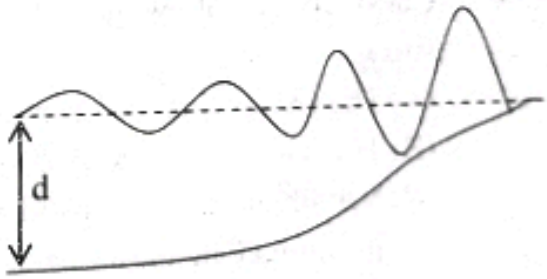
the ratio $\frac{\text{fundamental frequency produced by A}}{\text{fundamental frequency produced by B}}$

1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) $\frac{1}{\sqrt{2}}$ 4) $\sqrt{2}$ 5) 2 (2010)

23) When a standing wave is setup on a string fixed at both ends,

1) the number of nodes is equal to the number of antinodes.
2) the wavelength of the wave is always equal to the value obtained when the length of the string is divided by an integer.
3) the frequency of the wave is equal to the value of the number of nodes times the fundamental frequency.
4) the frequency of the wave is equal to the value of the number of antinodes times the fundamental frequency.
5) the shape of the string at the fundamental frequency is not symmetric about the mid point of the string. (2010)

24) The figure shows the shape of a tsunami wave of wavelength λ amplitude A reaching the beach. The speed of the wave can be approximately gives by $\upsilon = \sqrt{gd}$, where d is the depth of the sea. When the wave reaches the beach,



1) λ decreases and υ and A increases. 2) λ and υ decrease and A increases
3) λ remains the same but A and υ increase. 4) λ, A and υ increase
5) λ, A and υ decrease (2011N)

25) A stretched string is vibrating with four loops. If the frequency of vibration is increased by a factor of 2, the number of loops formed would be

1) 3 2) 5 3) 6 4) 7 5) 8 (2013)

26) When a guitar is played, it will produce
1) longitudinal progressive waves on the strings and longitudinal progressive waves in air.
2) transverse progressive waves on the strings and longitudinal progressive waves in air.
3) longitudinal standing waves on the strings and transverse progressive waves in air.
4) transverse standing waves on the strings and longitudinal progressive waves in air.
5) transverse standing waves on the strings and transverse progressive waves in air. (2016)

27) Two identical strings are separately subjected to a tension T. When plucked at the middle, each string produces waves of frequency f. Now, if the tension of only one string is reduced to 0.81 T and the strings are plucked at the middle simultaneously, five beats can be heard during one second. The value of f is
1) 25 Hz 2) 50 Hz 3) 75 Hz 4) 90 Hz 5) 100 Hz (2014)

28) A sonometer wire having mass per unit length of 1.0 g m^{-1} and tension of 40 N is simultaneously sounded with a tuning fork of frequency 320 Hz while varying its vibration length starting from a small value. In this process, if beats of frequency 5 s^{-1} can be observed on an oscilloscope, the corresponding vibration lengths (in m) of the sonometer wire are,
1) $\frac{2}{13}, \frac{10}{63}$ 2) $\frac{4}{13}, \frac{5}{8}$ 3) $\frac{4}{13}, \frac{20}{63}$ 4) $\frac{5}{8}, \frac{20}{63}$ 5) $\frac{10}{13}, \frac{4}{13}$ (2015)

29) Consider the following statements made about a standing wave on a stretched string.
(A) The energy does not propagate along the string.
(B) The position of a node does not vary with time.
(C) Maximum displacement achieved by each particle in the string depends on its position along the string.
Of the above statements,
1) Only A is true. 2) Only B is true. 3) Only A and C are true.
4) Only B and C are true. 5) All A, B and C are true. (2016)

04. Velocity of Sound

01) The velocity of sound is greatest in,
1) air 2) water 3) steel 4) aluminium 5) kerosene (1992)

02) If the velocity of sound in air at 0^0C is v_0 the temperature at which the velocity becomes $2v_0$ is,
1) – 205°C 2) 2°C 3) 673°C 4) 819°C 5) 1092°C (1993)

03) The quality of sound depends on its,
1) frequency 2) amplitude 3) wavelength
4) loudness 5) presence of overtones (1997)

04) The velocity of sound in a gas at 27^0C is V. The temperature at which the velocity of sound in the gas becomes 2V is,
1) 54°C 2) 108°C 3) 600°C 4) 927°C 5) 1200°C (2001)

05) Which of the following could influence the speed of sound in air,
(A) Frequency of the sound wave (B) Temperature of air (C) Humidity of air
1) (A) only 2) (B) only 3) (C) only
4) (B) and (C) only 5) All (A), (B) and (C) (2002)

06) Consider the following statements made regarding the speed of sound in air,
(A) Speed increases with the increase of pressure when the temperature is kept constant
(B) speed increases with the increase of temperature and humidity
(C) Speed decreases with the increase of density when the temperature is kept constant.
Of the above statements,
(1) Only (A) is true (2) Only (B) is true (3) Only (C) is true
(4) Only (A) and (B) are true (5) all (A), (B) and (C) are true (2003)

07) A gas is confined to a closed container. Consider the following statements made regarding the speed of sound in the gas.
(A) The speed of sound does not change when the volume of the container is changed at a constant temperature.
(B) The speed of sound changes with temperature
(C) The speed of sound changes when more gas is added to the container at a constant temperature.
Of the above statements
1) Only (A) is true 2) Only (B) is true 3) Only (C) is true
4) Only (A) and (B) are true 5) all (A), (B) and (C) are true (2004)

08) A source of sound is located at a point *O* above the earth surface. In the daytime, the air temperature decreases gradually when moving upwards from the earth surface. Which of the following figures best represents the way in which the eave fronts of the sound emitted from the source are propagated ?

(1) (2) (3) (4) (5) (2010)

09) Consider the following statements made a regarding the speed of sound.
A) The speed of sound in air increases with the increase of temperature of air.
(B) At a given temperature the speed of sound in a metal is higher than that in air.
(C) The *speed* of sound depends on the frequency of *the* sound wave.
Of the above statements
(1) only (A) is true. (2) only (C) is true. (3) only (A) and (B) are true.
(4) only (A) and (C) are true (5) all (A) (B) and (C) are true (20

10) Two ideal diatomic gases A and B of volumes V_A and V_B respectively of different densities at the same temperature and pressure are mixed together. The mixture is maintained at the above temperature and it can be considered as an ideal diatomic gas. If u_A and u_B are speeds of sound in gas A and gas B respectively at the above temperature and pressure, then the speed of sound in the mixture will be given by,

1) $u_A u_B \sqrt{\dfrac{V_A + V_B}{V_A u_A^2 + V_B u_B^2}}$ 2) $u_A u_B \sqrt{\dfrac{V_A + V_B}{V_A u_B^2 + V_B u_A}}$ 3) $\sqrt{\dfrac{V_A u_A^2 + V_B u_B^2}{V_A + V_B}}$

4) $\sqrt{\dfrac{V_A u_B^2 + V_B u_A^2}{V_A + V_B}}$ 5) $\sqrt{u_A u_B}$ (20

05. Longitudinal Waves

01) The speed of sound in air is 332 ms^{-1}. The frequency of the fundamental note of an open pipe 50cm long will be,
1) 160 Hz 2) 272 Hz 3) 323 Hz 4) 332 Hz 5) 385 Hz (199

02) Which of the following will produce overtones with even – integral multiples of its fundamental frequency?
(A) An open organ pipe
(B) an organ pipe closed at one end
(C) A rod clamped at the centre and producing transverse vibrations
1) (A) and (B) only 2) (B) and (C) only 3) (A) and (C) only
4) All (A), (B) and (C) 5) None of the above (199

03) Two pipes one closed at one end and the other open at both ends have length L_1 and L_2 respectively. If the two pipes when sounded together have the same frequency at their first overtones, $\dfrac{L_1}{L_2}$ the is equal to

1) $\dfrac{1}{4}$ 2) $\dfrac{1}{3}$ 3) $\dfrac{1}{2}$ 4) $\dfrac{3}{4}$ 5) $\dfrac{5}{6}$ (199

04) Consider the following statements made about vibrating air column inside a tube closed atone end.
(A) The frequency of the first overtone is twice that of the fundamental
(B) The maximum air pressure occurs at the closed end of the tube
(C) The wavelength of the air column changes with humidity
Of the above statements
1) Only A is true 2) Only B is true 3) Only C is true
4) Only B and C are true 5) all A, B and C are true (199

05) Consider the following statements made about stationary waves produced in a pipe open at both ends

(A) allowed oscillation modes form pressure nodes at each of the ends

(B) Allowed frequencies consist of all harmonics of the fundamental

(C) The length of the pipe corresponding to allowed oscillation modes is always an integral multiple of wave length

Of the above statements

1) Only A is true 2) Only A and C are true 3) Only A and Bare true

4) Only B and C are true 5) all A, B and C are true (1996)

06) An organ pipe of length 50 cm is closed at one end. If the speed of sound in air is 300ms-1. the two lowest resonant frequencies produced when the pipe is sounded are,

1) 150 Hz and 300Hz 2) 150 Hz and 450 Hz 3) 300 Hz and 450 Hz

4) 300 Hz and 900 Hz 5) 450 Hz and 1050 Hz (1997)

07) The fundamental frequency (f_0) produced by a certain closed and an open are same. The open pipe is inserted fully into the closed pipe until it hits the bottom of the closed pipe. If the end corrections are neglected the corresponding fundamental frequency of the new setup will be,

1) $\frac{f_0}{3}$ 2) $\frac{f_0}{2}$ 3) f_0 4) $2f_0$ 5) $3f_0$ (1998)

08) When two organ pipes of lengths 50 cm and 50.5 cm are sounded together 3 beats per second are heard. If the end corrections ate neglected, the frequencies of the pipes are respectively.

1) 303 Hz and 300Hz 2) 300 Hz and 303Hz 3) 150 Hz and 153Hz

4) 153 Hz and 150Hz 5) 203 Hz and 200Hz (1999)

09) An organ pipe closed at one end resonates with one of the strings of a guitar. The length of the string is 0.8 times that of the pipe of both the pipe and the string vibrate at their at their fundamental frequencies and the end correction of the pipe is neglected, the ratio $\frac{\text{speed of wave on the string}}{\text{speed of sound in air}}$ is equal to

1) 0.1 2) 0.2 3) 0.4 4) 0.8 4) 1.6 (2000)

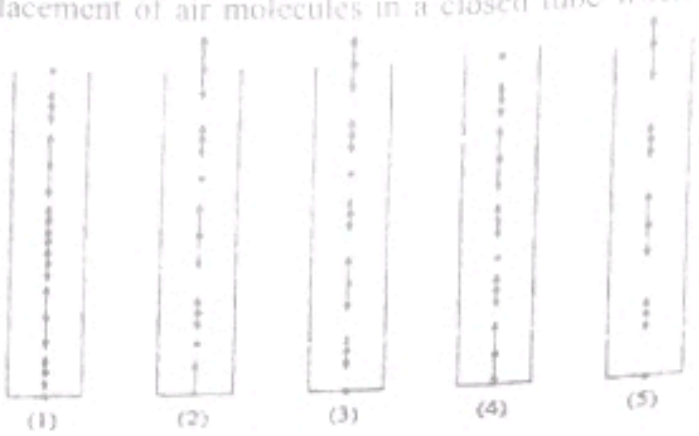
10) A 50 cm long hollow cylindrical tube open at both ends is placed in air. A sound source that produces pure tones is placed adjacent to one end of the tube. The frequency of the emitted sound is increased gradually starting from a very low value. At a frequency of 320 Hz, the tube resonates. The speed of sound in air is,

1) $160ms^{-1}$ 2) $320ms^{-1}$ 3) $340ms^{-1}$ 4) $360ms^{-1}$ 5) $640ms^{-1}$ (2001)

11) An organ pipe filled with O_2 has a fundamental frequency f_0. If the pipe is filled with H_2 at the same temperature and pressure, the new fundamental frequency of the pipe is (relative molecular masses of H_2 and O_2 are 2 and 32 respectively)

1) $\frac{1}{4} f_0$ 2) $\frac{1}{2} f_0$ 3) f_0 4) $2f_0$ 5) $4f_0$ (2007)

12) If the length and arrow head of arrow in the figures represent the magnitudes and directions of motion of air molecules, which of the following figures correctly shows the displacement of air molecules in a closed tube when a resonates as its first overtone ?



(2011N)

13) The figure shows a speaker mounted at B, at a certain distance from a smooth wall A and emitting a sound of single frequency. When a sound detector which is sensitive to pressure variation is taken from A to B, a minimum of sound level is detected at 2m from the wall. Speed of sound in air is 320 ms^{-1}. The frequency of the sound emitted by the speaker could be,

1) 40 Hz 2) 60 Hz 3) 80 Hz 4) 100 Hz 5) 160 Hz (2011N)

14) The human vocal tract (larynx) can be considered as a tube that is open at one end. If the length of this tube is 17cm, the frequencies of the lowest two harmonics produced as given by,
(The speed of sound n air = 340 ms^{-1})
1) 500 Hz, 1500 Hz 2) 500 Hz, 1000 Hz 3) 1000 Hz, 2000 Hz
4) 1000 Hz, 3000 Hz 5) 1500 Hz, 2500 Hz (2012)

15) A wire of radius 1.0 mm made of a material of Young's modulus $4\times10^{11}Nm^{-2}$ is subjected to a tension of 30 N. The magnitude of the ratio $\frac{v_L}{v_T}$ of the longitudinal wave velocity (v_L) to transverse wave velocity (v_T) along the wire is (Take π to be 3)
1) 100 2) 150 3) 200 4) 250 5) 300 (2015)

06. Doppler Effect

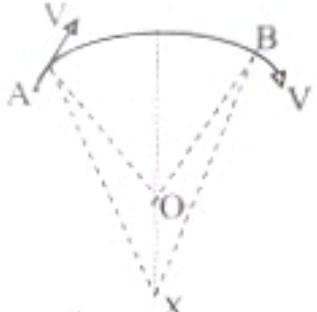
01) A sound source moves towards a stationary observer with a speed ¼ of the speed of sound in air. The ratio $\frac{\text{apparent frequency heard by the obsever}}{\text{Frequency emitted by the source}}$ is

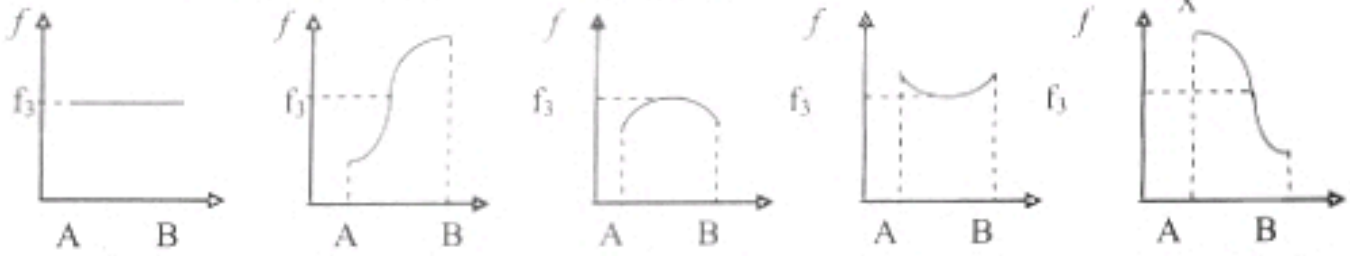
1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) $\frac{3}{4}$ 4) $\frac{4}{3}$ 5) 4 (1997)

02) A sound S moves towards and away from a stationary observer O as shown in the figure. If the ratio of the velocity of sound in air (v_0) and the velocity of the source (v_s) $\left(i.e.\ \frac{v_0}{v_s}\right)$ is 11, the ratio of the maximum and minimum apparent frequencies heard by the observer will be.

1) 1 2) $\frac{11}{10}$ 3) $\frac{12}{11}$ 4) $\frac{6}{5}$ 5) 11 (1998)

03) A sound source emitting signals at a constant frequency f_2 moves along an arc of a circle with constant speed V as shown in the figure. A stationary observer is located at a point X, O is the centre of the circle. As the source moves from A to B the variation of the frequency (f) heard by the observer is best represented by.





1) 2) 3) 4) 5) (2000)

04) A train travels along a straight track. Another train the same direction behind the first train at the same speed. The train blows a whistle of frequency f_0 . If the apparent frequency of the whistle heard by a stationary passenger sitting in the second train is f, then,

1) $f > f_0$ 2) $f < f_0$ 3) $f = f_0$ 4) $f = 2f_0$ 5) $f = \frac{1}{2} f_0$ (2001)

05) An observer is moving at a speed of 40ms^{-1} towards a stationary siren sounding at a frequency of 600Hz. If the speed of sound in air is 320 ms^{-1} what is the frequency of the sound heard by

1) 686 Hz 2) 675 Hz 3) 600 Hz 4) 533 Hz 5) 525 Hz (2002)

06) A train moving along a straight track at a velocity of 30 ms^{-1} emits a sound of frequency 600Hz If the speed of sound in air is 330ms^{-1} the wavelength of the sound propagated forward along the track will be,

1) 30 cm 2) 40 cm 3) 45 cm 4) 50 cm 5) 55 cm(2003)

07) A driver sitting in a parked car, seeing another car moving directly towards his car, sounds his horn. The frequency of the horn of the parked car is 340Hz and the speed of sound in air is 340 ms^{-1} . If the driver of the moving car detects the frequency of this sound as 348 Hz , the speed of his car is,

1) 2.0 ms^{-1} 2) 3.0 ms^{-1} 3) 4.0 ms^{-1} 4) 6.0 ms^{-1} 5) 8.0 ms^{-1} (2004)

08) A car travels at a speed of 20 ms^{-1} towards a stationary sound source that produces sound at a frequency of 1 kHz. Waves that are reflected from the car and return to the source are used to produce beats with the original waves. The approximately value of the beat frequency is (use the speed of sound in air as 320 ms^{-1})

1) 59 Hz 2) 62Hz 3) 111 Hz 4) 118 Hz 5) 133 Hz (2005)

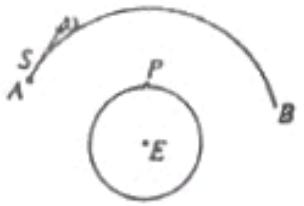
09) Wave from emitted from three sources of sources. These figures respectively represent sound.

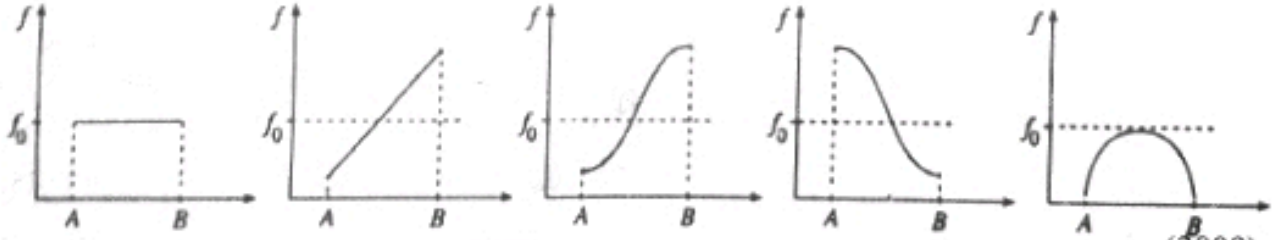
1) moving to the right, moving to the left and stationary.
2) moving to the left, moving to the right and stationary.
3) stationary, stationary and moving to the right.
4) moving to the left, moving to the right, and moving to the left with the speed of sound.
5) moving to the left, moving to the right, and moving to the right with the speed of sound. (2007)

10) A source of sound (S), moving with velocity V_S, emits a sound wave of freequency f_0. An observer (O) moving with velocity V_0, as shown in the figure, determines the frequency of the sound as f. Which of the following statement is true ?

1) If $V_S = 60\ ms^{-1}$ and $V_0 = 20\ ms^{-1}$ then $f' > f_0$
2) If $V_S = 20\ ms^{-1}$ and $V_0 = 60\ ms^{-1}$ then $f' < f_0$
3) If $V_S = -20\ ms^{-1}$ and $V_0 = -60\ ms^{-1}$ then $f' > f_0$
4) If $V_S = -60\ ms^{-1}$ and $V_0 = -20\ ms^{-1}$ then $f' > f_0$
5) If $V_S = 60\ ms^{-1}$ and $V_0 = -20\ ms^{-1}$ then $f' > f_0$ (2008)

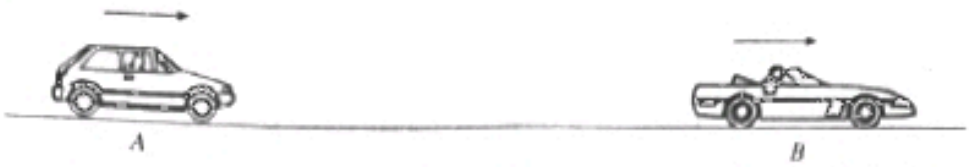
11) A satellite S in moving with constant speed υ relative to the earth (E) along a fixed circular orbit as shown in figure. The satellite is sending radio signals of frequency f_0. A station located at P on the earth detects these radio signals. The variation of the frequency f of the detected signal as the satellite moves from A to B is best represented by,



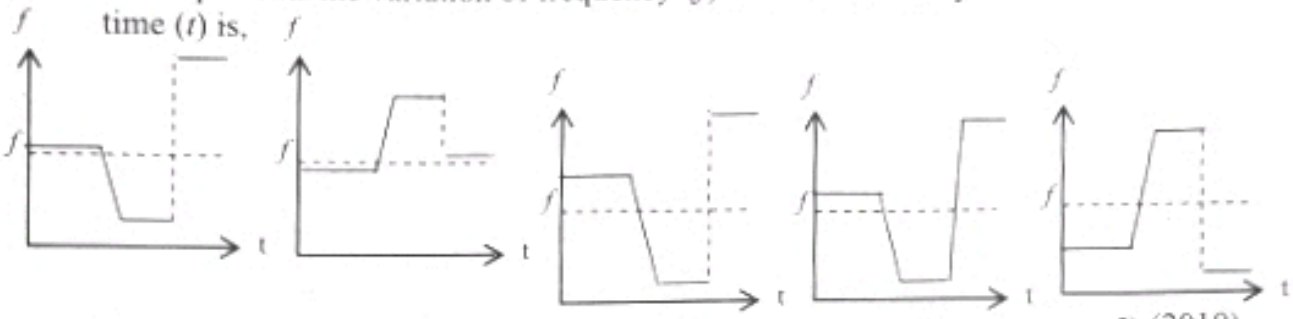


(2009)

12)



Two cars are moving along a road at constant speed as shown in the figure. The driver of A is sounding the horn of the his car of frequency f_0 continuously. Initially the car B is moving faster than A. Suddenly B slows down and stops. A continues to move at the same speed and passes B which is stopped. The graph that best represents the variation of frequency (f) of sound heard by the driver of B with time (t) is,



1) 2) 3) 4) 5) (2010)

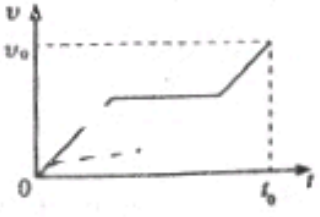
13) A source of sound is moving to the right with a speed of sound. Which of the following figures correctly shows the propagation of wave front ?

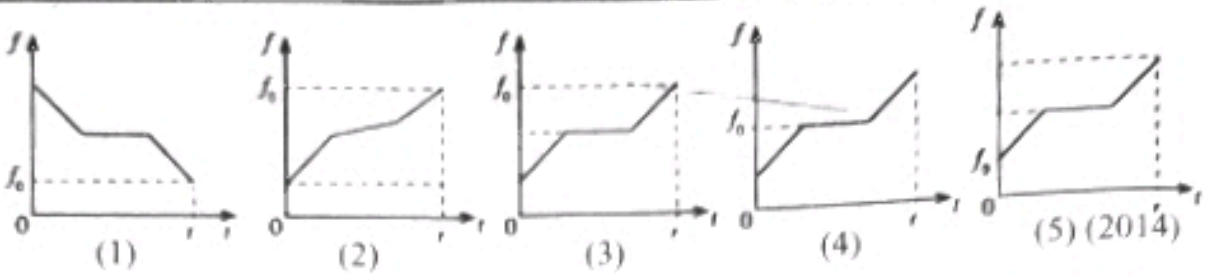
1) 2) 3) 4) 5) (2011NS)

14) A child swinging a swing, hears a sound from a stationary whistle located in the direction where he is facing as shown in figure. The minimum and maximum frequencies of the sound heard by him are 1314 Hz and 1326 Hz respectively. If the speed of sound in air is 330 ms^{-1} and air remains still, what is the wavelength of the sound emitted from the whistle?

1) 12.5 cm 2) 24.8 cm 3) 25.0 cm 4) 25.2 cm 5) 50.0 cm (2013)

15) An ambulance which emits a sound of frequency f_0 from its siren is traveling with constant velocity v_0 along a straight road. A car starting from rest is moving behind the ambulance in the same direction, and the velocity – time graph of the car is shown in figure. The car approaches the velocity v_0 of the ambulance at time t_0. The variation of the frequency (f) of the siren sound heard by a passenger in the car with time (t) is best represented by,





(1) (2) (3) (4) (5) (2014)

16) During a Tsunami warning, a stationary siren emits sound waves of frequency 1 600 Hz while a wind is blowing at a uniform speed of 60 ms^{-1} from the shore towards the land. A person hearing the sound of the siren is driving his car away from the shore towards the land at 30 ms^{-1}. If the wind blows in the direction of motion of the car and if the speed of sound in **still air** is 340 ms^{-1}, the frequency of the sound of the siren heard by the driver is,

1) 1 400 Hz 2) 1 480 Hz 3) 1 600 Hz 4) 1 740 Hz 5) 1 880 Hz (2015)

17) A whistle emitting a sound of frequency f moves along the circumference of a circle of radius r at a constant angular velocity ω. υ is the velocity of sound in air. The highest frequency of sound heard by a listener, who is at rest outside the circle is,

1) $f\left(\frac{\upsilon}{\upsilon - r\omega}\right)$ 2) $f\left(\frac{\upsilon - r\omega}{\upsilon}\right)$ 3) $f\left(1 - \frac{\upsilon}{r\omega}\right)$ 4) $f\left(\frac{\upsilon}{r\omega}\right)$ 5) $f\left(\frac{\upsilon}{\upsilon + r\omega}\right)$ (2016)

07. Intensity of sound

01) The intensity of sound from a source is increased by 10^6 times its original intensity. The corresponding increase in sound intensity level in dB is,

1) 5 2) 6 3) 50 4) 60 5) 600 (1997)

02) A sound source of intensity I is replaced by a sound source of intensity 100I. The change in intensity level at a given point is,

1) 1 dB 2) 10 dB 3) 20 dB 4) 50 dB 5) 100 dB (1999)

03) Ten identical machines produce a certain sound intensity level at a given point. In order to decrease the sound intensity level by 10dB, the number of machines that has to be turned off is

1) 1 2) 2 3) 5 4) 8 5) 9 (2000)

04) A sound with intensity 10^{-12} Wm^{-2} is defined to have an intensity level of 0 decibels. The intensity level of a sound of intensity 10^{-8} W m^{-2} is,

1) -40 dB 2) 20 dB 3) 40 dB 4) 60 dB 5) 80 dB (2001)

05) A person hears a sound intensity level of 10dB. When a speaker produces a sound output of 5W. When the sound output of the speaker is increased to 50W, the sound intensity level that the person hears, is

1) 15 dB 2) 20dB 3) 40 dB 4) 80 dB 5) 100 dB (2002)

06) A sound wave of intensity 2.0. Wm^{-2} passes normal to a surface area of $10cm^2$. The amount of energy passes through the area in 1 hour is,

1) 7.2 μJ 2) 72 μJ 3) 0.072 μJ 4) 7.2J 5) 72kJ (2002)

07) The unit of intensity level of a sound wave is.
1) Hz 2) W 3) Jm^{-2} 4) $W m^{-2}$ 5) dB (2003)

08) Ten persons are standing on a circle. When out of them shouts, the intensity level at the centre of the circle is 50 dB. If all ten person shout at the same time each producing the above sound level, the intensity level at the certain becomes.
1) 40 dB 2) 50 dB 3) 60 dB 4) 80 dB 5) 90 dB (2005)

09) A point source of sound emits sound equally in all directions. For intensity at a point is inversely propotional to the square of its distance from the source. If the intensity level at a distancr of 5m from the source is 70dB then the intensity level at a distance of 50 m from the source is,
1) 30 dB 2) 40 dB 3) 50 dB 4) 60 dB 5) 80 dB (2006)

10) A sound emitted by a source of intensity I reaches a certain point. The change in the sound intensity level at the same point when the sound intensity is increased to $2I$ is (log 2 = 0.3)
1) 0.3 dB 2) 3 dB 3) 6 dB 4) 9 dB 5) 15 dB (2007)

11) The audio systems A and B produce sounds with intensity levels of 90 dB and 95 dB repectively.If the corresponding sound intensities are I_A and I_B repectively, the raion of $\frac{I_B}{I_A}$ is equal to,
1) 500 2) 100 3) $\sqrt{50}$ 4) $\sqrt{10}$ 5) $\sqrt{5}$ (2008)

12) Many rock musicians wear special ear – plugs to protect their hearing during performances. If an ear – plug decreases the sound intensity level by 20dB, it reduces the intensity of sound waves by a factor of,
1) 10^4 2) 10^3 3) 10^2 4) 10 5) $\sqrt{10}$ (2009)

13) If the ratio of sound intensities and the corresponding difference in sound intensity levels (in dB) of two sound sources are numerically equal, then the ratio of sound intensities is,
1) 10 2) 20 3) 100 4) 200 5) 1000 (2010)

14) Sound that has an intensity level of 100 dB is how many times more intense than sound of intensity level 20 dB.
1) 5 2) 8 3) 10^3 4) 10^5 5) 10^8 (2013)

15) Intensity of the noise generated by a machine is 10^{-2} Wm^{-2}. By employing a noice barrier, the intensity of noise is reduced to 10^{-6} Wm^{-2} . What is the reduction in the noise intensity level?
1) 160 dB 2) 100 dB 3) 60 dB 4) 40 dB 5) 25 dB (2014)

16) By what factor does the sound intensity increase if the sound intensity level increases by 1 dB?
(1) 1 (2) $10^{0.1}$ (3) 10^1 (4) 10^{10} (5) 10^{12} (2015)

17) A moving jet plane can create a maximum sound intensity of 150 dB. Take the sound intensity at the threshold of hearing as 10^{-12} W m^{-2}. The maximum intensity of the sound that can be created by the jet plane in W m^{-2} is,
1) 100 2) 200 3) 400 4) 800 5) 1 000(2016)

08. Electromagnetic Waves

01) What is the order in decreasing frequency of the following electromagnetic waves?
(A) visible light (B) VHF television waves (C) UHF television waves
(D) FM radio waves
1) A,C,B, D 2) A, B, C, D 3) D, C, B, A
4) D, B, C, A 5) C, B, A, D (1994)

02) Consider the following statements regarding electromagnetic waves
(A) They all have the same speed in any medium
(B) They are transverse waves
(C) A material medium is not essential for their propagation

Of the above statements
1) Only B is true 2) Only B and C are true 3) Only A and C are true
4) Only A and B are true 5) all A, B and C are true (1994)

03) Consider the following statements made about infrared, ultraviolet, X-rays, radio waves and gamma rays.
(A) All of them are electromagnetic waves
(B) All of them travel with the same speed in free space
(C) Radio waves have the longest wavelength
Of the above statements
1) Only (A) is true 2) Only (A) and (B) are true 3) Only (A) and (C) are true
4) Only (B) and (C) are true 5) all (A), (B) and (C) are true (2001)

04) Consider the following statements made about laser light
(A) The energy of a photon in a laser beam of certain frequency is higher than the energy of a photon of the same frequency in a normal light beam
(B) A laser beam cannot be refracted by a glass prism
(C) All the photons in a laser beam have the same energy the same phase and the same direction.

Of the above statements,
1) only (B) is true 2) only (C) is true
3) only (A) and (B) are true 4) only (B) and (C) are true
5) all (A), (B) and (C) are true (2012)

05) Which of the following is **not true** regarding electromagnetic waves?
1) Directions of electric and magnetic fields are perpendicular to each other.
2) Speed does not depend on the medium of propagation.
3) Do not necessarily require a material medium for propagation.
4) Direction of propagation of the wave is perpendicular to the directions of electric and magnetic fields.
5) Can be reflected at the boundary between two media. (2016)

06) Three monochromatic light beams *A*, *B* and *C* have the same intensities (i.e. energy flow through unit area per second.) However, the wavelength associated with beam *A* is longer that of *B*, and the frequency associated with beam *C* is smaller than that of *A*. The photon flux (number of photons crossing a unit area per second) of three beams when written in the ascending order, it will be,

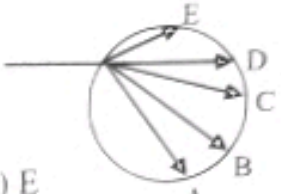
1) *C, A, B* 2) *B, A, C* 3) *A, B, C* 4) *B, C, A* 5) *C, B, A* (2016)

09. Refraction

1) If the index of refraction of water is $^4/_3$ and the velocity of light in air 3×10^8 ms^{-1}, then the velocity of light in water is equal to,

1) 2.25×10^8 ms^{-1} 2) 3×10^8 ms^{-1} 3) 4×10^8 ms^{-1}
4) 4.25×10^8 ms^{-1} 2) 1.2×10^8 ms^{-1} (1992)

2) The figure shown a ray of light passing through a block of glass having a spherical air cavity. The path of the light ray in the cavity is best represented by the ray,



1) A 2) B 3) C 4) D 5) E (1992)

3) When a light wave travelling in a rare medium enters a dense medium.

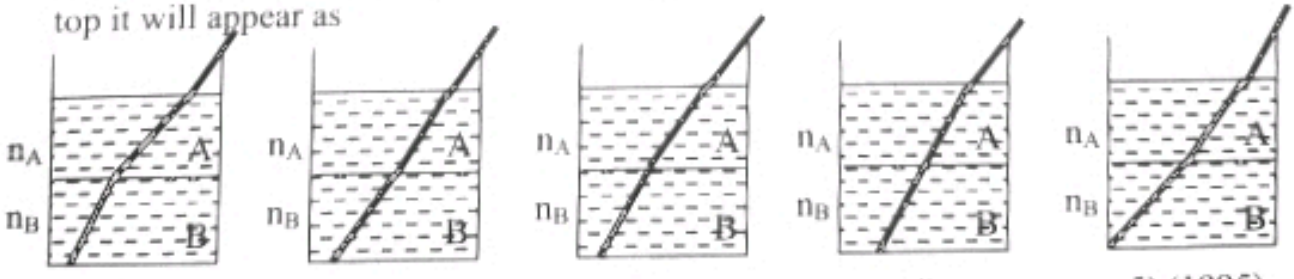
1) its velocity increases
2) Only the frequency of the wave changes
3) only the wavelength of the wave change
4) both velocity and wavelength change
5) both frequency and wavelength remain unchanged. (1993)

4) Which one of the following summarizes the changes occur when visible light passes from air into glass?

	Frequency	Speed	Wavelength
1)	No change	No change	No change
2)	Changes	Changes	No change
3)	Changes	Changes	Changes
4)	Changes	No changes	No change
5)	No Change	Changes	Changes

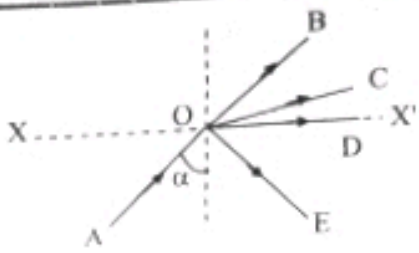
(1995)

5) A beaked contains two immiscible transparent liquids A of different refractive indices n_A and n_B ($n_A > n_B$). If a rod is sipped into the liquids and viewed from the top it will appear as



1) 2) 3) 4) 5) (1995)

6) A ray of red light AO traveling in a glass medium is incident on the glass air interface XX' at an angle of incidence α as shown in the figure, where α is the critical angle for glass-air interface for yellow light, the possible subsequent path/paths of the red ray is/are,



1) Only OE 2) only OD 3) OD and OE
4) only OB 5) OC and OE

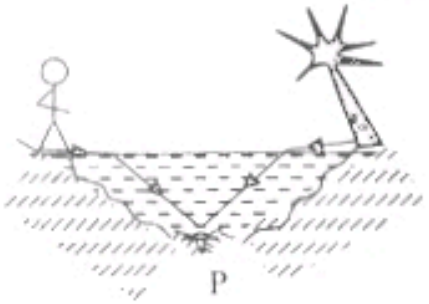
(1996)

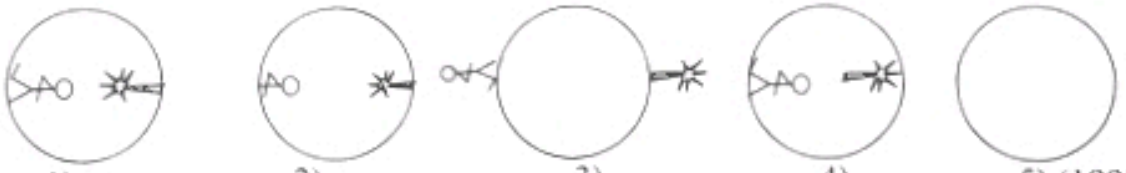
7) A ray of light traveling through a medium of refractive index n_1 has a speed v_1 and wavelength λ_1. If this ray then enters a second medium of refractive index n_2, which of the following correctly gives the speed and wavelength of the ray in the second medium.

	Speed	Wavelength
1)	$\frac{n_2 v_1}{n_1}$,	λ_1
2)	$\frac{n_1 v_1}{n_2}$,	λ_1
3)	$\frac{n_1 v_1}{n_2}$,	$\frac{n_1}{n_2}\lambda_1$
4)	$\frac{n_2 v_1}{n_1}$,	$\frac{n_2}{n_1}\lambda_1$
5)	$\frac{n_2 v_1}{n_1}$,	$\frac{n_1}{n_2}\lambda_1$

(1996)

8) A person who is at a river bed looks upwards through the water surface of the river as shown in the figure. The person's eye is located at P and the water is clear and still. Which of the following diagrams best represents the view seen by the person?





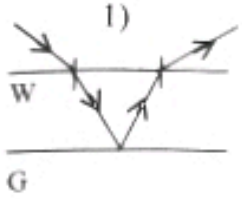
1) 2) 3) 4) 5) (1997)

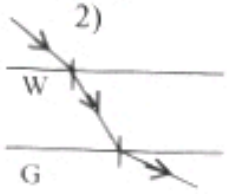
9) A light wave of wavelength 450 traveling with a speed of 3×10^8 ms^{-1} in a certain medium enters another medium of refractive index 1.5 times that of the first medium. The speed (V) and the wavelength (λ) in the second medium are given by

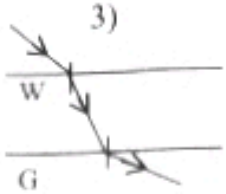
	V(ms^{-1})	λ (nm)
1)	3×10^8	300
2)	2×10^8	450
3)	2×10^8	300
4)	1.5×10^8	300
5)	1.5×10^8	450

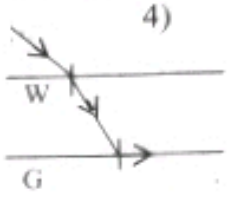
(1998)

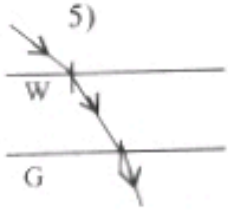
10) A ray of monochromatic light traveling in air is incident on a layer of water (W), which is present on the surface of a glass block (G). which of the following ray diagrams correctly represents the subsequent path of the ray?

1) 

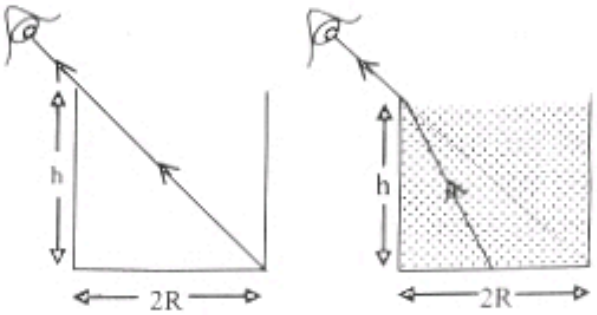
2) 

3) 

4) 

5) 

(1998)

11) 

(A) (B)

A person can just see the opposite edge of the bottom of an empty vessel over its brim as shown in figure (A) .While keeping the eye in the same position, the vessel is filled with a clear liquid up to its brim. Then he is able to see a small mark at the centre of the bottom of the vessel as shown in figure (B). The refractive index of the liquid is given by,

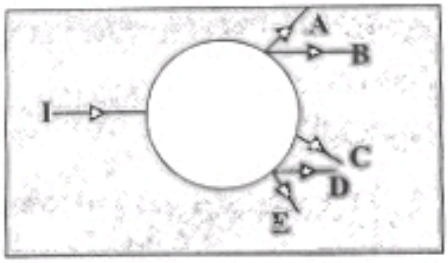
1) $\frac{\sqrt{h^2+R^2}}{\sqrt{h^2+4R^2}}$ 2) $\frac{2\sqrt{h^2+R^2}}{\sqrt{h^2+4R^2}}$ 3) $\frac{\sqrt{h^2+R^2}}{\sqrt{h^2+2R^2}}$

4) $\frac{\sqrt{h^2+2R^2}}{\sqrt{h^2+R^2}}$ 5) $\frac{h+2R}{h+R}$ (2000)

12) A glass cube of side 24 cm and refractive index 1.5 contains a small air bubble. When viewed through the block from one side the air bubble appears to be 12 cm from that side. When viewed from the opposite side, how far will the air bubble appear from that side?

1) 16 cm 2) 12 cm 3) 8 cm 14) 6 cm 5) 4 cm (2001)

13) A ray of monochromatic light (I) approaches a spherical air bubble in a block of glass as shown in the figure. Which of the paths shown best represents the emergent ray?



1) A 2) B
3) C 4) D
5) E

(2002)

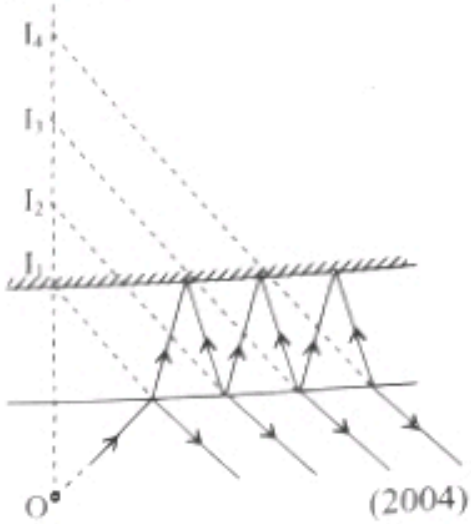
14) A traveling microscope is focused upon a mark at the bottom of an empty beaker. Now if the microscope is raised by 1cm, to what depth should water be poured into the beaker so that the mark be again in focus?

[Refractive index of water = $\frac{4}{3}$]

1) 5cm 2) 4 cm 3) 3 cm 4) 2 cm 5) 1 cm (2002)

15) When an object O is kept in front of a thick plane mirror formed by silvering one side of a thick glass plate as shown in the figure, a series of images I_1, I_2, I_3..... can be observed.. Which of the following statements is correct?

1) I_1 is the brightest and the intensities of images I_1, I_2, I_3, ... Decrease gradually
2) I_2 is the brightest and the intensities of images I_3, I_4, ... Decrease gradually
3) I_2 is the brightest and the intensities of images I_3, I_4 .... are the same
4) I_3 is the brightest and the intensities of images I_2, I_4, ... are the same
5) I_1 is the brightest and the intensities of images I_2, I_3, ... are the same



(2004)

16) Consider the following statements made regarding the refraction of light.

A) Refractive index of a medium is equal to the ratio, $\frac{\text{speed of light in a vacuum}}{\text{speed of light in the medium}}$

B) As light travels from one medium to another, its frequency does not change.

C) The wavelength of light is reduced when is passes from vacuum to a medium.

Of the above statement,

1) only (A) and (B) are true
2) only (A) is true.
3) only (B) is true
4) only (B) and (C) are true
5) all (A), (B) and (C) are true.

(2005)

17) A ray of light traveling in water (refractive index n_1) is incident on the air/ water boundary at the critical angle. When a layer of oil (refractive index n_2) is floated on the water surface, the angle of refraction of this light ray in oil is,

1) $\sin^{-1}\frac{1}{n_2}$ 2) $\sin^{-1}\frac{1}{n_1}$ 3) $\sin^{-1}\frac{n_1}{n_2}$ 4) $\sin^{-1}\frac{n_2}{n_1}$ 5) 90° (2005)

18) The refractive indices of water and glass are $\frac{4}{3}$ and $\frac{3}{2}$ respectively, The refractive index of glass relative to water

1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) $\frac{8}{9}$ 4) $\frac{9}{8}$ 5) 2 (2006)

19) Refracting indices for red light and blue light in crown glass are 1.51 and 1.53 respectively. Consider the following statements.

A) The speeds of red light and blue light in vacuum are the same.
B) The speed of red light grater than that of blue light incrown glass.
C) Critical angle of red light is gteater than that of blue light for crown glass.

Of the above statements,

1) only (A) is true
2) only (B) is true.
3) only (A) and (B) are true
4) only (B) and (C) are true.
5) all (A), (B) and (C) are true

(2006)

20) Consider the following statements made regarding a monochromatic light ray refracting through a glass prism placed is air,

A) The speed of the light ray inside the prism is lower than that outside the prism

B) The frequency of the light ray inside the prism is lower than that outside the prism.

C) The wavelength of the light ray inside the prism is lower than that outside the prism

Of the above statements,

1 only (A) is true. 2) only (C) is true.

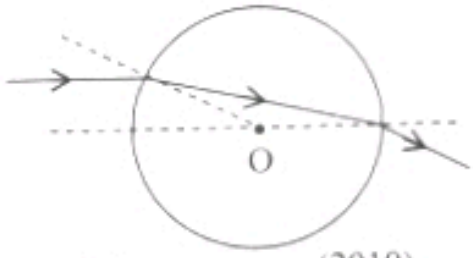
3) only (A) and (B) are true. 4) all (A) and (C) are true.

5) all (A), (B) and (C) are true. (2007)

21) A light wave of frequency 4.5×10^{14} Hz, has a wavelength of 4×10^{-7} m in a certain medium. If the velocity of light in vacuum is 3×10^{8} m s^{-1}, the refractive index of the medium for that light is,

1) $\frac{6}{5}$ 2) $\frac{4}{3}$ 3) $\frac{7}{5}$ 4) $\frac{3}{2}$ 5) $\frac{5}{3}$ (2009)

22) A monochromatic ray of light is incident close and parallel to a diameter of a transparent plastic sphere with centre. Q and refracted as shown in the figure. The refractive index of the plastic is closest to (take sin θ = θ for small angles)



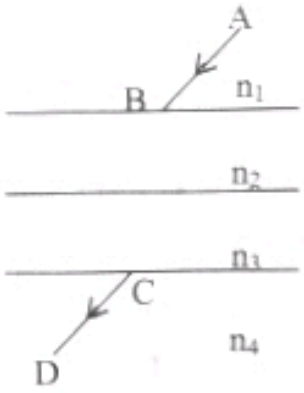
(1) 1.2 (2) 1.3 (3) 1.5 (4) 2.0 (5) 2.5 (2010)

23) A monochromatic ray of light passes through four layers of transparent plastic with refractive indices n_1, n_2, n_3 and n_4 as shown. If the emergent ray CD is parallel to the incident ray AB, then,

1) $n_1 > n_2 > n_3 > n_4$ 2) $n_1 < n_2 < n_3 < n_4$

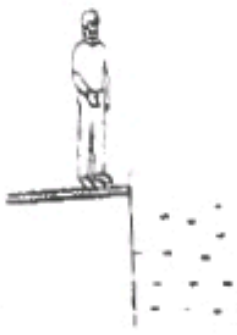
3) $n_1 > n_2 > n_3 = n_4$ 4) $n_1 = n_4$

5) $n_1 = n_2 > n_3 = n_4$ (2011 N)

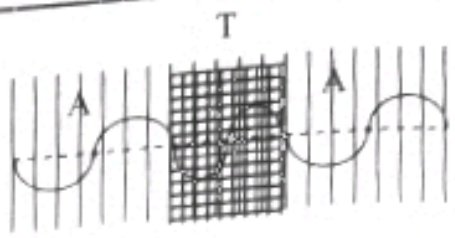


24) A shown in the figure, a person is standing on the shore of a lake. He spots a fish some distance below the water surface. If he used a laser to locate the fish, he should aim the laser,

1) above the apparent position of the fish.
2) below the apparent position of the fish.
3) directly at the apparent position of the fish.
4) directly at the actual position of the fish.
5) above the actual position of the fish (2011N)

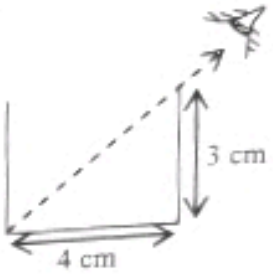


25) Figure shows the changes occurred to a wavefrom of a monochromatic ray of light travelling in air (A) when incident normally and transmitted through a transparent medium (T). The refractive index of the transparent medium is,



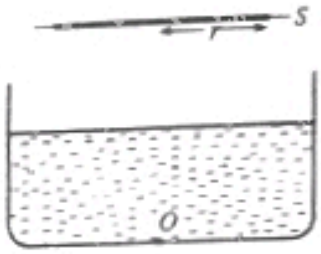
1) 1.5 2) 2.0 3) 2.5 4) 3.0 5) 3.5 (2012)

26) By looking at an empty glass vessel the path shown by the broken line in figure, a person could see the left corner of the bottom of the glass vessel. After the glass vessel is filled with a clear liquid the person could see the middle of the bottom of the glass vessel when looking along the same path. The refractive index of the liquid is (Take $\sqrt{13}$ = 3.6)



1) 1.11 2) 1.22 3) 1.33 4) 1.44 5) 1.55 (2013)

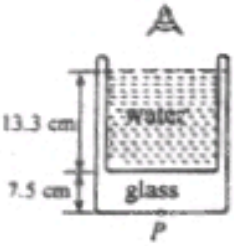
27) A point source of light O situated at the bottom of a water tank produces a circular patch of light of radius r on a horizontal screen S as shown in figure. C is the critical angle for the water-air interface. If the light source is moved vertically up by a distance d, the radius of the light patch will is moved vertically up by a distance d, the radius of the light patch will ismoved vertically up by a distance d, the radius of the light patch will



1) increase to r + d sin C
2) increase to r + d tan C
3) remain unchanged.
4) decrease to r – d sin C
5) decrease to r – d tan C

(2014)

28) A cylindrical glass vessel with a 7.5 cm thick bottom, is filled with water up to a height of 13.3 cm as shown in the figure. Refractive indices of glass and water are 1.5 and 1.33 respectively. The apparent depth of a mark located at point P of the bottom of the vessel when observed from above the water surface is,

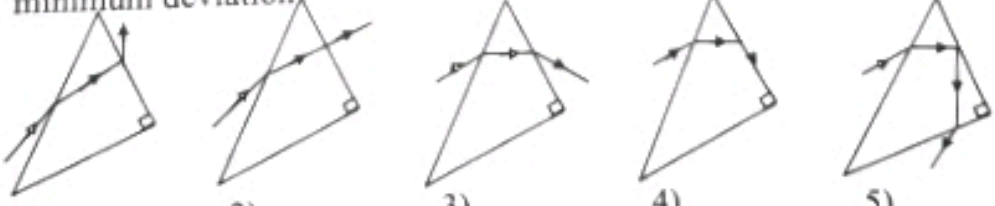


(1) 5.8 cm (2) 10.9 cm (3) 11.6 cm
(4) 11.9 cm (5) 15.0 cm

(2015)

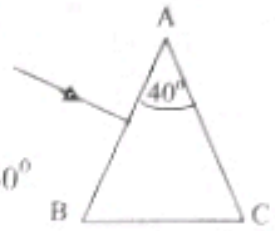
10. Refraction of Prism

01) Which of the following diagrams shows a ray of light passing through a prism with minimum deviation?



1) 2) 3) 4) 5) (1992)

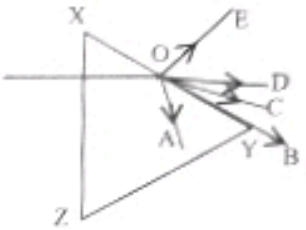
02) A ray of light is incident on the face AB of a prism normal to it. This ray emerges through the face AC grazing it. If the angle A = 40^0 the refractive index of the material of the prism is,



1) $\frac{1}{\sin 40^0}$ 2) $\frac{1}{\sin 50^0}$ 3) $\sin 40^0$

4) $\sin 50^0$ 5) $\frac{\sin 40^0}{\sin 50^0}$ (1993)

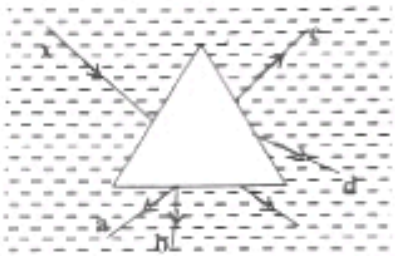
03) A narrow beam of white light falls normally on the surface XZ of a glass prism as shown in the figure. If subsequently makes an angle of incidence of 41^0 15' at face XY of the prism, this being the critical angle for yellow light for the glass air interface. The blue component of the white light travels along,



1) OA 2) OB 3) OC

4) OD 5) OE (1994)

04) A ray of monochromatic light X is incident on an air prism formed inside water, as shown in the figure. The emerging ray is most likely to be



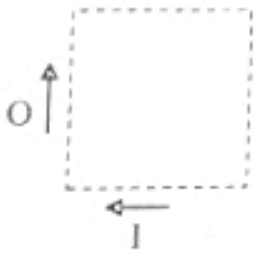
1) a 2) b 3) c

4) d 5) e (1995)

05) Of the following colours, the angle of deviation due to a glass prism is greatest for,

1) violet 2) red 3) blue 4) green 5) yellow (1996)

06) In the figures shown I represents the image of an object O. Which of the images shown in figures cab be realized by placing a right angled isosceles prism in the box.



(A)

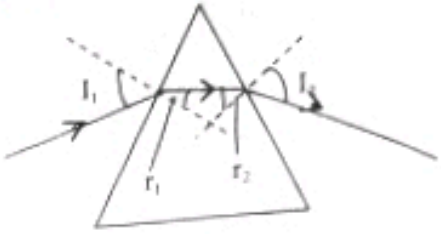
(B)

(C)

1) In B only 2) In A and C only 3) In B and C only

4) In A and B only 5) In all A, B and C (1997)

07) A monochromatic ray of light passes through a prism as shown in the figure.



Consider the following statements

(A) The angle $(i_1 - r_1)$ is known as the angle of deviation produced by the prism.

(B) The angle i_2 always increases with i_1

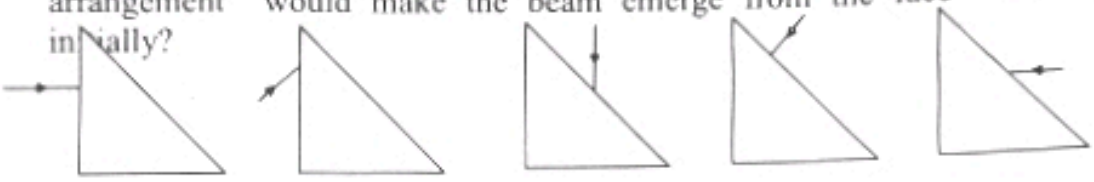
(C) At the minimum deviation $i_1 = i_2$

Of the above statements,

1) Only A is true 2) Only B is true 3) Only C is true

4) Only B and C are true 5) all A, B and C are true (1998)

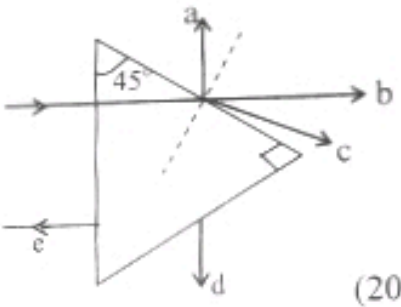
08) The following diagrams represent five different ways of directing a narrow parallel beam of monochromatic light on to a right angled isosceles glass prism. Which arrangement would make the beam emerge from the face where it entered initially?



1) 2) 3) 4) 5) (1999)

09) As shown in the figure a ray of monochromatic light is incident normally on one face of a prism made of plastic of refractive index 1.40. The refracted ray emerging to air is best shown by

$$\left(\sin 45^\circ = \frac{1}{1.42}\right)$$



1) a 2) b 3) c 4) d 5) e (2000)

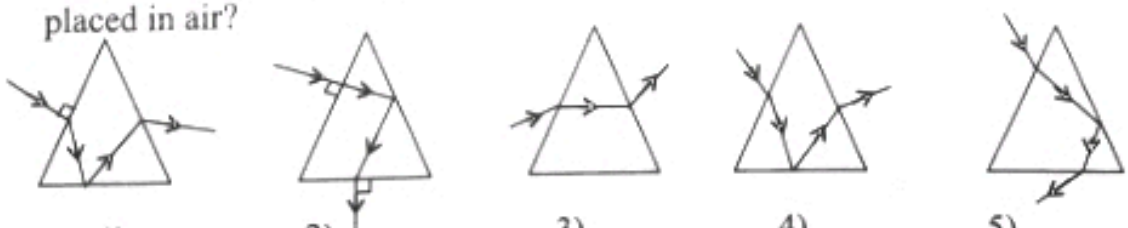
10) A monochromatic ray of light undergoes minimum deviation after passing through a prism. If the angle of deviation produced by one of the prism surface is 20^0, the angle of minimum deviation of the ray is

1) 10° 2) 20° 3) 30° 4) 40° 5) 60° (2001)

11) Which of the following statements is correct with regard to the angle of deviation (d) of a monochromatic ray of light, produced by a glass prism

1) d is independent of the angle of incidence
2) d always increases with the angle of incidence
3) d always decreases with the angle of incidence
4) d has a minimum value and it is independent of the angle of prism
5) d has a minimum value which is dependent on the angle of prism (2003)

12) Which of the following is a possible path of a ray of light through a glass prism placed in air?



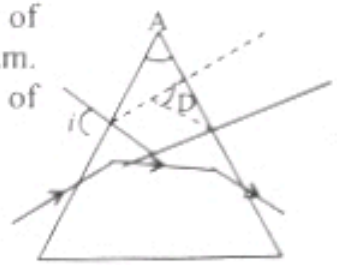
1) 2) 3) 4) 5) (2003)

13) Consider the following statements made about light passing through a prism.
(A) Frequency of light changes when passing through a prism
(B) Light of different colours travel at different speeds inside a prism
(C) Blue light deviates more than red light when passing through a prism

Of the above statements
1) Only (C) is true
2) Only (A) and (B) are true
3) Only (A) and (C) are true
4) Only (B) and (C) are true
5) all (A), (B) and (C) are true

(2004)

14) A monochromatic ray of light is incident upon a prism of refracting angle A and emerges as shown in the diagram. Consider the following statements made about the angle of deviation D.

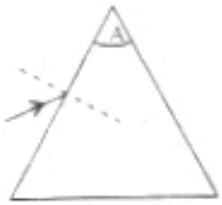


(A) As the angle i is increased from zero the value of D passes through a minimum.
(B) D is zero when the ray enters the prism normally.
(C) For a given value of i, D does not depend on A.

Of the above statements,
1) only (A) is true
2) only (A) and (B) are true
3) only (A) and (C) are true
4) all (A), (B) and (C) are true.
5) only (C) is true

(2005)

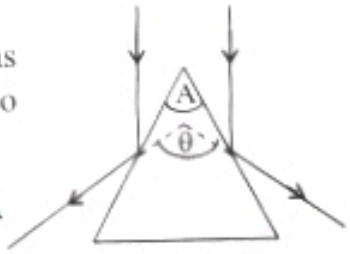
15) A ray of light incident on a glass prism is shown in the figure,



A) Irrespective of the value of angle A the incident ray always emerges from the opposite face.
B) For a certain value of the angle of incidence the deviation of the emergent ray is minimum.
C) There is an angle of incidence for the ray for which the angle of emergence equal to the angle of incidence.

Of the above statements,
1) only (B) is true
2) (A) and (B) are true
3) only (B) and (C) are true
4) only (A) and (C) are true.
5) all (A), (B) and (C) are true.

16) A parallel beam of light is incident on a prism as shown in the figure. The angle θ between the two reflected beams is equal to,



1) $\frac{A}{4}$ 2) $\frac{A}{2}$ 3) A 4) 2A 5) 4A

(2008)

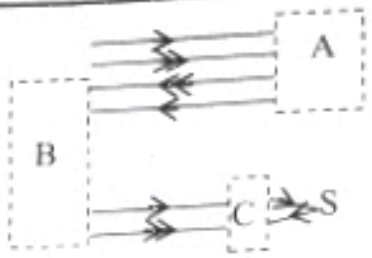
17) A light ray deviates from a prism with the minimum deviation of 30°. If the angle of the prism is 60° , the refractive index of the material of the prism is,

1) $\frac{3}{2}$ 2) $\frac{3}{\sqrt{2}}$ 3) $\sqrt{3}$ 4) $\sqrt{2}$ 5) $\frac{4}{3}$ (2009)

18) When white light passes through a glass prism, which of the following colours deviates the least ?

1) green 2) orange 3) blue 4) yellow 5) indigo (2010)

19) The set up shown in the diagram is used to focus a parallel beam of light to the point S. The respective optical element A, B and C should be,



1) A plane mirror, a plane mirror and a 60° – 40° – 60° prism
2) a 60° – 60° – 60° prism, a 60° – 60° – 60° prism and a convex lens.
3) a 45° – 90° – 45° prism, a 45° – 90° – 45° prism and a 60° – 60° – 60° prism.
4) a 45° – 90° – 45° prism, a 45° – 90° – 45° prism and a concave lens.
5) a 45° – 90° – 45° prism, a 45° – 90° – 45° prism and a convex lens. (2011NS)

20) A prism is placed on the prism table of a properly adjusted spectrometer and the refracted image of the illuminated collimator slit is observed while rotating the prism table starting from a large of incidence towards smaller angles. As the prism table rotates.

1) the image will move in a direction with continuously decreasing angle of deviation.
2) the image will move in a direction with continuously increasing angle of deviation.
3) the image will first move in a direction with increasing angle of deviation, turn back, and move in a direction with decreasing angle of deviation.
4) the image will first move in a direction with decreasing angle of deviation, turn back, and move in a direction with increasing angle of deviation.
5) the image will first move in a direction with decreasing angle of deviation and then stop. (2013)

21) Which of the types of glass prisms shown in figure (2) can be used to bend a ray of light into all the forms given in figure (1)?

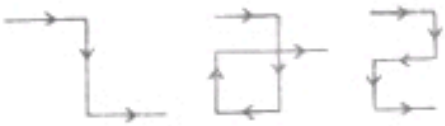


Figure (1)

Figure (2)

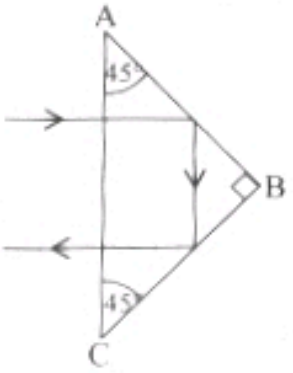
1) Type A only 2) Type B only 3) Type C only
4) Types A and B only 5) Types B and C only (2014)

22) Narrow beams of light consisting of a mixture of three primary colours, blue (B), green (G) and red (R), are incident normally as shown in figures (X), (Y) and (Z) on different glass prisms made from the same material. The critical angles of the material of the prism for blue, green and red are 43^0, 44^0 and 46^0 respectively. When viewed through the faces PQ, only red colour can be seen in

1) X only'
2) Y only'
3) X and Y only'
4) X and Z only'
5) all X ,Y and Z

(2015)

23) A ray of light is incident perpendicular to the surface AC of a right angled glass prism as shown in the figure. Minimum value of the refractive index of the material of the prism for which the ray will follow the path shown is,



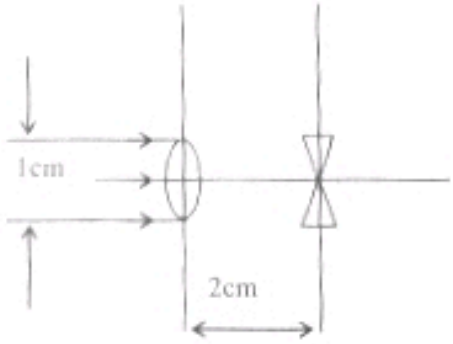
1) 1.22 2) 1.41 3) 1.58
4) 1.73 5) 1.87 (2016)

11. Refraction to lenses

01) A convex lens is used to form an image of an object on a screen, when the upper half of the lens is painted with an opaque paint,
1) half the image will get less intense
2) upper half of the image will disappear
3) lower half of the image will disappear
4) intensity of the whole image will decrease
5) entire image will disappear (1992)

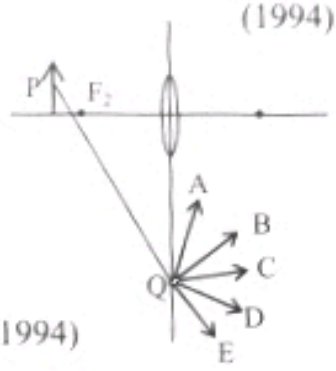
02) A camera is used to take a close - up photograph of a person. If the distance between the lens and the film is 50 mm. the focal length of the lens.
1) is equal to 50 mm 2) is less than 50 mm
3) is greater than 50 mm 4) is equal to 100 m
5) depends upon the size of the lens aperture (1992)

03) A convex lens of focal length 8cm is placed 2cm to the left of a concave lens of focal length 6cm, a parallel monochromatic light beam of diameter 1 cm is incident on the convex lens from the left as shown in the figure the emergent beam from the concave lens will



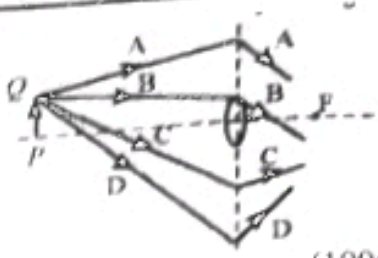
1) Diverge 2) converge
3) be a parallel beam of diameter 1 cm
4) be a parallel beam of diameter less than 1 cm
5) be a parallel beam of diameter greater than 1 cm (1994)

04) An object is placed on the principal axis of a convex lens. A ray of light PQ which originates from the mid-point, P on the object is drawn as shown in the figure. Which of the points A, B, C, D, or E is the correct continuation of the ray PQ?



1) A 2) B 3) C 4) D 5) E (1994)

05) An object PQ is situated in front of a thin convex lens and figure shows four rays of light drawn by a student, starting from the point Q. Of the rays indicated which will pass through the image of the point Q?

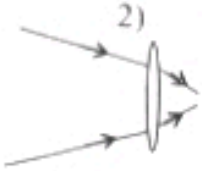


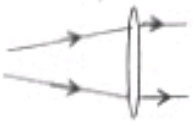
1) (A) only 2) (C) only 3) Only (A) and (B)
4) Only (A) and (C) 5) Only (A) and (C)

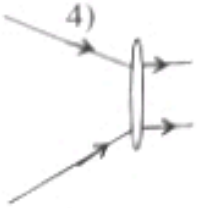
(1995)

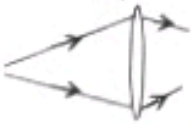
06) Which of the following ray diagrams is incorrect?

1) 

2) 

3) 

4) 

5) 

(1996)

07) Two rays of light enter a box from one side and leave as shown in the figure. The possible optical element/s inside the box is / are

1) a concave lens and a convex lens
2) a rectangular glass block
3) a convex lens and a rectangular glass block
4) two convex lenses
5) two concave lenses

(1996)

13) Focal length of a convex lens is 5cm. The magnitude of the power of the lens in diopters is,

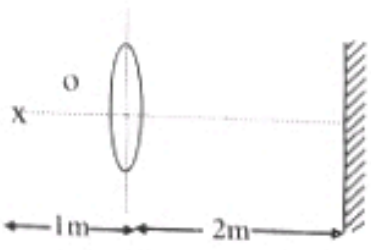
1) 0.025 2) 0.2 3) 5 4) 10 5) 20 (1997)

09) Two thin lenses in contact focus a parallel beam of light to a point 10 cm away from the combination. The lens combination will consist of ,

1) a convex lens of focal length 10 cm and a concave lens of focal length 10 cm
2) a convex lens of focal length 10 cm and a concave lens of focal length 20 cm
3) a convex lens of focal length 20 cm and a concave lens of focal length 10 cm
4) two concave lenses of focal length 20 cm each
5) two convex lenses of focal length 20 cm each

(1998)

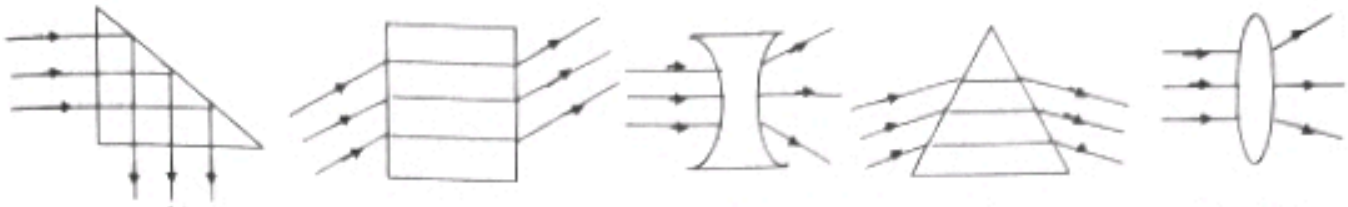
10) As shown in the figure, a small object O and a plane mirror are kept on the opposite sides of a convex lens of focal length 0.5m. Regarding the number of images formed and their nature, which of the following statements is correct?



1) Three images of which two are real
2) Three images of which one is real
3) two real images
4) two images of which one is real
5) only one real image

(1999)

11) Refractive index of the material of each optical element shown in the following diagrams is less than that of its surrounding medium. Which shows the correct ray diagram?

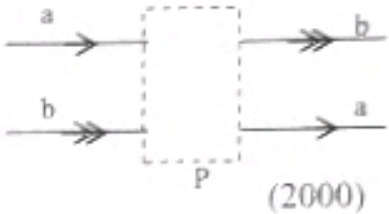


1) 2) 3) 4) 5) (1999)

12) Power of a lens combination is 44 diopters and the power of one of the lenses is 40 diopters. The magnitude of the focal length of other lens is,

1) 0.25 cm 2) 2.5 cm 3) 4.0 cm 4) 25.0 cm 5) 84.0 cm (2000)

13) Two monochromatic light rays a and b after passing through an optical element P. emerge as shown in the figure. The optical element is a,



1) convex lens 2) convex mirror
3) concave lens 4) plane mirror
5) prism (2000)

14) A convex lens of focal length 25 cm is kept in contact with a concave lens of focal length 10 cm. The power of the lens combination in diopters is,

1) 4 2) 6 3) 10 4) 14 5) 15 (2001)

15) Consider the following statements made about the magnification m of an image produced by a convex lens. As the object distance increases.

(A) from u = O to u = f, m increases
(B) from u = O to 2f m decreases
(C) from u = 2f to u = ∞ ,m increases

Of the above

1) Only (A) is true 2) Only (B) is true 3) Only (A) and (B) are true
4) Only (A) and (C) are true 5) all (A), (B) and (C) are true (2002)

16) Which of the following optical element/s could turn a ray of light as shown below?

(A) A prism
(B) A convex lens
(C) A concave lens

1) Only (A) 2) Only (B) 3) (A) and (B) only
4) (A) and (C) only 5) all (A), (B) and (C) (2002)

17) A broad beam of parallel light is to be converted to narrow beam of parallel light. This can be achieved with.

(A) two convex lenses
(B) two concave lenses
(C) a convex lens and a concave lens

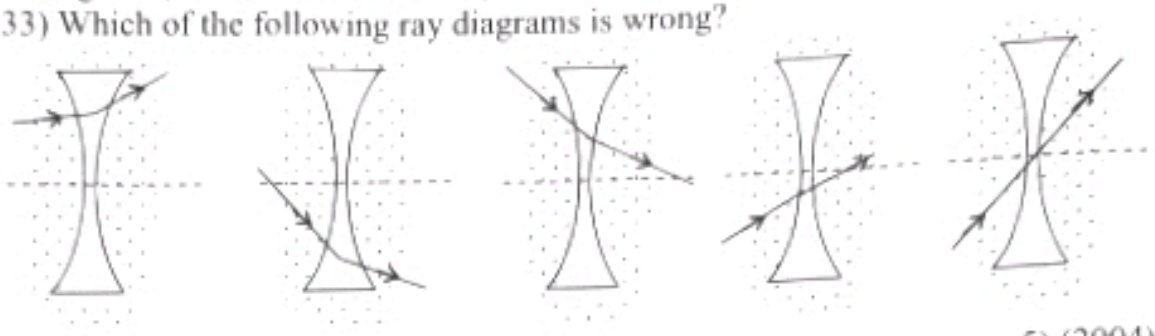
Of the above statements

1) Only (A) is true 2) Only (C) is true 3) Only (A)and (B) are true
4) Only (A) and (C) are true 5) all (A), (B) and (C) are true (2003)

18) when an object is placed 10cm from a lens its image is formed 10cm behind the object. The focal length and the type of the lens respectively are,

1) 6.7cm, concave 2) 6.7cm, convex 3) 10.00 cm, concave
4) 10.0 cm, convex 5) 20.0 cm, convex (2003)

19) A thin glass (refractive index = 1.5) lens is immersed in water (refractive index = 1.33) Which of the following ray diagrams is wrong?



1) 2) 3) 4) 5) (2004)

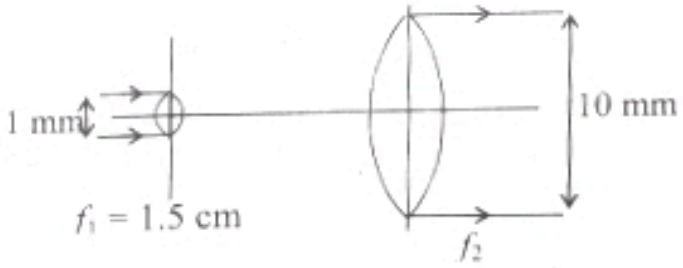
20) A beam of light that appears to be converging to a point on the axis 10 cm behind a lens is actually converged to a point on the axis 8cm behind it. The lens is,

1) a convex lens of focal length 40 cm
2) a concave lens of focal length 40cm
3) a convex lens of focal length 4.4 cm
4) a concave lens of focal length 4.4 cm
5) a convex lens of focal length 20 cm (2004)

21) The image of an erect victual object which is situated between the lens and its focus, formed by a diverging lens is,

1) real erect and larger than the object. 2) real inverted and larger than the object.
3) real erect and similar than the object.4) victual erect and smaller than the object.
5) victual inverted and smaller than the object. (2005)

22) A laser beam of diameter 1 mm has to be converted into a beam of 10 mm diameter using two convex lenses as shown. What is the value of the focal length f_2 of the second lens and the distance of at which is should be placed from the first lens ?



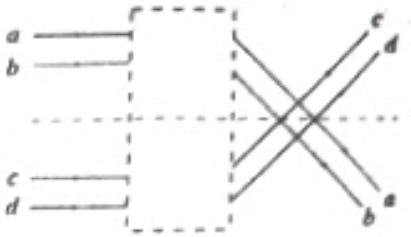
	f_2	d
1)	4.5cm	6.0 cm
2)	10.0cm	10.0 cm
3)	10.0 cm	11.5cm
4)	15.0 cm	15.0 cm
5)	15.0 cm	16.5cm

(2006)

23) The size of the image of an object placed at a distance of 10 cm from a convex lens is twice that of the object. If the image is erect, the focal length of the lens is

1) 7 cm 2) 10 cm 3) 20 cm 4) 30 cm 5) 40 cm (2007)

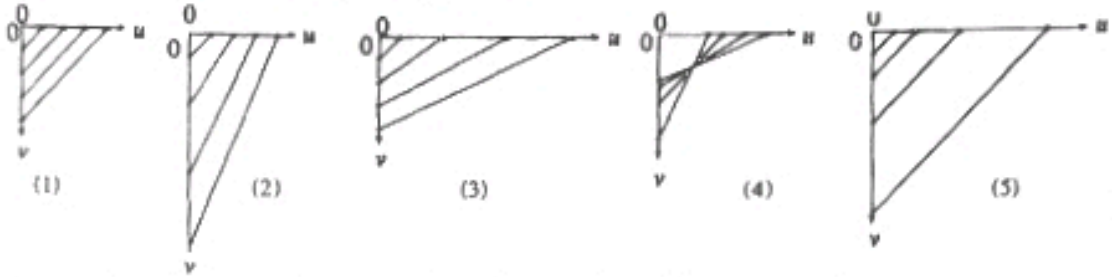
24) Rays from a monochromatic source of light are deviated by an optical element as shown in the figure. This optical element is likely to be,



1) a convex lense 2) a concave lense
3) a single prism 4) a combination of two prism
5) a combination of a prism and a convex lens

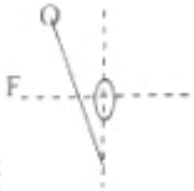
(2007)

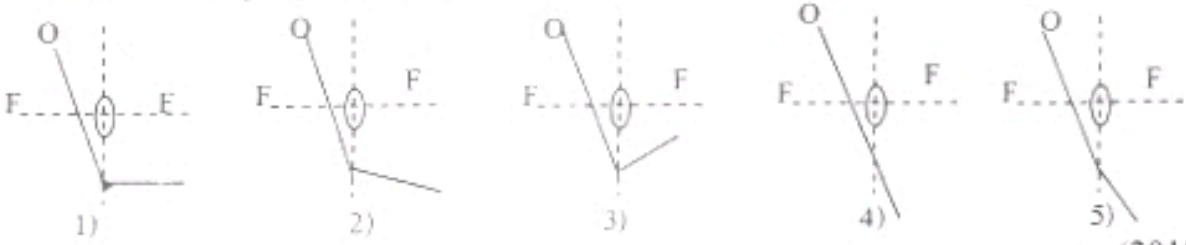
25) For real images produced by a convex lens, values of object distance (u) and image distance (v) are marked on the u – axis and v – axis respectively. Which of the following best represents the correct pattern when the corresponding u and v points are connected by straight lines ?



(2008)

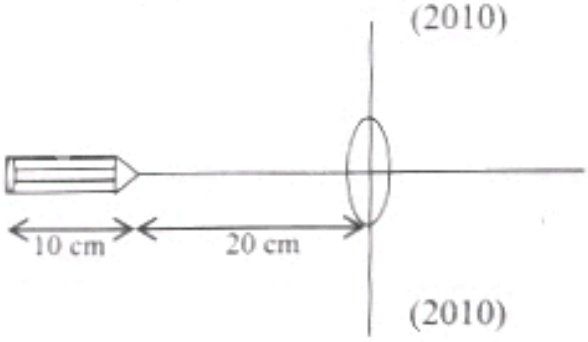
26) A point object O is placed in front of a thin convex lens as shown in the figure. The refracted path of the incident ray shown is best represented by,.





(2010)

27) A 10cm long pencil is placed along the optical axis of a convex lens as shown in the figure. If the length of the image of the pencil is also 10cm, the value of the focal length of the lens is,



1) 4 cm 2) 8 cm 3) 10 cm
4) 12 cm 5) 20 cm

(2010)

28) The image I formed by a concave lens L of an object pin O mounted on a stand is set to align with the object pin, and viewed through a small circle hole H out at the centre of the lens. Which of the following figures correctly indicates the view of the object pin O and the image I ?

1) 2) 3) 4) 5) (2011NS)

29) A lighted candle is placed in front of a convex lens as shown in figure (a).

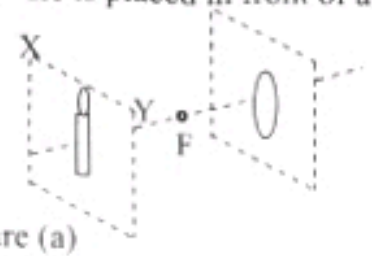


Figure (a)

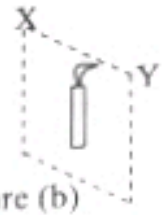


Figure (b)

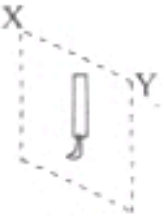
If the flame bends towards the direction Y due to wind as shown in figure (b), which of the following shows the nature of the image of the candle and the flame?

(1)

(2)

(3)

(4)



(5)

(2013)

30) A convex lens is used to obtain a clear image of an object on a screen. The screen is located 30 cm away from the lens, and the object is at 20 cm from the lens. If the lens is now used to focus the image of a distant tree on the screen, the distance between the lens and the image of the tree is,

1) 12 cm 2) 24 cm 3) 50 cm 4) 60 cm 5) 90 cm (2014)

31) When a small object is placed 30 cm in front of a thin lens L_1 of focal length 10 cm, an image is formed behind the lens. When another thin lens L_2 is placed in contact with L_1, the image is formed at infinity. L_2 is a,

1) concave lens of focal length 15 cm 2) convex lens of focal length 15 cm
3) concave lens of focal length 20 cm 4) concave lens of focal length 10 cm
5) convex lens of focal length 20 cm

(2015)

32) When an object is placed on the principle axis of a thin convex lens of focal length f_1, it forms a real at a distance V_1 with a linear magnification of m_1. When this lens is replaced by another thin convex lens of focal length f_2 ($f_2 < f_1$), being kept at the same position the new image distance V_2 and the magnification m_2 will satisfy the conditions,

1) $V_2 > V_1$ and $m_2 > m_1$
2) $V_2 > V_1$ and $m_1 > m_2$
3) $V_2 < V_1$ and $m_2 > m_1$
4) $V_2 < V_1$ and $m_1 > m_2$
5) $V_2 < V_1$ and $m_1 = m_2$

(2016)

12. Defect of Vision

01) A person suffering from vision defect / defects sees more clearly under water He is suffering from

1) short sight 2) long sight 3) astigmatism
4) colour blindness 5) both long sight and astigmatism (1992)

02) A certain person can see objects clearly, only when they lie between 0.75 m and 1.8 m from his eyes. To see distant objects clearly, which of the following lenses are most suitable for him?
1) Concave lenses of focal length 0.75 m 2) Convex lenses of focal length 1.8 m
3) Concave lenses of focal length 1.275 m4) Convex lenses of focal length 0.75 m
5) Concave lenses of focal length 1.275 m (1995)

03) In the human eye the location of the image of an object is adjusted to appear on the retina by changing the
1) diameter of the pupil 2) position of the lens 3) focal length of the lens
4) shape of the cornea 5) diameter of the eye ball (1996)

04) An eye a near point at 1m. The lens needed to change this to 25 cm is a,
1) convex lens with focal length 25 cm.
2) concave lens with focal length 25cm
3) convex lens with focal length 33.3 cm
4) concave lens with focal length 33.3 cm
5) convex lens with focal length 40 cm (1997)

05) A person can see clearly, objects placed 25cm from his eyes when he wears spectacles of power – 1.5 diopters. Without spectacle, he can see the objects most clearly at a minimum distance of
1) 18 cm from his eyes 2) 20 cm from his eyes 3) 30 cm from his eyes
4) 40 cm from his eyes 5) 50 cm from his eyes (1999)

06) The maximum focal length of the lens of a normal eye is 2.5cm. If the near point is 25cm. the minimum focal length of the eye lens is about
1) 1.5 cm 2) 1.8 cm 3) 2.0 cm 4) 2.3 cm 5) 2.5 cm (2000)

07) A person who is long sighted has near point at 50 cm. What spectacles are required for him to view objects comfortably at 25 cm?
1) Converging lens of focal length 100 cm
2) Converging lens of focal length 50 cm
3) Converging lens of focal length 25 cm
4) Diverging lens of focal length 100 cm
5) Diverging lens of focal length 50cm (2001)

08) A certain person has a defective eye. The distance between the eye – lens and the retina of the eye is 0.025 m, but the power of the lens of the resting eye is 45 diopters. What show be the type, and power of the corrective lens he should wear in order to see distant objects?
1) Convex, and 4D 3) Concave, and 4D 4) concave, and 10D
2) Convex, and 5D 4) Concave , and 5D (2002)

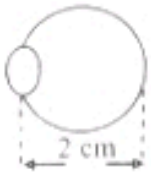
09) A defective eye of a person has a near point at 0.5m. The magnitude of the power of the lens that the person has to use in order to bring the near point to 0.25m is,
1) 2 diopters 2) 1 diopter 3) 0.5 diopters
4) 0.75 diopters 5) 2.5 diopters (2003)

10) A certain person cannot clearly see objects located beyond 1m away from the eye. This defect can be corrected by wearing
1) a concave lens of focal length 1m
2) a convex lens of focal length 1 m
3) a concave lens of focal length 0.5 m
4) a convex lens of focal length 0.5 m
5) a convex lens of focal length 0.25 m (2004)

11) The furthest point of distinct vision of a long sighted person is at infinity. This person used a magnifying lens to view close objects. He finds that he can see a clearly magnified image of an object if it is held any where between 50mm and 60 mm form the lens, but no where else. His least distance of distinct vision is,
1) 25 mm 2) 50 mm 3) 250 mm 4) 300 mm 5) 350 mm (2005)

12) The near point of a defective eye is 50 cm and the lense that should be worn to correct the near point to 25 cm is,
1) a converging lens of focal length 50 cm
2) a diverging lens of focal length 50 cm.
3) a converging lens of focal length 25 cm.
4) a diverging lens of focal length 25 cm.
5) a converging lens of focal length 75 cm. (2006)

13) A normal eye ball has a diameter of 2 cm as shown in the figure. The magnitude of the minimum power of the eye lens is,



1) 0 2) 10 D 3) 25 D
4) 50 D 5) 100 (2007)

14) The far point of a near sighted eye is 50 cm, in front of the eye to see clearly object at infinity a lens is worm 2 cm in front of the eys. The lens should be a,
1) converging lens with a focal length of 50 cm.
2) converging lens with a focal length of 48 cm.
3) diverging lens with a focal length of 52 cm.
4) diverging lens with a focal length of 50 cm.
5) diverging lens with a focal length of 48 cm (2008)

15) A person cannot see clearly the objects beyond a distance of 50cm from his eyes. In order to see distant objects be must wear.
1) concave lenses of focal length 10cm.
2) convex lenses of focal length 50cm.
3) concave lenses of focal length 50cm.
4) convex lenses of focal length 100cm.
5) concave lenses of focal length 100cm. (2009)

16) The distance from the eye lens to the retina of a person is 1.7 cm. The focal length of the eye lens when the eye is in compulsory relaxed position is,
1) 0.85 cm 2) 1.0 cm 3) 1.2 cm 4) 1.4 cm 5) 1.7 cm (2010)

17) A patient with cataract got his eye lens replaced by an artificial lens that has a fixed focal length, after a surgery. His vision was then found to be best for viewing objects at a distance of 10 m. The lens that he should use for reading is (near point is 25 cm),

1) a convex lens of approximate focal length 4 cm.
2) a concave lens of approximate focal length 4 cm.
3) a convex lens of approximate focal length 25 cm.
4) a concave lens of approximate focal length 25 cm.
5) a convex lens of approximate focal length 8 cm. (2011NS)

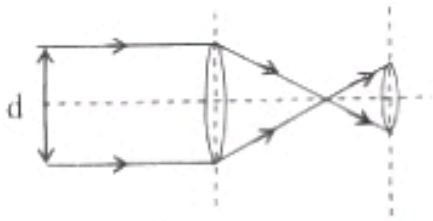
18) A person suffering from farsightedness has his near point located at 150 cm from the eyes. After wearing contact lenses, he could read clearly a book held at a distance of 25 cm. The used contact lenses are

1) concave lenses with 21.7cm focal length
2) convex lenses with 21.7cm focal length
3) convex lenses with 30.0 cm focal length
4) convex lenses with 30.0 cm focal length
5) convex lenses with 60.0cm focal length

(2013)

13. Opticle Instrument

01) An astronomical telescope is adjusted to view a distant object. The incident rays fill the objective lens whose diameter is d as shown in the figure. If the angular magnification of the telescope is m, the diameter of the emergent beam is,



1) dm 2) $\frac{d}{m}$ 3) $\frac{m}{d}$ 4) $\frac{d}{2m}$ 5) $\frac{2d}{m}$ (1992)

02) The compound microscope objective that will produce the greatest angular magnification with a given eyepiece must be a

1) concave lens of focal length 20 cm
2) convex lent of focal length 20 cm
3) convex lens of focal length 15 cm
4) concave lens of focal length 10 cm
5) concave lens of focal length 10 cm (1994)

03) As astronomical telescope in normal adjustment consists of two lenses of focal length 80 cm and 4 cm consider the following statements

(A) The eyepiece is the one with the least power
(B) The angular magnification of the telescope is 20
(C) The separation of the lenses is 84 cm

Of the above statements,

1) Only A is true 2) Only B is true 3) Only A and B are true
4) Only B and C are true 5) all A, B and C are true (1994)

04) Consider the following statements made about microscopes and telescopes

(A) The magnifying power of a compound microscope becomes maximum when the final image is formed at the near point of the eye

(B) It is suitable to have an object lens with a large diameter for astronomical telescopes used to study very distant objects

(C) The magnifying power of an astronomical telescope becomes maximum when the final image is formed at infinity.

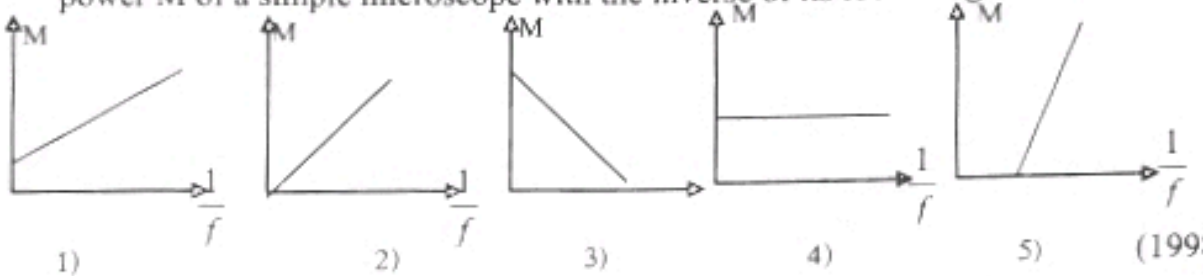
Of the above statements

1) Only B is true 2) Only A and B are true (3) Only A and C are true
4) Only B and C are true 5) all A, B and C are true (1996)

05) A converging lens of focal length 5cm is used as a magnifying lens. If the near point of the eye is 25cm, the maximum magnifying power that can be achieved is,

1) 4 2) 5 3) 6 4) 8 5) 10 (1997)

06) Which of the following graphs best represents the variation of the magnifying power M of a simple microscope with the inverse of its focal length?



1) 2) 3) 4) 5) (1998)

07) The objective of an astronomical telescope has a 60 cm focal length. When the telescope is adjusted to view objects for a relaxed normal eye, the distance between the lenses is 65cm. The angular magnification of the instrument is,

1) 2.4 2) 2.6 3) 5 4) 12 5) 20 (1999)

08) Consider the following statements regarding an astronomical telescope and a compound microscope.

(A) To obtain a high magnification the telescope must have an objective lens of long focal length and an eyepiece of short focal length.

(B) To obtain a high magnification the microscope must have an objective lens of short focal length and an eyepiece of long focal length.

(C) At the normal adjustment of the telescope the separation between the lenses is equal to the sum of the focal length of the lenses.

Of the above statements

1) Only (A) is true 2) Only (B) is true 3) Only (C) is true
4) Only (A) and (C) are true 5) all (A), (B) and (C) are true (2000)

09) An astronomical telescope has an eyepiece of focal length 5 cm. At normal adjustment the separation between the eyepiece and the objective is 85 cm. The angular magnification of the telescope at normal adjustment is,

1) 90 2) 85 3) 80 4) 17 5) 16 (2001)

10) A simple microscope has a convex lens of focal length 5cm. if the least distance of distinct vision is 25cm. the magnification of the microscope in normal adjustment is,

1) 2 2) 4 3) 5 4) 6 5) 8 (2002)

11) An astronomical telescope is in normal adjustment. The diameter of the incident light beam falling on the objective is d. If the angular magnification of the telescope is m the diameter of the emerged beam is,

1) $\frac{d}{m}$ 2) dm 3) d(m+1) 4) $\frac{2d}{m}$ 5) $\frac{d}{2m}$ (2003)

12) An astronomical telescope consists of two convex lenses of focal heights 50 mm and 650 mm. The moon subscends is angle of 0.5° on at unaided eye. If the telescope is used to normal adjustment to view the moon, the angle substended by the first image of the moon of the eye is,

1) 6.5° 2) 5.5° 3) 4.5° 4) 3.5° 5) 2.5° (2006)

13) The focal length of the lens of a simple microscope is 10 cm. If the near point of an eye is 25 cm, the approximate value of the object distance required to obtain the maximum angular magnification is,

1) 5 cm 2) 6 cm 3) 7 cm 4) 8 cm 5) 9 cm (2007)

14) The planet Mars subtends an angle of 8.0×10^{-5} rad at an undaided eye. When Mars is viewed using an astronomical telescope in normal adjustment it subtends an angle of 2.4×10^{-3} rad at the eye. If the focal length of the eyepiece is 0.03 m, the focal length of the objective is,

1) 0.001 m 2) 0.01 m 3) 0.5m 4) 0.9 m 5) 1.0 m (2008)

15) Astronomical telescope has an objective lens of focal length f_0 and an eyepiece of focal length f_e. If the telescope is in normal adjustment, the total length and the magnifying power of the telescope are given respectively by,

1) $2(f_0 + f_e)$ and $\left(\frac{f_0}{f_e}\right)$ 2) $2(f_0 + f_e)$ and $\left(\frac{f_e}{f_0}\right)$ 3) $(f_0 + f_e)$ and $\left(\frac{f_e}{f_0}\right)$

4) $(f_0 + f_e)$ and $\left(\frac{2f_0}{f_e}\right)$ 5) $(f_0 + f_e)$ and $\left(\frac{f_0}{f_e}\right)$ (2009)

16) A telescope having a magnifying power of 15 has an eyepiece of power 50 diopters. The length of the telescope, when it is in the normal adjustment is,

1) 15 cm 2) 28 cm 3) 30 cm 4) 32 cm 5) 64 cm (2010)

17) Final image of a compound microscope at normal adjustment is,

1) virtual, inverted and larger than the object
2) virtual, erect and larger than the object.
3) real, inverted and larger than the object.
4) real, erect and larger than the object.
5) real, inverted and smaller than the object (2011 NS)

18) Consider the following statements made about a compound microscope.
(A) The object should be placed just outside the focal point of the objective.
(B) The eyepiece acts as a simple magnifier.
(C) The angular magnification is independent of the focal length of the objective.
1) only (A) is true 2) only (A) and (B) are true
3) only (B) and (C) are true 4) only (A) and (C) are true
5) all (A), (B) and (C) are true. (2013)

19) Which of the following statements is not true with regard to a compound microscope?
1) It has two convex lenses.
2) Image of the object formed by the objective is real.
3) Separation of the lenses is much greater than the focal length of hte objective or the eyepiece.
4) Final image formed bythe microscope is a virtual image.
5) The object to be examined should be placed within the focal length of the objective. (2014)

20) Consider the following statements made regarding three optical instruments.
A) Simple microscope has a single convex lens, and when in normal adjustment, the microscope produces a virtual image at the least distance of distinct vision.
B) Compound microscope has two convex lenses, and when in normal adjustment, the microscope produces a virtual magnified image at infinity.
C) Astronomical telescope has two convex lenses, and when in normal adjustment, the telescope produces a real magnified image at infinity.
Of the above statements,
(1) only A is true (2) only A and B are true (3) only A and C are true
(4) only B and C are true (5) all A, B and C are true (2015)

ANSWERS

01) Simple Harmonic Motion

(1)	3	(2)	4	(3)	4	(4)	5	(5)	2	(6)	3
(7)	2	(8)	5	(9)	1	(10)	1	(11)	2	(12)	4
(13)	3	(14)	1	(15)	4						

02) Wave Properties

(1)	2	(2)	1	(3)	4	(4)	5	(5)	5	(6)	2
(7)	2	(8)	4	(9)	1	(10)	2	(11)	2	(12)	4
(13)	3	(14)	4	(15)	5	(16)	4	(17)	10	(18)	3
(19)	3										

03) Transverse Waves

(01)	4	(02)	4	(03)	5	(04)	3	(05)	2	(06)	2
(07)	1	(08)	4	(09)	1	(10)	4	(11)	3	(12)	2
(13)	1	(14)	2	(15)	2	(16)	1	(17)	4	(18)	3
(19)	2	(20)	4	(21)	3	(22)	2	(23)	4	(24)	4
(25)	5	(26)	4	(27)	2	(28)	3	(29)	5		

04) Velocity of Sound

(1)	4, 3	(2)	4	(3)	5	(4)	4	(5)	2	(6)	4
(7)	1	(8)	5	(9)	3	(10)	1				

05) Longitudinal Waves

(1)	4	(2)	All	(3)	4	(4)	4	(5)	3	(6)	2
(7)	2	(8)	1	(9)	3	(10)	2	(11)	5	(12)	3
(13)	1	(14)	1	(15)	3						

06) Doppler Effect

(1)	4	(2)	4	(3)	2	(4)	3	(5)	2	(6)	4
(7)	5	(8)	5	(9)	5	(10)	4	(11)	4	(12)	5
(13)	1	(14)	3	(15)	3	(16)	2	(17)	1		

07) Intensity of Sound

(1)	4	(2)	3	(3)	5	(4)	3	(5)	2	(6)	1
(7)	5	(8)	3	(9)	3	(10)	2	(11)	4	(12)	3
(13)	1	(14)	5	(15)	4	(16)	2	(17)	5		

08) Electro Magnetic Waves

(1)	1	(2)	2	(3)	5	(4)	2	(5)	2	(6)	2

09) Refraction

(1)	1	(2)	5	(3)	4	(4)	5	(5)	1	(6)	5
(7)	3	(8)	1	(9)	3	(10)	5	(11)	2	(12)	5
(13)	1	(14)	2	(15)	2	(16)	5	(17)	1	(18)	3
(19)	5	(20)	4	(21)	3	(22)	4	(23)	4	(24)	3
(25)	2	(26)	4	(27)	all	(28)	5				

10) Refraction through Prisms

(1)	3	(2)	1	(3)	1	(4)	2	(5)	1	(6)	2
(7)	3	(8)	4	(9)	3	(10)	4	(11)	5	(12)	5
(13)	3	(14)	1	(15)	3	(16)	4	(17)	4	(18)	2
(19)	5	(20)	4	(21)	3	(22)	2	(23)	2		

11) Refraction through lenses

(1)	4	(2)	2	(3)	4	(4)	3	(5)	4	(6)	4
(7)	4	(8)	5	(9)	5	(10)	1	(11)	5	(12)	4
(13)	5	(14)	2	(15)	3	(16)	5	(17)	4	(18)	5
(19)	2	(20)	1	(21)	1	(22)	5	(23)	3	(24)	3,4
(25)	4	(26)	4	(27)	4	(28)	1	(29)	5	(30)	4
(31)	1	(32)	4								

12) Defects of Vision

(1)	1	(2)	4	(3)	3	(4)	3	(5)	4	(6)	4
(7)	3	(8)	4	(9)	1	(10)	1	(11)	4	(12)	1
(13)	4	(14)	5	(15)	3	(16)	5	(17)	3	(18)	4

13) Optical Instruments

(1)	2	(2)	2,5	(3)	4	(4)	2	(5)	3	(6)	1
(7)	4	(8)	4	(9)	5	(10)	4	(11)	1	(12)	1
(13)	3	(14)	4	(15)	5	(16)	4	(17)	1	(18)	2
(19)	5	(20)	1								