Wave and Motion : Sound – Subjective Questions (Typical)

No of Questions:90 **Time Allotted: 12 Hours**

All questions are compulsory

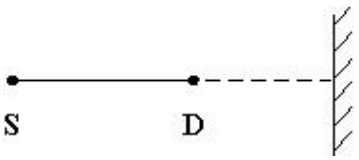
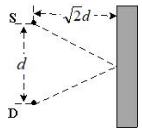
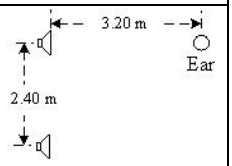
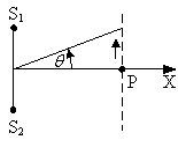
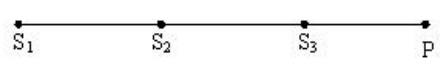
[Note: a. Figures are conceptual only and not to the scale**]**

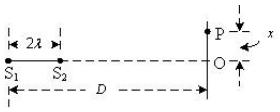
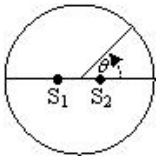
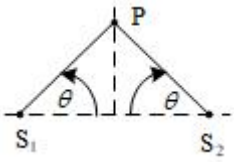
[b. Solutions may be taken up in Two parts as, Part I: 1 to 20, Part II: 21 to 40, Part III: 41 to 60 and Part IV: 61 to 90**]**

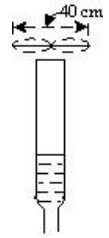
[c. It is advised to attempt question under examination conditions**]**

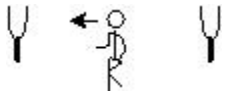
Q-01	A steel tube of length 1.00 m is struck at one end. A person with his ears close to the other end hears the sound of blow twice, one travelling through the body of tube and the other through the air in the tube. Find the time gap between the two hearings. Speeds of sound in air and the tube are 330 m/s and 5200 m/s respectively.
Q-02	At a prayer meeting, the disciples sing JAI-RAM JAI-RAM. The sound amplified by a loudspeaker comes back after reflection from a building at a distance of 80 m from the meeting. What maximum time interval can be kept between JAI-RAM and the next JAI-RAM so that echo does not disturb listener sitting in the meeting. Speed sound in air is 320 m/s.
Q-03	A man stands before a large wall at a distance of 50.0 m and claps his hands at regular intervals. Initially, the interval is large. He gradually reduces the interval and fixes it at a value when the echo of a clap merges with the next clap. If he has to clap 10 times during every 3 seconds, find velocity of sound in air.
Q-04	A person can hear sound waves in the frequency range 20 Hz to 20 kHz. Find the minimum and maximum wavelengths of sounds that is audible to the person. The speed of sound is 360 m/s.
Q-05	Find the minimum and maximum wavelengths of sound in water that is in the audible range (20-20,000 Hz) for an average human ear. Speed of sound in water is 1450 m/s.
Q-06	Sound waves from loudspeaker spread nearly uniformly in all directions if wavelength of the sound is much larger than the diameter of the speaker. (a) Calculate the frequency for which the wavelength of sound in air is ten times the diameter of the speaker if the diameter is 20 cm. (b) Sound is essentially transmitted in the forward direction if wavelength is much shorter than the diameter of the speaker. Calculate the frequency at which the wavelength of the sound is one tenth of the diameter of the speaker described above. Take the speed of sound to be 340 m/s.
Q-07	Ultrasonic waves of frequency 4.5 MHz are used to detect tumor in soft tissues. The speed of sound in tissue is 1.5 km/s and that in air is 340 m/s. Find the wavelength of this ultrasonic wave in air and in tissue.
Q-08	The equation of a travelling sound wave is $y = 6.0\ \sin(600t - 1.8x)$ where y is measured in 10^{-5} m, t in seconds and x in meter. (a) Find the ratio of the displacement amplitude of the particle to the wavelength of the wave, (b) Find the ratio of the velocity amplitude of the particle to the wave speed.
Q-09	A sound wave of frequency 100 Hz is travelling in air. The speed of sound in air is 350 m/s. (a) By how much is the phase changed at a given point in 2.5 ms? (b) What is the phase difference at a given instant between two points separated by a distance of 10.0

	cm along the direction of propagation?
Q-10	Two point sources of sound are kept at a separation of 10 cm. They vibrate in phase to produce waves of wavelength 5.0 cm. What would be the phase difference between the two waves arriving at appoint 20 cm from one source- (a) on the line joining the sources? (b) on the perpendicular bisector of the line joining the sources?
Q-11	Calculate the speed of sound in oxygen from the following data. The mass of 22.4 liter of oxygen at STP (T=273 K, and $P = 1.0 \times 10^5$ N/m^2) is 32 g, the molar heat capacity at constant volume is $C_v = 2.5R$ and that at constant pressure is $C_p = 3.5R$.
Q-12	The speed of sound as measured by a student in the laboratory on a winter day is 340 m/s when the room temperature is 17^0C. What speed will be measured by another student repeating the experiment on a day when the room temperature is 32^0C.
Q-13	At what temperature will the speed of the sound in air be double of its value at 0^0C?
Q-14	The absolute temperature of air in a region linearly increases from T_1 to T_2 in a space of width d. Find the time taken by a sound wave to go through the region in terms of T_1 , T_2 , d and the speed of sound v at 273 K. evaluate this time for $T_1 = 280$ K, $T_2 = 310$ K, $d = 33$ m and $v = 330$ m/s.
Q-15	Find the change in the volume of 1.0 litre kereosene when it is subjected to an extra pressure of 2.0×10^5 N/m^2 from the following data. Density of kerosene is 800 kg/m^3 and speed of sound in kerosene is 1330 m/s.
Q-16	Calculate the bulk modulus of air from the following data about a sound wave of wavelength 35 cm travelling in air. The pressure at a point varies between $(1.0 \times 10^5 \pm 14)$ Pa and the particles of the air vibrate in simple harmonic motion of amplitude 5.5×10^{-6}m.
Q-17	A source of sound operates at 2.0 kHz, 20 W emitting sound uniformly in all directions. The speed of sound in air is 340 m/s and density of air is 1.2 kg/m^3. (a) What is the intensity at a distance of 6.0 m from the source? (b) What will be the pressure amplitude at this point? (c) What will be the displacement amplitude at this point?
Q-18	The intensity of sound from a point source is 1.0×10^{-8}W/m^2 at a distance of 5.0 m from the source. What will be the intensity at a distance of 25 m from the source?
Q-19	The sound level at a point 5.0 m away from a point source is 40 dB. What will be sound level at a point 50 m away from the source?
Q-20	If intensity of sound is doubled, by how many decibels the sound level increases?
Q-21	Sound with intensity larger than 120 dB appears painful to a person. A small speaker delivers 2.0 W of audio output. How close can the person get to the speaker without hurting his ears?
Q-22	If the sound level in a room is increased from 50 dB to 60 dB, by what factor is the pressure amplitude increased?
Q-23	The noise level in a classroom in absence of the teacher is 50 dB when 50 students are present. Assuming that on the average each student outputs same sound energy per second, what will be the noise level if the number of students is increased to 100?

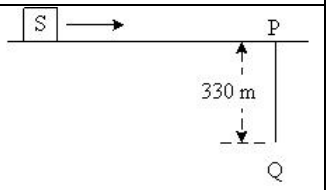
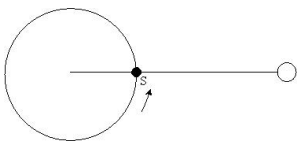
Q-24	In a Qunicke's experiment the sound detected is changed from a maximum to minimum when the sliding tube is moved through a distance of 2.50 cm. Find the frequency of sound if the speed of sound in air is 340 m/s.
Q-25	In Quincke's experiment, the sound intensity has a minimum value *I* at a particular position. As the sliding tube is pulled out by a distance of 16.5 mm, the intensity increases to a maximum of 9 *I.* Take the speed of sound in air to be 330 m/s, (a) Find the frequency of the sound source, (b) Find the ratio of the amplitudes of the two waves arriving at the detector assuming that it does not change much between the positions of minimum intensity and maximum intensity.
Q-26	Two audio speakers are kept some distance apart and are driven by the same amplifier system. A person is sitting at a place 6.0 m from one of the speakers and 6.4 m from the other. If sound signal is continuously varied from 500 Hz to 5000 Hz, what are the frequencies for which there is a destructive interference at the place of the listener? Speed of sound in air is 320 m/s.
Q-27	A source of sound S and a detector D are placed at some distance from one another. A big cardboard is placed near the detector and perpendicular to the line SD as shown in the figure. It is gradually moved away and it is found that the intensity changes from a maximum to a minimum as the board is moved through a distance of 20 cm. Find the frequency of sound emitted. Velocity of sound in air is 336 m/s. 
Q-28	A source S and a detector D are placed at a distance d apart. A big cardboard is placed at a distance $\sqrt{2}d$ from the source and the detector as shown in the figure. The source emits a wave of wavelength $\frac{d}{2}$ which is received by the detector after reflection from the cardboard. It is found to be in phase with the direct wave received from the source. By what minimum distance should the cardboard be shifted away so that the reflected wave becomes out of phase with the direct wave? 
Q-29	Two stereo speakers are separated by a distance of 2.40 m. A person stands at a distance of 3.20 m directly in front of one of the speakers as shown in the figure. Find the frequencies in the audible range (20-20000 Hz) for which the listener will hear a minimum sound intensity. Speed of sound in air is 320 m/s. 
Q-30	Two sources of sound S_1 and S_2 emitting waves of equal wavelength 20.0 cm are placed with a separation of 20.0 cm between them. A detector can be moved on a line parallel to S_1S_2 and at a distance of 20.0 cm from it. Initially, the detector is equidistant from the two sources. Assuming that the waves emitted by the sources are in phase, find the minimum distance through which the detector should be shifted to detect a minimum of sound.
Q-31	Two speakers S_1 and S_2 driven by the same amplifier are placed at $y = 1.0$ m and $y = -1.0$ m. The speakers vibrate in phase at 600 Hz. A man stands at a point on the X-axis at a very large distance from the origin and starts moving parallel to the Y-axis. The speed of sound in air is 330 m/s. (a) At what angle θ will the intensity of sound drop to a minimum for the first time? (b) At what angle will he hear a maximum of sound intensity for the first time? (c) If he continues to walk along the line, how many more maxima can he hear? 
Q-32	Three sources of sound S_1, S_2 and S_3 of equal intensity are placed in a straight line with S_1S_2 equal to S_2S_3 as shown in the figure. At a point P far away from the sources, the wave coming from S_2 is 120^0 ahead in phase of that from S_1. Also S_3 is 120^0 ahead in phase of that from S_2What would be the resultant intensity of sound at P? 

Q-33	 Two coherent narrow slits emitting sound of wavelength λ in the same phase are placed parallel to each other at a small separation of 2 λ. The sound is detected by moving a detector on the screen $\sum$ at a distance $D \gg \lambda$ from the slit S_1 as shown in the figure. Find the distance x such that the intensity at P is equal to the intensity at O.
Q-34	Figure shows two coherent sources S_1 and S_2 which emit sound of wavelength λ in phase. The separation between the sources is 3λ. A circular wire of large radius is placed in such a way that S_1S_2 lies in its plane and the middle point of S_1S_2 is at the center of the wire. Find the angular positions θ on the wire for which constructive interference takes place. 
Q-35	Two sources of sound S_1 and S_2 vibrate at the same frequency and are in phase and are placed as shown in the figure. The intensity of sound detected at a point P as shown in the figure is I_0. (a) If angle $\theta = 45^0$, what will be the intensity of sound detected at this point if one of the source is switched off? (b) What will be the answer of the previous part if $\theta = 60^0$? 
Q-36	Find the fundamental, first and second overtone frequencies of an open organ pipe of length 20 cm. Speed of sound in air is 340 m/s.
Q-37	A closed organ pipe can vibrate at a minimum frequency of 500 Hz. Find the length of the tube. Speed of sound in air is 340 m/s.
Q-38	In a standing wave pattern in a vibrating air column, nodes are formed at a distance of 4.0 cm. If speed of sound in air is 328 m/s, what is the frequency of the source?
Q-39	The separation between a node and the next anti-node in a vibrating air column is 25 cm. If speed of sound in air is 340 m/s, find the frequency of vibration of the air column.
Q-40	A cylindrical metal tube has a length of 50 cm and is open at both ends. Find the frequencies between 1000 Hz and 2000 Hz at which the air column in the tube can resonate. Speed of sound in air is 340 m/s.
Q-41	In a resonance column experiment, a tuning fork of frequency 400 Hz is used. The first resonance is observed when air column has a length of 20.0 cm and the second resonance is observed when the air column has a length of 62.0 cm. (a) Find the speed of sound in air (b) How much distance above the open end does the pressure node form?
Q-42	The first overtone frequency of a closed organ pipe P_1 is equal to the fundamental frequency of an open organ pipe P_2. If length of pipe P_1 is 30 cm, what will be the length of P_2?
Q-43	A copper rod of length 1.0 m is clamped at its middle point. Find the frequencies between 20 Hz and 20 kHz at which standing longitudinal waves can be set up in in the rod. The speed of sound in copper is 3.8 km/s.
Q-44	Find the greatest length of an organ pipe open at both ends that will have its fundamental frequency in the normal hearing range 20-20 kHz. Speed of sound in air is 340 m/s.
Q-45	An open organ pipe has a length of 5 cm. (a) Find the fundamental frequency of vibration of this pipe. (b) What is the highest harmonic of such a tube that is in the audible range? Speed of sound in air is 340 m/s and audible range is 20-20 kHz.

Q-46	An electronically driven loudspeaker is placed near the open end of a resonance column apparatus. The length of air column in the tube is 80 cm. The frequency of the loudspeaker can be varied between 20-2 kHz. Find the frequencies at which the column will resonate. Speed of sound in air is 320 m/s.
Q-47	Two successive resonance frequencies in an open organ pipe are 1944 Hz and 2592 Hz. Find the length of the tube. Speed of sound is 324 m/s.
Q-48	A piston is fitted in a cylindrical tube of small cross-section with the other end of tube open. The tube resonates with the tuning fork of frequency 512 Hz. The piston is gradually pulled out of the tube and it is found that second resonance occurs when the piston is pulled out through a distance of 32.0 cm. Calculate the speed of sound in the air of the tube.
Q-49	A U-tube having unequal arm-lengths has water in it. A tuning fork of frequency 440 Hz can set up the air in the shorter arm in its fundamental mode of vibration and the same tuning fork can set up air in the longer arm in its first overtone vibration. Find length of the air columns. Neglect any end effect and assume that the speed of sound in air is 330 m/s.
Q-50	Consider the situation shown in the figure. The wire which has a mass of 4.00 gm oscillates in its second harmonic and sets the air column of 1 m in the tube into vibrations on its fundamental mode. Assuming that the speed of sound in air is 340 m/s, find the tension in the wire. 
Q-51	A 30.0 cm long wire having a mass of 10.0 g is fixed at the two ends and is vibrated in its fundamental mode. A 50.0 cm long closed organ pipe, placed with its open end near the wire, is set up into resonance in its fundamental mode by the vibrating wire. Find the tension in the wire. Speed of sound in air is 340 m/s.
Q-52	Show that if the room temperature changes by a small amount from T to $T + \Delta T$, the fundamental frequency of an organ pipe changes from f to $f + \Delta f$. Where $\frac{\Delta f}{f} = \frac{\Delta T}{2T}$.
Q-53	The fundamental frequency of a closed pipe is 293 Hz when the air in it is at a temperature of 20^0C. What will be its fundamental frequency when temperature changes to 22^0C ?
Q-54	A Kundt's tube apparatus has a copper rod of length 1.0 m clamped at 25 cm from one of the ends. The tube contains air in which speed of sound is 340 m/s. The powder collects in heaps separated by a distance of 5.0 cm. Find the speed of sound waves in copper.
Q-55	A Kundt's tube apparatus has a steel rod of length 1.0 m clamped at the center. It is vibrated in its fundamental mode at a frequency of 2600 Hz. The lycopodium powder dispersed in the tube collects into heaps separated by 6.5 cm. Calculate the speed of sound in steel and air.
Q-56	A source of sound with adjustable frequency produces 2 beats per second with a tuning fork when its frequency is either 476 Hz or 490 Hz. What is the frequency of the tuning fork?
Q-57	A tuning fork produces 4 beats per second with another tuning of frequency 256 Hz. The first one is now loaded with a little wax and the beat frequency is found to increase to 6 per second. What was the original frequency of the tuning fork?
Q-58	Calculate the frequency of beats produced in air when two sources of sound are activated, one emitting a wavelength of 32 cm and the other of 32.2 cm. The speed of sound in air is 350 m/s.
Q-59	A tuning fork of unknown frequency makes 5 beats per second with another tuning fork which can cause a closed organ pipe of length 40 cm to vibrate in its fundamental mode. The beat frequency decreases when

	the first tuning fork is slightly loaded with fax. Find its original frequency. The speed of sound in air is 320 m/s.
Q-60	A piano wire A vibrates at a fundamental frequency of 600 Hz. A second identical wire B produces 6 beats per second with it when the tension in A is slightly increased. Find the ratio of the tension in A to the tension in B.
Q-61	A tuning fork of frequency 256 Hz produces 4 beats per second with a wire of length 25 cm vibrating in its fundamental mode. The beat frequency decreases when the length is slightly shortened. What could be the minimum length by which the wire be shortened so that it produces no bats with the tuning fork?
Q-62	A traffic policeman standing on a road sounds a whistle emitting the main frequency of 2.00 kHz. What could be the apparent frequency heard by a scooter driver approaching policeman at a speed of 36.0 kmph. Speed of sound in air is 340 m/s.
Q-63	The horn of a car emits sound with a dominant frequency of 2400 Hz. What will be the apparent dominant frequency heard by a person standing on the road in front of the car if the car is approaching at 18.0 km/h? Speed of sound in air is 340 m/s.
Q-64	A person riding a car moving at 72 km/h sounds a whistle emitting a wave of frequency 1250 Hz. What frequency will be heard by another person standing on the road. – (a) In front of the car? (b) Behind the car? Speed of sound in air is 340 m/s.
Q-65	A train approaching a platform at a speed of 54 km/h sounds a whistle. An observer on the platform finds the frequency to be 1620 Hz. The train passes the platform keeping the whistle on and without slowing down. What frequency will the observer hear after the train has crossed the platform? The speed of sound in air is 332 m/s.
Q-66	A bat emitting an ultrasonic wave of frequency 4.5×10^4 Hz flies at a speed of 6m/s between two parallel wall. Find the two frequencies heard by the bat and the beat frequency between the two. The speed of sound is 330 m/s.
Q-67	A bullet passes past a person at a speed of 220 m/s. Find the fractional change in the frequency whistle sound heard by the person as the bullet crosses the person. Speed of sound in air is 330 m/s.
Q-68	Two electric trains run at the same speed of 72 km/h along the same track and in the same direction with a separation of 2.4 km between them. The two trains simultaneously sound brief whistles. A person is situated at a perpendicular distance of 500 m from the track and is equidistant from the two trains at the instant of whistling. If both the whistles were at 500 Hz and the speed of sound in air is 340 m/s, find the frequencies heard by the person.
Q-69	A violin player riding on a slow train plays a 440 Hz note. Another violin player standing near the track plays the same note. When the two are close by and the train approaches the person on the ground, he hears 4.0 beats per second. The speed of sound in air is 340 m/s. (a) Calculate the speed of train, (b) What beat frequency is heard by the player in the train?
Q-70	Two identical tuning forks vibrating at the same frequency 256 Hz are kept fixed at some distance apart. A listener runs between the forks at a speed of 3.0 m/s so that he approaches one tuning fork recedes from the other as shown in the figure. Find the beat frequency observed by the listener. Speed of sound in air is 332 m/s. 

Q-71	Figure shows a person standing somewhere in between two identical tuning forks, each vibrating at 512 Hz. If both the tuning forks move towards right at the speed of 5.5 m/s, find the number of bats heard by the listener. Speed of sound in air is 330 m/s. 
Q-72	A small source of sound vibrating at frequency 500 Hz is rotated on a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. A listener situates himself in the plane of circle. Find the minimum and maximum frequency of the sound observed. Speed of sound in air is 332 m/s.
Q-73	Two trains are travelling towards each other both at a speed 90 kmph. If one of the trains sounds a whistle at 500 Hz, what will be the apparent frequency heard in the other train? Speed of sound in air is 350 m/s.
Q-74	A traffic policeman sounds a whistle to stop a car-driver approaching towards him. The car-driver does not stop and takes the plea in court that because of Doppler shift, the frequency of the whistle reaching him might have gone beyond the audible limit of 20 kHz and he did not hear it. Experiments showed that the whistle emits a sound with frequency close to 16 kHz. Assuming that the claim of the driver is true, (a) how fast was he driving the car? (b) Is this speed practical with today's technology? Take the speed of sound in air to be 330 m/s.
Q-75	A car moving at 108 kmph finds another car in front of it going in the same direction at 72 kmph. The first car sounds a horn that has a dominant frequency of 800 Hz. What will be the apparent frequency heard by the driver in front of the car? Speed of sound in air to be 330 m/s.
Q-76	Two submarines are approaching each other in a calm sea. The first submarine travels at a speed of 36 kmph and the other at 54 kmph relative to the water. The first submarine sends a sound signal (sound waves in water are also called sonar) at a frequency of 2000 Hz (a) At what frequency is this signal received by the second submarine? (b) The signal is reflected from the second submarine. At what frequency is this signal received by the first submarine? Take the speed of the sound wave in water to be 1500 m/s.
Q-77	A small source of sound oscillates in simple harmonic motion with an amplitude of 17 cm. A detector is placed along the line of motion of the source. The source emits a sound of frequency 800 Hz which travels at a speed of 340 m/s. If the width of the frequency band detected by the detector is 8 Hz, find the time period of the oscillation of the source.
Q-78	A boy riding on his bike is going towards east at a speed of $4\sqrt{2}$ m/s. At a certain paint he produces a sound pulse of frequency 1650 Hz that travels in air at a speed of 334 m/s. A second boy stands on the ground 45^0 south of east from him. Find the frequency of the pulse as received by the second boy.
Q-79	A sound source, fixed at the origin, is continuously emitted sound at a frequency of 660 Hz. The sound travels in air at a speed of 330 m/s. A listener is moving along the line at $x = 336$ m at a constant speed of 26 m/s. Find the frequency of the sound as observed by the listener when he is – (a) At $y = -140$ m (b) At $y = 0$ (c) At $y = 140$ m
Q-80	A train running at 108 kmph towards east whistles at a dominant frequency of 500 Hz. Speed of sound in air is 340 m/s. (a) What frequency will a passenger sitting near the open window hear? (b) What frequency will a person standing near the track hear whom the train has just passed? (c) A wind starts blowing towards east at a speed of 36 kmph. Calculate the frequency heard by the passenger in the train and by the person standing near the track.

Q-81	A boy riding on a bicycle going at 12 kmph towards a vertical wall whistles at his dog on the ground. If the frequency of the whistle is 1600 Hz and the speed of sound is 330 m/s find – (a) The frequency of the whistle as received by the wall, (b) The frequency of the reflected whistle as received by the boy.
Q-82	A person standing on a road sends a sound signal to the driver of a car going away from him at a speed of 72 kmph. The signal travelling at 330 m/s in air and having a frequency of 1600 Hz gets reflected from the body of the car and returns. Find the frequency of the reflected signal as heard by the person.
Q-83	A car moves with a speed of 54 kmph towards a cliff. The horn of the car emits sound of frequency 400 Hz at a speed of 335 m/s. (a) Find the wavelength of the sound emitted by horn in-front of the car. (b) Find the wavelength of the wave reflected from the cliff (c) What frequency does a person sitting in the car hear for the reflected sound wave? (d) How many beats does he hear in 10 seconds between sound coming directly from the horn and that coming after the reflection?
Q-84	An operator sitting in his base camp sends a sound signal of frequency 400 Hz. The signal is reflected back from a car moving towards him. The frequency of the reflected sound is found to be 410 Hz. Find the speed of the car. Speed of sound in air is 324 m/s.
Q-85	Figure shows a source of sound moving along the X-axis at a speed of 22 m/s continuously emitting a sound of frequency 2.0 kHz which travels in air is at a speed of 330 m/s. A listener Q stands on the Y-axis at a distance of 330 m from the origin. At $t = 0$, the source crosses the origin P. (a) When does the sound emitted from the source at P reaches the listener? (b) What will be the frequency heard by the listener at this instant? (c) Where will the source at this instant? 
Q-86	A source moving on the ground along the Y-axis with a speed of 22 m/s emits a pulse of sound at a frequency 4000 Hz. The pulse reaches a listener situated on the ground at the position (660 m,0) when the source reaches the origin. Find the frequency of the sound received by the listener at the instant the source crosses the origin. Speed of sound in air is 330 m/s.
Q-87	A source of sound emitting a 1200 Hz note travels along a straight line at a speed of 170 m/s. Detector is placed at a distance of 200 m from the line of motion of the source. (a) Find the frequency of sound received by the detector at the instant when the source gets closest to it. (b) Find the distance between the source and the detector at the instant it detects the frequency 1200 Hz. Velocity of sound in air is 340 m/s.
Q-88	A small source of sound S of frequency 500 Hz is attached to the end of a tight string and is whirled in a vertical circle of radius 1.6 m. The string just remains tight when the sources is at the highest point.  (a) An observer is located in the same vertical plane at a large distance and at the same height as the center of the circle as show in the figure. The speed of sound in air is 330 m/s and $g = 10$ m/s^2. Find the maximum frequency heard by the observer. (b) An observer is situated at a large distance vertically above the center of the circle. Find the frequency heard by the observer corresponding to the sound emitted by the source when it is at the same height as the center.

Q-89	A source emitting a sound of frequency f is placed at a large distance from an observer. The source starts moving towards the observer with a uniform acceleration a. Find the frequency heard by the observer corresponding to the wave emitted just after the source starts. The speed of sound in the medium is V.
Q-90	A stationary source is emitting sound at a fixed frequency f_0, which is reflected by two cars approaching the source. The difference between the frequencies of sound reflected from cars is 1.2% of f_0. What is the difference in the speeds of the cars (in kmph) to the nearest integer? The cars are moving at constant speeds much smaller than the speed of sound which is 330 m/s.

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