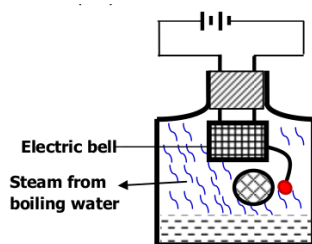# 9. Sound

1. Briefly describe how sound is propagated in air.
2. Using the mode of propagation state the difference between sound waves and light wave
3. State **two** factors affecting the speed of sound in gases
4. Fig shows a set up by a student.

(I) State what happens to the sound from the bell as the bottle and its contents are cooled to 0°C .
(ii) Explain the observation you have stated in (i) above.

5. The figure below represents a set up used to study sound waves
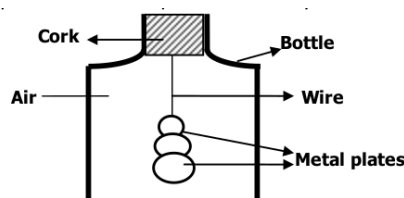

   i) What would be observed when the bottle is shaken?
   ii Explain the observation that would be made if a little hot water is poured into the bottle then cork is replaced and the bottle is shaken?
   (iii) State explain the observation that would be made if all the air is removed and the bottle is shaken again?
   (iv) What conclusion would you make from the above observations.

6. Describe an experiment to show that sound cannot travel in a vacuum.
7. Explain why sounds are fainter at high mountains than at sea level.
8. Explain the effect of pressure on the speed of sound in gases at a constant temperature.
9. In determining the depth of an ocean an echo sounder produces ultrasonic sound. Give reasons why this sound is preferred
10. What is the advantage of ultrasound over normal sound when used in sonars.
11. Give a reason why gases are poor transmitters of sound.
12. State the reason why the sound of thunder is always heard sometime after lighting flash is observed.
13. Explain the following statement: sound is a longitudinal pressure wave
14. State two factors that affect the speed of sound in air
15. What is an echo?
16. A Girl stands some distance from a high wall and claps her hands

   (i) What two measurements would need to be made in order to determine the speed of sound?
   (ii) Describe how you would make use of these measurements

17. The speed of sound in air determined on a warm day is 330 m/s. Explain any difference you would expect in the results if the measurement is done on a cold day.
18. A range standing some distance from a wall blows a whistle and hears its echo 2.4 seconds later . How far is the wall from the ranger? (Speed of sound in air is 330 m/s). *ANS 396 m*
19. A soldier standing between 2 cliffs fires a gun. He hears the first echo after 2.16 s and the next after 4.75 s. Determine the distance, between the two cliffs.*(Take speed of sound as 330 m/s.) ANS 1140.15 m*
20. A source generates 40 waves per second. If the wavelength is 8.5 cm. Calculate the time waves takes to reach a wall 120 meters from the source. *ANS 35.29 s*
21. A soldier standing between 2 cliffs fires a gun. He hears the first echo after 2 s and the next after 5 s. Determine the distance, between the two cliffs *(Take speed of sound as 340 m/s.) ANS 1190 m*
22. The human ear can distinguish two sounds as separate only if they reach it at least 0.1 seconds apart. How far from a wall must an observer be in order to hear an echo when he shouts?(speed of sound in air 330 m/s) *ANS 16.5 m*
23. A gun is fired and an echo heard at the same place 0.5 s later. How far is the barrier which reflected the sound from the gun? (Velocity of sound = 340 m/s) *ANS 85 m*
24. The audible frequency range for a certain person is 30 Hz to 16500 Hz. Determine the largest wavelength of sound in air the person can detect. Speed of sound 340 m/s *ANS 11.33 m*
25. A person watching a miner sees the miner strike, the rock and hears the sound 2 seconds later. Determine the distance between the person and the miner. Speed of sound = 340 m/s) *ANS 680 m*
26. A man fires a gun and hears an echo **6** seconds later from a cliff that is **990 m** away. Calculate speed of sound at that place. *ANS 330*
27. A sonar pulse sent out by a boat arrives back after **3** seconds. If the speed of sound in water is **1500 m/s**, how deep is the water
   ANS 2250 m
28. The speed of sound in air at a certain place is **320 m/s**. if the distance between a sound source and a wall is **800 m**, find the time taken for the echo to be heard. *ANS 5 s*
29. A boy standing **240 m** from a cliff claps his hands and hears an echo **0.6** seconds later determine the speed of sound at that place.

30. A student stands between two halls and **800 m** from the nearest hall. The halls are **X** meters apart. Every time the student claps, two echoes are heard by the student such that the first echo comes after **5** seconds while the second follows **2** seconds later. Calculate the value of **X**. *ANS 1920 m*

31. A fathometer produces sound in a ship and receives two echo's where there is a raised sea bed one after **2.5** seconds and the other after **3.0** seconds. Find the height of the raised sea bed if the velocity of sound in water is **1460 m/s**. *ANS 365 m*

32. A mine worker in a valley between two cliffs sits **150** metres from the nearest cliff and strikes a stone. He hears two echoes one after **0.9** seconds while the second comes **0.2** seconds later. Calculate the distance between the two cliffs. *ANS 168.33 m*

33. The figure below shows vibrating tuning forks. The time taken for a prong to undergo maximum displacement is **0.02** seconds. Determine the frequency of the vibration *ANS*
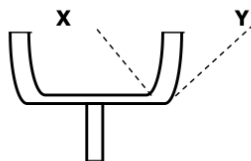
34. A soldier standing some distance from a tall building blows a whistle and hears its echo, 1.8 seconds later. How far is the wall from the soldier (speed of sound = 330 m/s) *ANS 297 m.*

35. A lightning flash is seen, followed by thunder 6 seconds later. How far is the storm from the observer? Speed of sound = 340 ms^{-1} *ANS 2040 m.*

36. A pulse of sound is sent from sea surface to the seabed and its echo received after **0.8** seconds. Calculate the depth of sea given that velocity of sound in sea water is **1500 m/s**. *ANS 600 m.*

37. A fathometer produces sound in a ship and receives two echo's where there is a raised sea bed after **2** seconds and the other after **5** seconds. Find the height of the raised sea bed if the velocity of sound in water is **1500 m/s**. *ANS 2250 m*

38. A student stands between two halls and 400 m from the nearest hall. The halls are X metres apart. Every time the student claps, two echoes are heard by the student such that the first echo comes after 2.5 seconds while the second follows 2 seconds later. From this information calculate;
    i) The speed of sound in air. *ANS 320 m/s.*
    (ii) The value of X. *ANS 1120 m.*

39. A girl standing in front of a wall 90 m away claps her hands at time intervals of 0.5 seconds. She notices that each echo produced by the wall coincides with the next lap. Determine the speed of sound. *ANS 360 m/s.*

40. The speed of sound in air is 330 m\s. How far from the wall would you stand? Choose an answer from the following distances .10 m, 200 m, 500 m. Give reasons why you did not choose each of the other two distances *ANS*

41. The frequency of the sound emitted by the loud speaker is 1020 Hz. **Calculate** the wavelength of the sound wave in air where its velocity is 340 m\s *ANS 0.3333 m*

42. A girl shouts and ears an echo after 0.6 seconds later from a cliff. If velocity of sound is 330 m/s,calculate the distance between her and the cliff. *ANS 99 m.*

43. An observer watching a fireworks displays sees the light from an explosion and hears the sound 2 seconds later. How far was the explosion from the observer? (Speed of sound is air 340 m/s) *ANS 680 m.*

44. A girl standing 600 m away from a cliff bangs two pieces of wood together and hears an echo 3.5 seconds later. Determine the speed of sound in air at that place. *ANS 342.86 m/s.*

45. Peter and John are 12 m and X metres respectively away from a wall as shown.
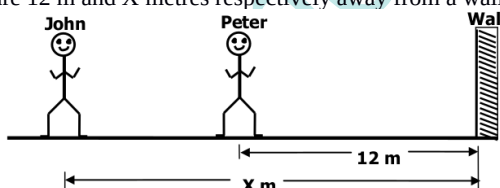
Peter claps his hands once. John hears the echo 0.4 s later. Calculate the distance between John and Peter. (Speed of sound in air = 330 ms^{-1}) *ANS 108 m.*

46. A man is standing 85 m from a cliff face in front and 170 m from a cliff at his back. He whistles loudly and hears two echos, one after another
    i) Explain how this can happen.
    ii) Calculate the time interval between the two echoes (velocity of sound in air is 340 m/s) *ANS 0.5 s.*

47. A man standing between two parallel walls fires a gun. He hears an echo after 1.5 seconds and another one after 2.5 seconds and yet another one after 4 seconds. Determine the separation of the walls. (Take velocity of sound 340 m/s) *ANS 680 m.*

48. A boy standing in level ground between two high walls claps his hands. He hears an echo from one wall after 0.7 s and from the other wall 0.2 s later. Determine the distance between the two walls. (Speed of sound in air v = 330 ms^{-1}) *ANS 264 m.*

49. Water waves are observed as they pass a fixed point at a rate of 30 crests per minute. A particular wave crest takes 2 second to travel between two fixed points 6 m apart. Determine the frequency and the wave length of the wave. *ANS f = 0.5 Hz λ = 6 m*

50. In an experiment to determine the speed of a sound, an observer stood in front of a high wall at a distance of 80 m. He clapped two boards together at such a rate that each clap coincided with the echo from the wall. A second observer noted a time of 9.5 seconds starting with the first clap and ending with the 21st clap.
    i. Calculate the speed of sound under these conditions *ANS 353.68 m/s.*
    ii. Describe one probable source of error in this experiment.
    (i) State four properties of sound waves which are similar to those of light waves
    (ii) State one way in which sound waves differ from light waves

51. A radio transmitter directs pulses of waves towards a satellite from which reflections are received 10 millisecond after transmission. Determine the distance of the satellite from the radio transmitter. (Speed of radio waves= 3 x 10^{8} ms^{-1}) *ANS 1.5×10 [6] m*

52. A ship in an ocean sends an ultra sound whose echo is received after 3 seconds. If the wavelength of the ultra sound in water 7.5 cm, and the frequency of the transmitter is 30 kHz, determine the depth of the ocean. *ANS 3375 m*