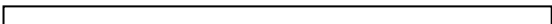
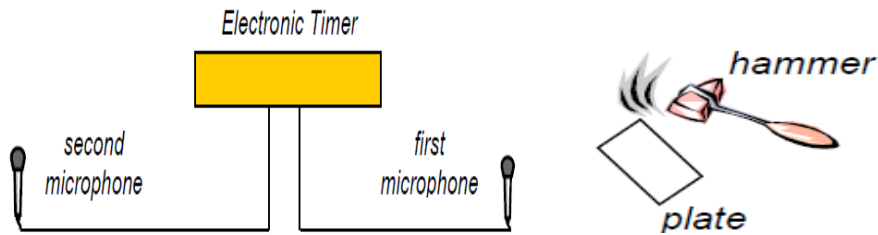




Sound Answers – NAT 5

- 1) Sound energy.
- 2) The particles in the air vibrate.
- 3) a) The number of waves that pass a point per second.
b) Hertz (Hz)
- 4) a) The frequency of the tuning fork.
b) 256 is the longest.
- 5) Pitch.
- 6) Oscilloscope.
- 7) a) Centre line of the wave to the top(crest) or the centre line to the bottom (trough).
b) Amplitude is a measure of the energy in the wave.
- 8) Describe the four waves below using the terms amplitude and frequency:
 - a) Small amplitude and small frequency.
 - b) Small amplitude and large frequency.
 - c) Large amplitude and small frequency.
 - d) Large amplitude and large frequency.

9)a)  metre ruler



b) Measure the distance that the sound waves travel from microphone 1 to microphone 2 using a metre ruler.

Measure the time taken for the sound waves to travel from microphone 1 to microphone 2 using the electronic timer.

c) A more precise measurement of time will be found and this will cut down on the uncertainty in the time reading.

10) a) 340 ms^{-1} .

b) Temperature and humidity.

c) 1020 m.

11) 3.75 seconds.

12) a) When you see the flash of light start the stopwatch and when you hear the clap of thunder you would stop the stopwatch. This is the time for the sound to reach you. Then use $d = v \times t$, where $v = 340\text{ms}^{-1}$, the speed of sound in air.

b) i) 4.5 seconds

ii) If the time that you recorded on the stopwatch was decreasing for each clap of thunder then the thunderstorm would be coming towards you and vice-versa.

13 a)

Solids	Liquids	Gases	Speed of sound in the material (ms ⁻¹)
Aluminium			5200
		Air	340
Bone			4100
		Carbon dioxide	270
	Glycerol		1900
	Water		1500

b) i) Solids

ii) Gases.

iii) The closer the particles the higher the speed of sound.

14) 5 seconds.

15) a) Sound level meter or Sound level indicator or Decibel meter.

b) Decibels (dB)

16)

Typical sounds	Sound Level (dB)
Threshold of hearing	0
Leaves rustling in the wind	10
Quiet conversation	40
Inside the average home	50
Danger level	80
Food blender at 0.5m	100
Jet engine at 35m	130

17) If the sound level gets ten times louder then it will increase by 10dB.

If the sounds level gets one hundred times louder it will increase by 20dB.

How would the sound level change in the examples below?

- a) 70dB to 60dB – Quieter by a factor of 10
- b) 10db to 40dB – Louder by a factor of 1000.
- c) 90dB to 70db – Quieter by a factor of 100.

18) To absorb the sound energy to protect the operators hearing. (Not to protect the ears!!)

19) The background sounds are picked up by a microphone on the outside of the headphones. The circuitry inside the headphones inverts these sound waves and then sends them back to the loudspeaker inside the headphones. The background sound and the newly added inverted sound waveform then cancel each other out.

20) a) 20 Hz to 20,000Hz

b) Ultrasound.

21) X-rays can damage living cells or tissue whereas ultrasound waves do not.

22) From the dimensions of the body parts the age of the baby and the sex of the baby.

23) Reflection. The sound waves transmitted are reflected at different times with the computer inside the ultrasound machine calculating how far the wave travelled before being reflected. The computer then builds up an image of the inside of the patient.

24) To find the depth of a shoal of fish and the depth of the sea bed.

25) a) 60 m.

b) 30 m.