High Demand Questions QUESTIONSHEET 1

(a) A musical instrument produces a sound wave with a frequency of 1000 Hz. The sound wave has a wavelength of 0.34 m in air. Calculate the speed of the sound wave in air.

.....

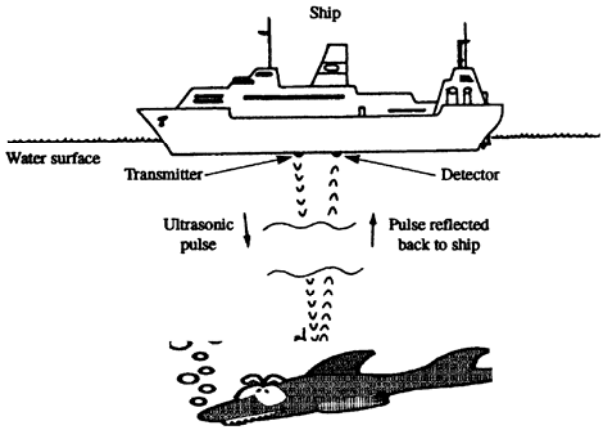
..... [2]

(b) In water the speed of sound is different. The speed of a sound wave in water is 1300 m/s. The sound wave has a frequency of 1000Hz. Calculate the wavelength of this sound wave.

.....

..... [2]

The diagram shows a ship using an Echo locator (SONAR) to find a shoal of fish. The pulsed wave is transmitted from the ship, which is then reflected off the top of the shoal and is then picked up by the receiver.



(c) The time taken to receive the echo is 0.2s after transmission. Calculate how deep the ship has to lower its fishing nets to catch the top of the shoal.

.....

.....

.....

..... [4]

(d) Define the term 'ultrasound wave'

..... [1]

(e) Give one other use of ultrasound waves (apart from echo location)

..... [1]

TOTAL / 10

GCSE PHYSICS **WAVES & SOUNDS**

High Demand Questions QUESTIONSHEET 2

The table shows the major groups of the electromagnetic spectrum. The wavelengths for ultra violet and infrared waves have not been given.

	Gamma Ray	X-rays	Ultra violet	Visible light	Infrared	Microwaves	Radio waves
Wavelength	$5x10^{-13}$	5×10^{-10}		5×10^{-7}		5	5000

(a) Give two reasons why all of these waves are placed in the same family of waves called the electromagnetic spectrum.

.....

..... [2]

(b) Suggest two likely values for the wavelengths of ultra violet and infrared waves.

.....

..... [2]

(c) State, which type of wave, has the highest **frequency.**

..... [1]

(d) All electromagnetic waves travel at the same speed of 300 million m/s. Calculate the frequency of X-rays.

.....

..... [2]

(e) Light takes roughly 8½ minutes to travel from the Sun to Earth. Calculate the distance (in meters) between the Sun and the Earth.

.....

.....

..... [3]

TOTAL / 10

High Demand Questions QUESTIONSHEET 3

(a) A man claps his hands on a hilltop.
He hears the echo 0.7 s later.

(i) If the speed of sound is 340 m/s, how far away was the surface from which the sound rebounded?

.....

.....

..... [3]

(ii) Why would this answer not be accurate?

.....

..... [2]

(iii) Suggest how the measurement could be improved

.....

..... [2]

(b) A radio wave has a frequency of 150 000 Hz. Its wavelength is 1100 metres.

(i) Calculate the speed of a radio wave.

.....

.....

..... [3]

(ii) How many times faster in air is a radio wave than a sound wave?

.....

..... [2]

TOTAL / 12

High Demand Questions QUESTIONSHEET 4

The behaviour of waves in water can be studied with a ripple tank.

(a) (i) Explain how the waves are made more visible.

.....

.....

..... [3]

(ii) How can continuous ripples be studied more easily?

.....

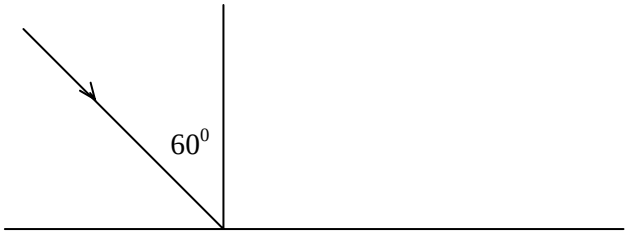
..... [2]

(b) The wave fronts which are the crests of waves can be represented in diagrams as a series of straight lines.

(i) How do the wave fronts relate to the direction of travel of the wave?

..... [1]

(ii) On the diagram below, draw the direction of travel of the reflected wave and show the wave fronts.



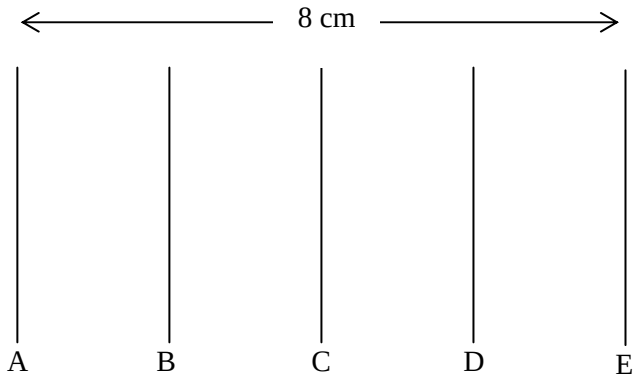
[2]

(iii) What is the angle of the reflected wave?

..... [1]

(Continued...)

(c)



(i) What is the wavelength of the ripples shown above?

..... [1]

(ii) If ripple A was in position E ten seconds before, calculate the frequency of the ripples.

.....

..... [2]

(iii) What is the speed of the ripples?

.....

..... [2]

High Demand Questions QUESTIONSHEET 5

The strings on a guitar have a natural frequency of vibration.
When plucked they vibrate and give out a note of that frequency.

(a) What would a musician call the frequency of a note?

..... [1]

(b) Shortening a string changes its frequency of vibration.

(i) How do musicians shorten guitar strings?

..... [1]

(ii) How does the frequency of the note change when the string is shortened?

..... [1]

(c) The string's natural frequency can be changed by changing its tension.
How is the tension of a guitar string changed?

..... [1]

(d) The velocity of a sound wave is calculated from the equation:

$V = f\lambda$

Where f = frequency, and λ = wavelength.

λ for middle C is 1.3 m. The speed of sound in air is 330 m/s.

Calculate the frequency of middle C.

.....

.....

..... [3]

(e) How do two musical notes relate to each other if the frequency of note A is twice that of note B?

..... [1]

TOTAL / 8

High Demand Questions QUESTIONSHEET 6

(a) All objects have a natural frequency of vibration.
This vibration can be started and increased by another object vibrating at the same frequency.

(i) What is this effect called?

..... [1]

(ii) Give two examples of places where this effect is useful.

.....

..... [2]

(iii) Give two examples of places where this effect is a nuisance

.....

..... [2]

(b) What is meant by an overtone?

..... [1]

(c) Use ideas about waves to explain the terms

(i) loudness

.....

..... [2]

(ii) pitch

.....

..... [2]

(iii) quality (timbre) of a musical note.

.....

..... [2]

TOTAL / 12

High Demand Questions QUESTIONSHEET 7

Sound waves with frequencies greater than 20 kHz are called ‘Ultrasonics’

(a) Explain how a fishing boat uses ultrasonics to detect shoals of fish

.....

..... [2]

(b) How is ultrasound used in pregnancy?

.....

..... [2]

(c) A dentist may use ultrasound to descale teeth.

Explain how this works.

.....

..... [2]

(d) How can ultrasound detect flaws in welded joints?

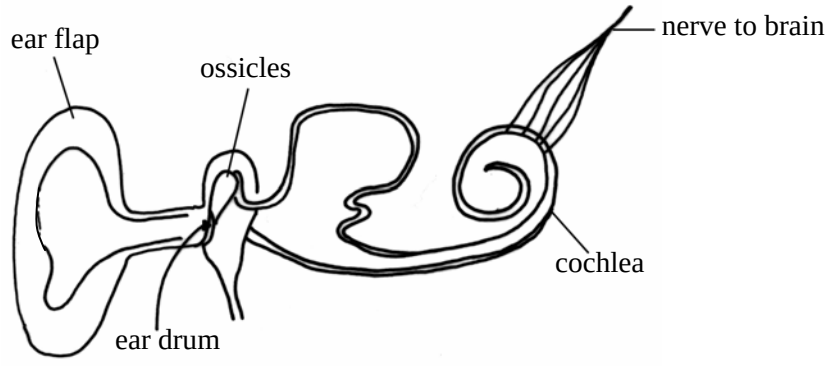
.....

..... [2]

TOTAL / 8

High Demand Questions QUESTIONSHEET 8

(a) Explain the part played by each of the following in detecting sound.



(i) the eardrum

.....

..... [2]

(ii) the cochlea

.....

..... [2]

(b) What is the function of the semi-circular canals?

.....

..... [2]

(c) Why do we not hear our own voice as others hear us?

.....

..... [2]

(d) How does a hearing aid pass sounds to the cochlea?

..... [1]

TOTAL / 9

Medium Demand Questions QUESTIONSHEET 9

The diagram shows somebody playing an electronic keyboard. The musician can hear the notes being played on the instrument.

(a) Explain how the sound waves travel from the instrument to the musician's ear.

.....

.....

..... [3]

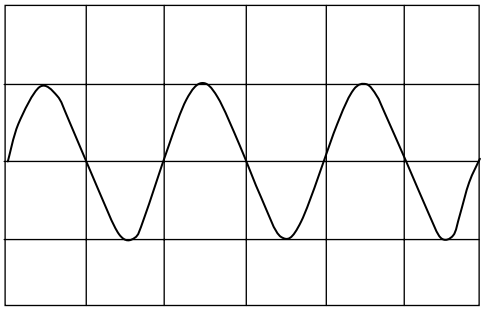
(b) The musician plays a note that has a frequency of 400 Hz. The speed of sound in air is approximately 300 m/s. Calculate the wavelength of the sound wave.

.....

.....

..... [3]

(c) The diagram shows the shape of the wave produced on an oscilloscope (an instrument used for analysing sounds). The wave on the screen has a frequency of 400Hz.



(i) On the diagram draw what you would see if the same note was played quieter. Label the line (Q) [2]

(ii) On the diagram draw what you would expect to see if the musician played a note with a frequency of 800 Hz was played. Label the line (F) [2]

(d) Explain why it is dangerous to listen to loud music for long periods of time.

.....

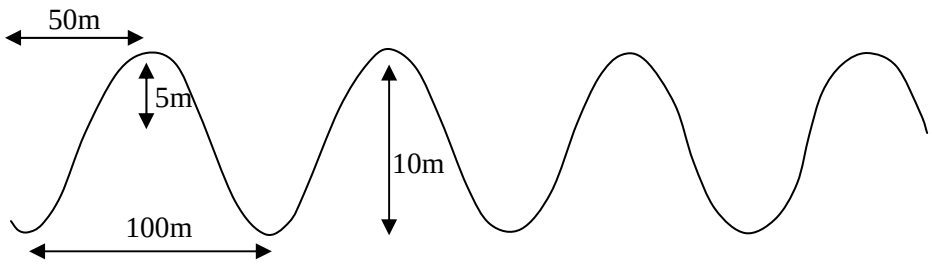
..... [2]

TOTAL / 12

GCSE PHYSICS **WAVES & SOUNDS**

Medium Demand Questions QUESTIONSHEET 10

The diagram below shows a wave with various measurements taken along the wave.



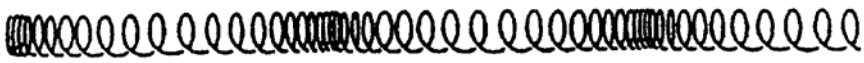
(a)(i) What is the amplitude of the wave?

..... [1]

(ii) What is the wavelength of the wave?

..... [1]

(b) The diagram below shows a wave travelling along the slinky spring.



(i) Use a ruler to measure the wavelength of this wave.

..... [1]

(ii) Describe how the wave shown is similar to a sound wave travelling through air.

.....

..... [2]

(c) Describe how the slinky spring can be made to show how light waves can travels.

..... [1]

(d) State the mediums for a sound wave and light wave in air and explain how sound waves travel through their medium.

.....

.....

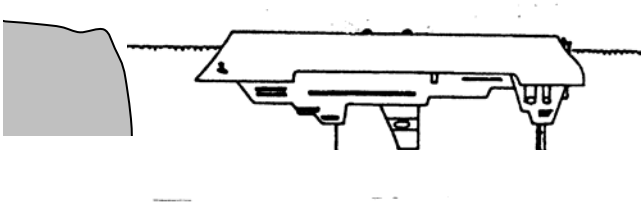
.....

.....

TOTAL / 9

Medium Demand Questions QUESTIONSHEET 11

A ship is approaching a cliff. It can use the delay in a reflected sound from its horn to roughly tell how far away it is from the cliff.



(a) What is a common name for the reflections of sounds from objects such as cliffs?

..... [1]

(b) Chose from the list below to complete the sentence:

30m/s
300 m/s
3,000 m/s
300,000,000 m/s

"The speed of sound in air is _____." [1]

(c) There was a time difference of 6 seconds between the fog horn sounding and hearing the sound again. How long did it take for the sound from the horn to reach the cliff?

..... [1]

(d) Calculate the distance that the ship is away from the cliff.

.....

..... [2]

(e) (i) What is ultrasound?

..... [1]

(ii) Explain how a bat uses ultrasound to find its prey and how the bat could tell if its prey is moving away or towards the bat.

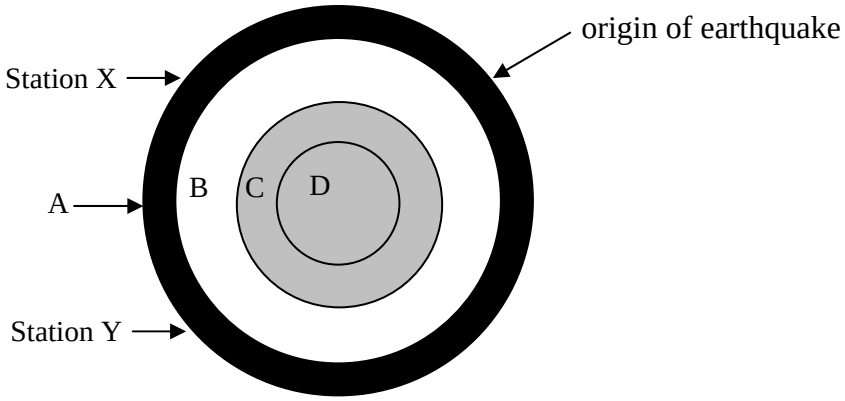
.....

.....

..... [3]

TOTAL / 9

The diagram shows a cross section of the Earth. The diagram is not drawn to scale.



(a) Connect the correct letter to the right name for that part of the interior of the Earth.

LETTER	SECTION OF THE EARTH
A	INNER CORE
B	CRUST
C	MANTLE
D	OUTER CORE

[3]

(b)(i) Describe two similarities between P waves and S waves.

.....

..... [2]

(ii) Describe two differences between P waves and S waves.

.....

..... [2]

(Continued...)

(c)(i) State the type of seismic wave(s) that will reach Station X.

..... [1]

(ii) State the type of seismic wave(s) that will reach Station Y. Explain your answer.

.....

.....

..... [3]

(d) At station X seismic waves are seen to vibrate buildings up and down and then later from side to side. Explain this observation.

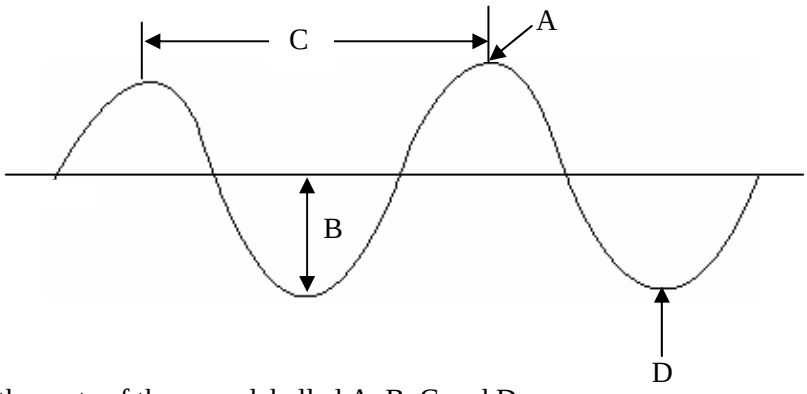
.....

.....

..... [3]

Medium Demand Questions QUESTIONSHEET 13

Below is a diagram of a wave



(a) Name the parts of the wave labelled A, B, C and D.

A: ..... [1]

B: ..... [1]

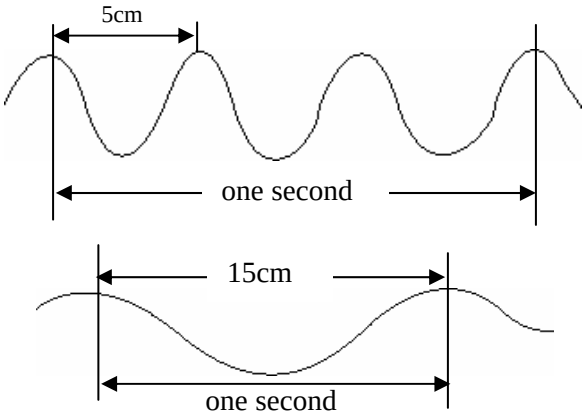
C: ..... [1]

D: ..... [1]

(b) (i) The frequency of a wave is the number of cycles it completes per second.
What is the unit of frequency?

..... [1]

(ii) What are the frequencies of the two waves shown below?



X: ..... [1]

Y: ..... [1]

(iii) Calculate the speed of each wave

X: .....

..... [2]

Y: ..... [1]

TOTAL / 10

Medium Demand Questions QUESTIONSHEET 14

James is given the job of timing the 100 m sprints on sports day.
He has never done the job before and starts the watch when he hears the starter's pistol.

(a)(i) When should be have started the watch?

..... [1]

(ii) Explain your answer to (a)(i)

.....

..... [2]

(b) How much shorter will the time for the race be on James' watch than on a correctly started watch?
(the speed of sound in air is 330 m/s)

.....

.....

..... [3]

TOTAL / 6

Medium Demand Questions QUESTIONSHEET 15

(a) A ship sends out a pulse of sound and receives an echo back one second later.
If the water is 750 m deep, what is the speed of sound in water?

.....

.....

..... [3]

(b)Katie ties a silver spoon to a piece of string and holds the ends to her ears.

When her friend Hazel, strikes the spoon with a pencil, Katie hears a sound like a bell.
Explain the reason for this.

.....

..... [2]

(c)Explain why we do not hear explosions on the Sun, although they must be very loud.

.....

..... [2]

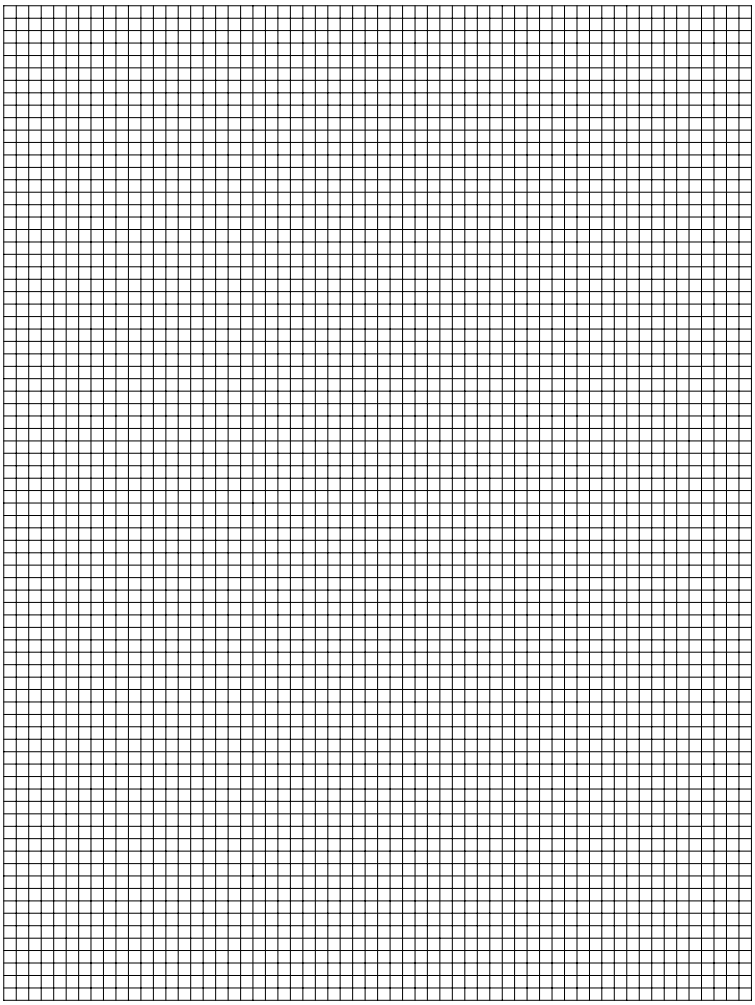
TOTAL / 6

Medium Demand Questions QUESTIONSHEET 16

Loudness of sounds is measured in decibels (dB).
The loudness of a loudspeaker gets less as you move away from it.
This is shown in the table below.

Distance /m	1	2	4	8	16
Loudness /dB	150	140	130	120	110

(a) (i) Plot a graph of these figures.



(ii) A man stands 5 m from the speaker. How loud is the sound to him?

..... [1]

The law allows people to experience sounds of 90 dB for a maximum of eight hours or 100 Db for 50 minutes.

(iii) Is 5 m a safe distance from the speaker?

..... [1]

(Continued...)

QUESTIONSHEET 16 CONTINUED

(b)(i) State **two** ways in which the sound getting into your living room can be reduced.

.....

..... [2]

(ii) What sort of covering would be put on the walls of a sound-proof studio?

..... [1]

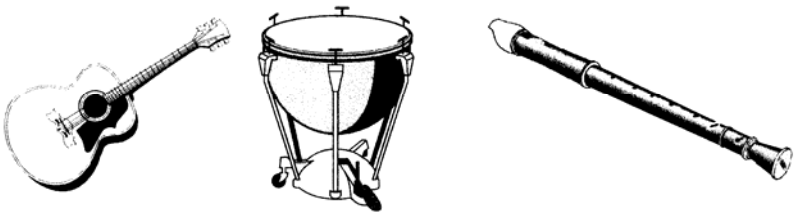
(iii) How do tractor drivers protect themselves from the noise of the tractor?

..... [1]

TOTAL / 9

Low Demand Questions QUESTIONSHEET 17

Look at the diagrams of the musical instruments. The three diagrams show some ways of producing sounds.



(a) For each diagram name the part which is vibrating.

(i) The vibrating part of a guitar is _____ .

(ii) The vibrating part of a drum is _____ .

(iii) The vibrating part of a recorder is _____ . [3]

(b) Most people can hear sounds of pitch ranging from 20 to 20,000 vibrations every second.

(i) What is the name for sounds that have a pitch higher than 20,000 vibrations every second?

..... [1]

Look at the table below. It shows three keywords, their definitions and the units used for that keyword. They are not in order.

Frequency	The maximum disturbance caused by a wave	Meters
Amplitude	The distance one complete wave travels in one second	Hertz
Wave speed	The number of complete vibrations per second	Meters/ second

(ii) Using straight lines, link the correct keyword with its definition and unit of measurement. [3]

(c) Choose words from the list below to complete the following sentences.

Higher, Lower, Louder, Quieter

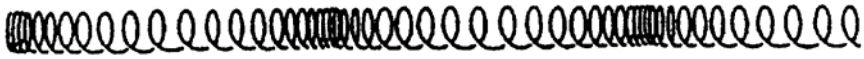
(i) A musical note with a high frequency sounds _____ than a musical note played at a low frequency. [1]

(ii) A musical note with large amplitude sounds _____ than a musical note with small amplitude. [1]

TOTAL / 9

Low Demand Questions QUESTIONSHEET 18

The diagram below shows a wave travelling along a slinky spring.



(a) Complete the following sentence:-
"The wave can be made to move along the spring by making the spring _____." [1]

(b) The diagram below shows a guitar.

(i) Describe how the guitar produces sounds.

..... [1]

(ii) Describe how the guitar can be made to produce louder sounds.

..... [1]

(iii) State two ways that the guitar can be made to produce higher pitch sounds.

.....

..... [2]

(c) Look again at the diagram of the slinky spring.

Explain why the wave travelling along the spring represents a sound wave but not a light wave.

.....

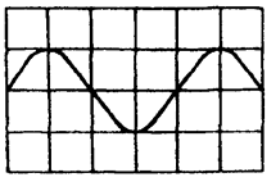
.....

..... [2]

TOTAL / 6

Low Demand Questions QUESTIONSHEET 19

The diagram below shows an oscilloscope with a sound wave produced by a musical instrument.



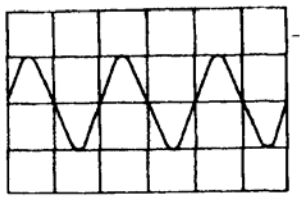
Each square represents a distance of 1cm.

(a) Use the above fact to state the wavelength and amplitude of the wave.

.....

..... [2]

(b) The diagram below shows a new sound produced by the same musical instrument.

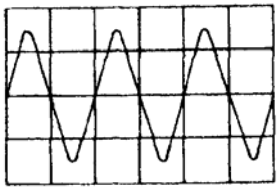


State how this new sound compares to the one produced in question 1.

.....

..... [2]

(c) The diagram below shows another new sound produced by the same musical instrument.



State how this new sound compares to the one produced in the first diagram.

.....

.....

(d) On the first diagram draw what you would see on the oscilloscope if the musical instrument played a quieter note that has twice the pitch.

.....

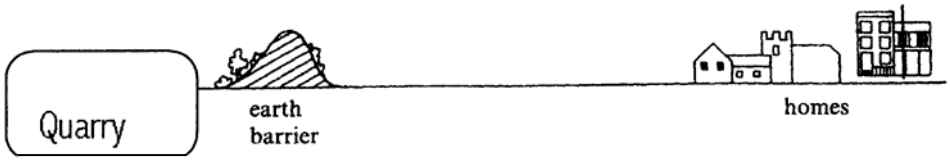
.....

.....

TOTAL / 9

Low Demand Questions QUESTIONSHEET 20

A Company operates a quarry near local housing.
People living near this quarry complained about the high noise levels.
The company then built an earth barrier to reduce the noise levels that reached the houses.
This is shown in the diagram below.



(a) (i) State what is meant by noise.

..... [1]

(ii) Why is it important to reduce noise?

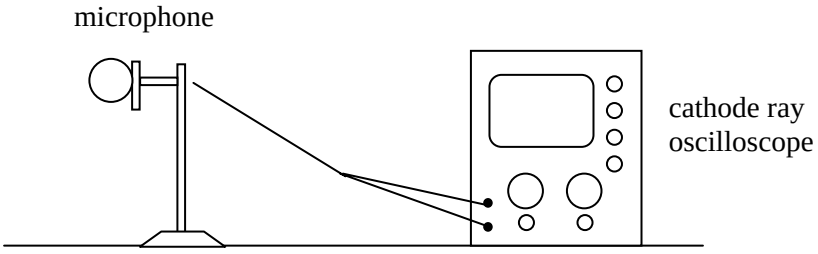
..... [1]

(iii) Describe how the barrier reduced noise levels at the houses.

.....

..... [2]

The diagram below shows apparatus that can be used to measure noise levels.



(b) For this question choose phrases from the following list:-

Changes electrical energy to sound energy
Changes sound energy to electrical energy
Amplifies sound
Produces alternating vibrations

State the use of the microphone in the above diagram.

..... [1]

(c) Describe how the received sound varies as the equipment is moved further away from the noise source.

.....

..... [2]

TOTAL / 7