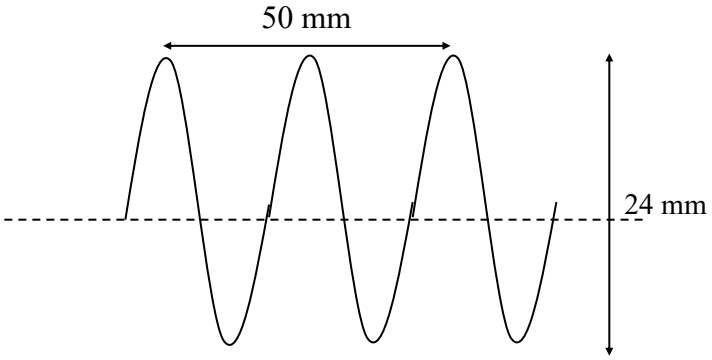
S2 Light and sound
Self Checks

Self check 1— Waves Parameters

1. Copy and complete the following passage:

   Sound energy travels from the source to the receiver in the form of a _ _ _ _.
   The greater the energy the larger the _ _ _ _ _ _ _ _ _.
   The _ _ _ _ _ _ _ _ _ of a wave is the number of waves per second and is measured in _ _ _ _ _. The _ _ _ _ _ _ _ _ _ _ is the distance from one crest to the next crest.

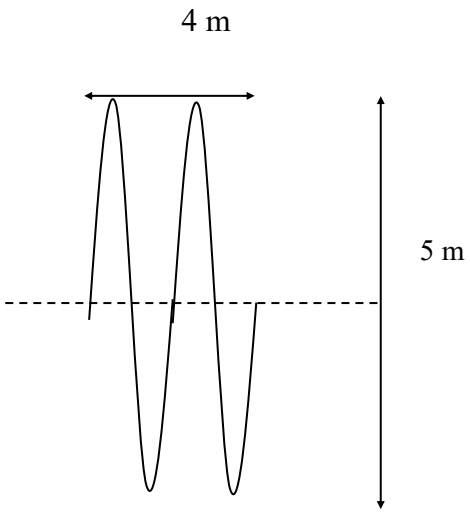
2. A wave is shown below:



   (a) What is the amplitude of the wave?

   (b) What is the wavelength of the wave?

3. For the wave below, the amplitude of the wave is:



   A. 4 m
   B. 2 m
   C. 5 m
   D. 2.5 m
   E. 1 m

Self check 1 continued

4. a) Explain, using a diagram, the difference between a transverse and longitudinal wave.

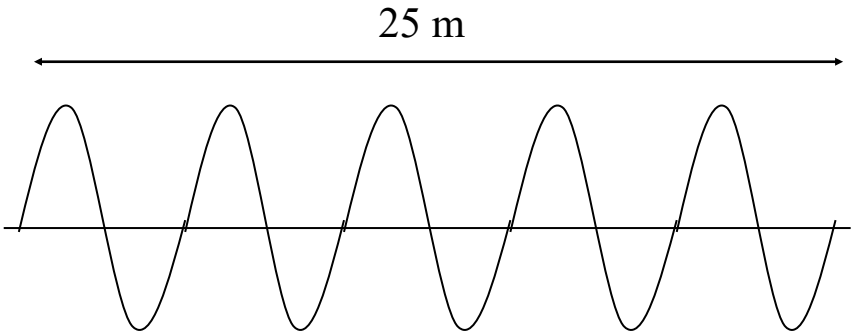
b) What type of waves are the following:

i) sound waves

ii) water waves

iii) light waves?

5. A wave is shown below:



In one second, 2.5 waves pass point P.

(a) State the type of wave.

(b) What is the wavelength of the wave?

Self check 2—Frequency

1. State the definition for the frequency of a wave. State the units for frequency.

2. What is the frequency if :

   (a) 10 waves pass a point in 2 seconds

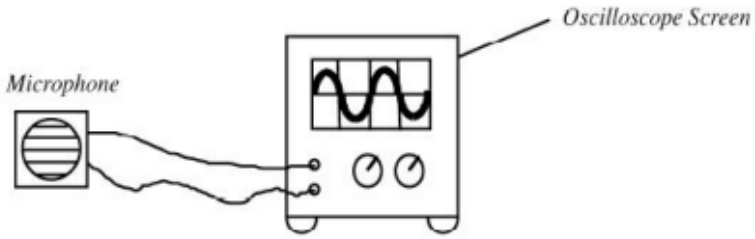
   (b) 40 waves strike a beach in 4 seconds

   (c) 120 waves pass a point in 2 minutes?

3. A wave generator at swimming pool sends out 10 waves in 20 s. The waves cross the 25 m pool in 10 s. Calculate the frequency of the waves

4. A pupil sends 16 waves along a rope in 2 seconds. Find the frequency of the wave.

5. A signal is displayed on the screen of the oscilloscope.



   (a) How many waves are seen on the screen?

   (b) The frequency of these waves is 50 Hz. How many waves are produced in one second?

Self check 3—Speed of sound

1. Give three examples which illustrate the speed of sound in air is less than the speed of light in air.

2. A pupil at a football match sees opposing fans clap and then hears the sound 0.2 s later. If the opposing fans are 68 m away, calculate the speed of sound in air.

3. At a school summer fete, the announcer uses a loud-hailer so that the pupils can hear about all the available activities.

A pupil stands 30m away from the loudspeaker.

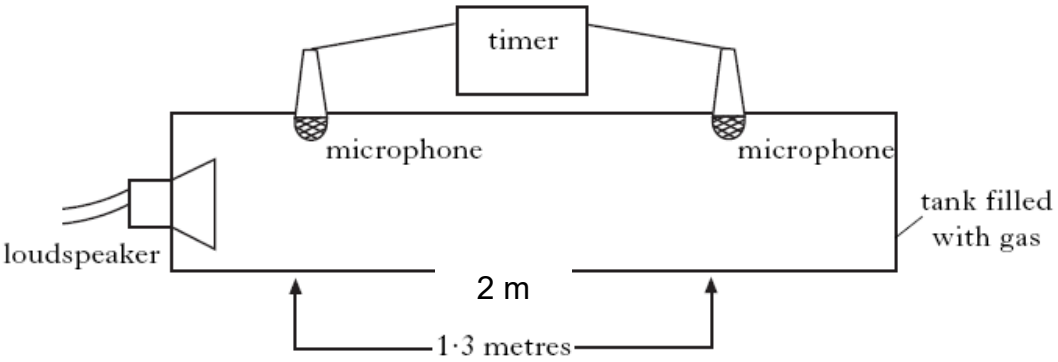
(a) Find the speed of sound in air if it takes the pupil 0.09s to hear the announcer.

(b) How far away would a pupil be if it took 0.18 s to hear the announcer.

4. In a thunderstorm, the thunder is heard 5 s after the lightning.
Calculate the distance to the storm. (speed of sound = 340 m/s)

Self check 3 continued

5. A pupil investigates the speed of sound in different gases. She designs an experiment as shown below. A short note is produced by the loudspeaker and the sound travels though the tank from one microphone to another.



The tank is filled with carbon dioxide. The sound takes 0.005 s to travel 2 metres.

(a) Calculate the speed of sound in carbon dioxide.

(b) The tank is now filled with a different gas. It takes the sound 0.5 s to travel 2 m. Explain if the speed of sound in the gas is less than, equal to or greater than the speed of sound in carbon dioxide.

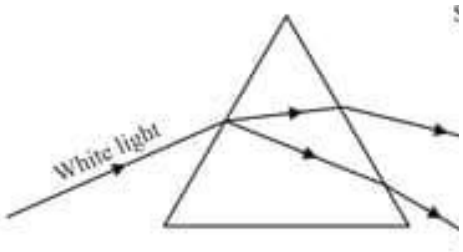
Self check 4—Light and colour

1. Stars and lamps can be seen because they give out light. How are other things, such as a pencil or your jotter seen ? You may draw and diagram to help you.

2. A beam of light strikes a mirror as shown :

Neatly copy and complete the diagram showing the direction of the beam of light. Add the normal to the diagram and label the angle of incidence and the angle of reflection .

3. Visible light can be split into 7 colours to form a spectrum.



(a) Name the seven colours produced.

(b) State which colour has the highest frequency.

(c) State which colour would bend the least.

Self check 4 continued

4. Copy and Complete:

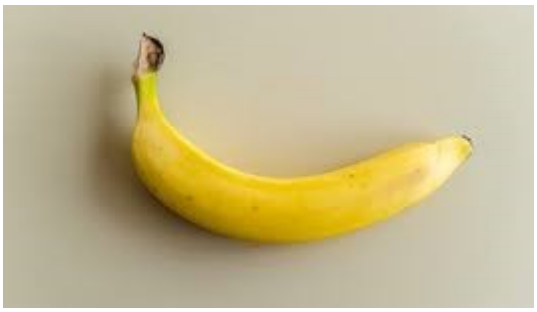
(a) Red + Green =

(b) Red + Blue =

(c) Blue + _____ = Cyan

(d) Red + Blue + Green =

5. A teacher places a yellow banana on her desk.



(a) Explain why the banana appears yellow to the learners in the room.

(b) The teacher switches off the lights and switches on a red light. State which colour the banana will look now. You must justify your answer.

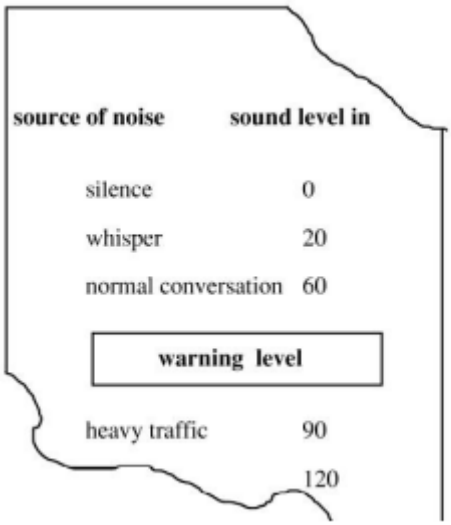
Self check 5—uses for light and sound

1. Humans can detect sound with a range of frequencies from 20 to 20 000 Hz.

   (a) What are frequencies beyond the range of human hearing known as?

   (b) Name two uses for these sound waves.

2. This poster appears on the wall of a hospital waiting room but part of it has been torn and some words are missing.



   (a) What is the missing word after “sound level in“?

   (b) The source of the sound with a level of 120 is also torn out of the poster. This source is a source of noise pollution. Give some possible examples of noise pollution.

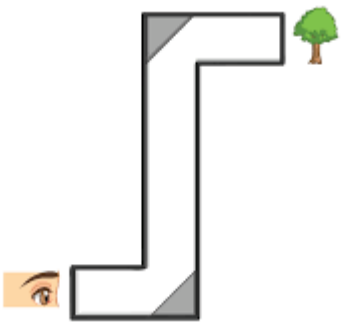
   (c) Why does the lower section of the paper carry a warning?

3. A sound engineer sometimes wears ear defenders in a studio. What is the purpose of ear defenders?

4. A student wants to spy around a corner into Mr Gough's class. He and his friend build a periscope.

(a) Explain how a periscope allows the student to see round a corner.

(b) Neatly copy and complete the diagram showing how a ray of light would travel from the tree to the student's eye. You must include arrows.



5. (a) List 3 other uses of light or sound.

(b) Research and write a brief description of how one of your choices work. You may include a diagram.