S2 Light and Sound Homework

Homework 1
Waves

1.

(a) What do all waves transfer?

The diagrams above represent two different wave forms

(b) What are the names given to each type of waves?

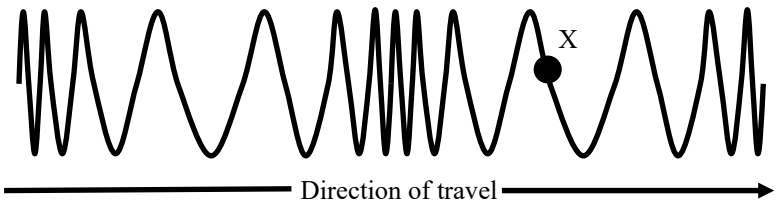
(c) Give an example of each of these waves.

2. *A slinky spring can be used to show different types of waves.*

(a) What type of wave is the slinky showing below?

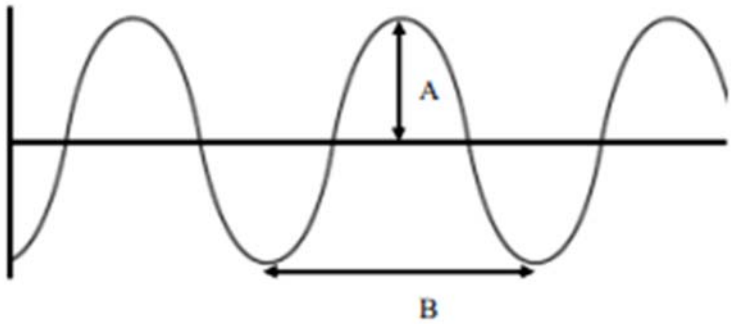
(b) The wave moves from left to right. How does point X move?

(c) Describe how point X would move in a transverse wave travelling from left to right?



3.

(a) Copy and complete the diagram below labelling A and B

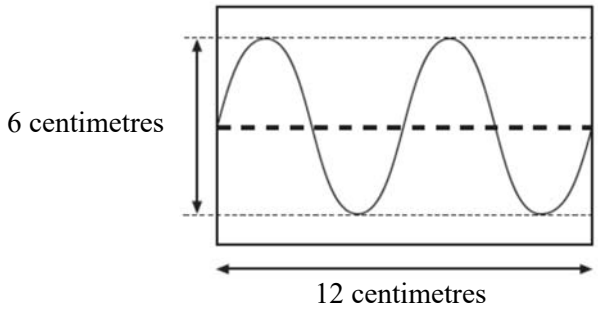


(b) Define the frequency of a wave

(c) What is the frequency measured in?

Homework 1 cont.
Waves

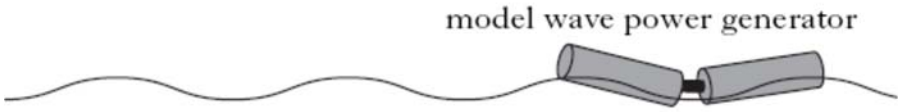
4. *Electrical signals are displayed as waves on an oscilloscope.*



(a) What is the wavelength of the waves ?

(b) What is the amplitude of the waves ?

5. *The diagram shows part of a water tank used to test a model wave power generator. A wave power generator uses waves to generate electricity.*



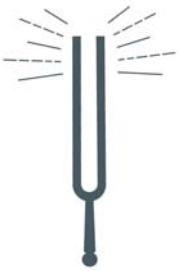
(*a*) A machine in the tank produces 20 waves in 10 seconds.
Calculate the frequency of the waves.

(b) The wavelength of the waves in the tank is 1·2 metres.
Calculate the speed of the waves in the tank.

(c) The amplitude of the waves in the tank is 0·15 metres.
Calculate the maximum vertical distance the wave power generator moves through.

6. A tuning fork produces a note of 262 Hertz.

Calculate the wavelength of the waves produced when the wave speed is 340 metres per second.



S2 Light and sound

Homework 2
Speed of sound

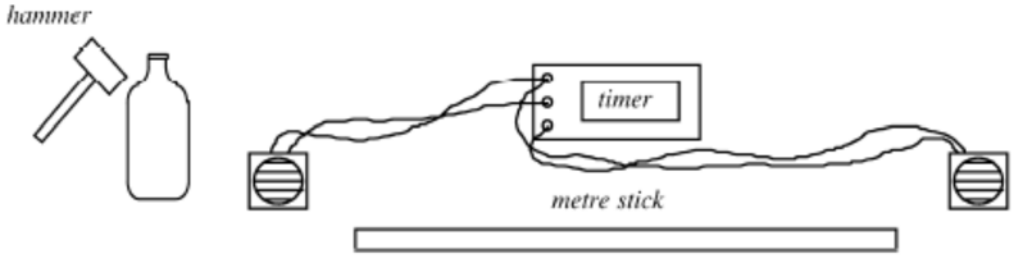
1. *A person walking through a golf course sees a golfer in the distance striking a golf ball. The sound of the club hitting the ball is heard by the person 2 seconds later.*

(a) Explain why there is a delay between seeing the ball being struck and hearing the sound.

(b) Calculate the distance between the person and the golfer. (*speed of sound in air = 340 metres per second*)

2. *A boy sees a firework explode in the night sky and starts a stopwatch. He stops the watch 1.5 s later when he hears the sound.*

Estimate the distance between the firework and the boy.



3. *A pupil uses the apparatus above to measure the speed of sound. Sound waves are produced when the hammer is struck against the bottle. When the sound waves reach the first sound sensor, a timer is triggered.*

When the sound reaches the second sensor, placed 5 m away, the timer stops. The final display on the timer shows 0.015 s.

(a) Calculate the speed of sound.

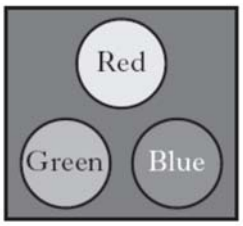
(b) The experiment is repeated five times to obtain an average time. The times in seconds are shown below :

0.017, 0.016, 0.014, 0.017, 0.019

Calculate the average speed of sound.

Homework 3
Light and colour

1. *Spectators viewing rugby in a stadium are able to view close-up images and replays of incidents in the match on giant screens.*



A cluster of LEDs

Each screen is composed of millions of clusters of LEDs. The diagram opposite shows one of these clusters.

(a) In one cluster all LEDs are switched on. What colour is observed?

(b) The green LED in this cluster is now switched off. What colour is observed?

2. *Stars and lamps can be seen because they give out light which enters our eyes.* Explain how we would see a green t-shirt?

3. What colour would a cyan jotter look behind a green filter? Justify your answer.

4.

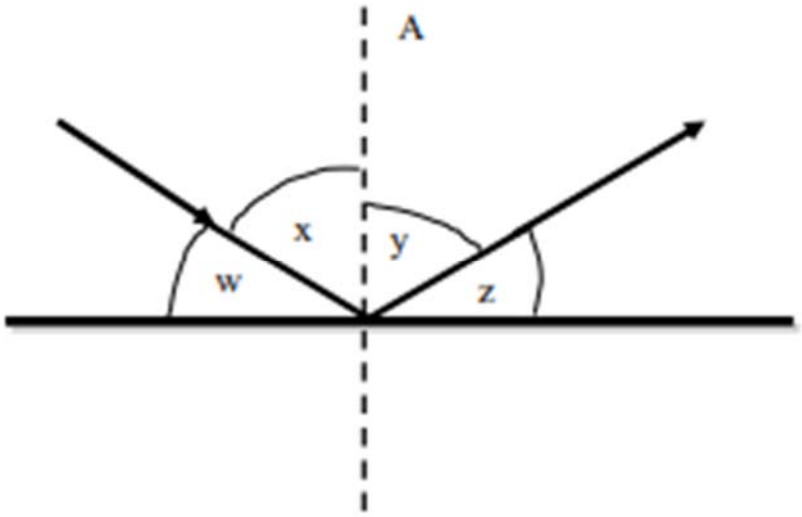
(a) State all of the colours of the spectrum.

(b) Design a mnemonic, or poem, to help you remember the colours of the spectrum. *e.g. Richard Of York Gave Battle In Vain.*

Homework 4
Law of reflection

1. Explain how we are able to see objects. Your answer should be in terms of light.

2. The diagram below shows how light reflects off a mirror:



(a) What is the name given to the dotted line labelled A?

(b) Which angle is the angle of incidence?

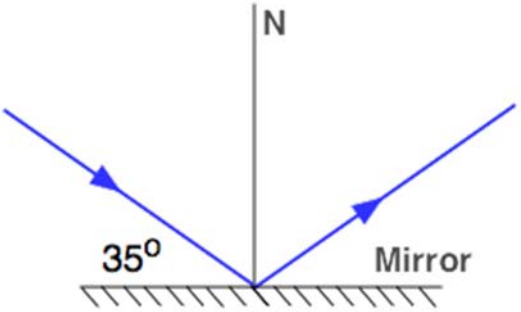
(c) Which angle is the angle of reflection?

3. State 3 uses of reflection in everyday life.

4. From the diagram across, state:

(a) the angle of incidence

(b) the angle of reflection.



Homework 5
Uses of light and sound

1.
A hiker stands near a gorge, and shouts so that she hears an echo from the gorge wall. She records a time of 0.53 seconds between her shouting and hearing the echo.

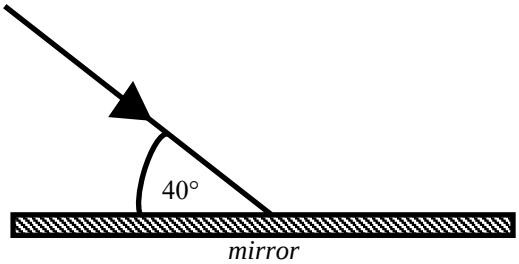
(a) What type of wave is a sound wave, and what speed does it travel at?
(b) Calculate how far the sound travelled in this time?
(c) Calculate the distance between the hiker and the gorge wall?

2.
Ultrasound scanners are used during pregnancy to image the growth of the foetus. Another use for ultrasound is to image the heart or other internal organs.

(a) Describe how ultrasound technology uses sound waves to image inside the human body.
(b) State whether humans can hear ultrasound waves. Give a reason why/why not.

3.
Mirrors uses light waves and the law of reflection to enable us to see ourselves and reflected objects. The diagram shows a light ray incident on a mirror.

Copy and complete the diagram and show the **normal**, **reflected ray** and the **angle of reflection.**



4.
Identify and research one other use of light waves that involves the law of reflection and mirrors, and describe how light is used in this use?