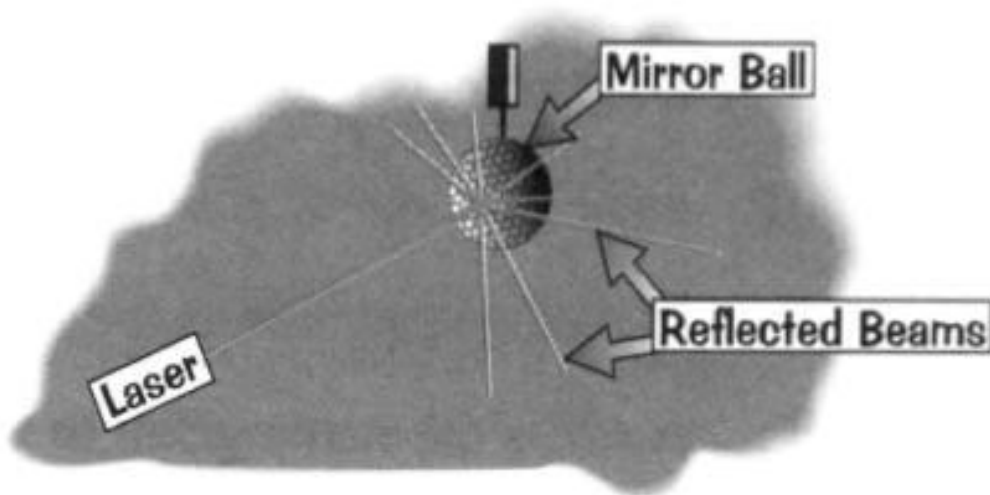


Task Booklet
Year 8 Science

Light and



Energy



Student Name:
Science Teacher:

Task One - How Light Travels

Core

1. The objects below all have something to do with light.
Circle the ones that are light sources.

a star

the moon

a mirror

white paper

a laser

a candle

2. The sentences below are in the wrong order. Rearrange them so that they are in the right order. Write the letters of the sentences to show this order.

A This is because light travels much more quickly than sound

B Some time later you hear the thunder

C Lightning strikes a distant hill

D You see the lightning first

3. Light travels very quickly but it still takes time to travel.
Match the distances to the times below by drawing a line between them.

Distance travelled by light

Time taken

across a room

eight minutes

to the moon

almost instantly

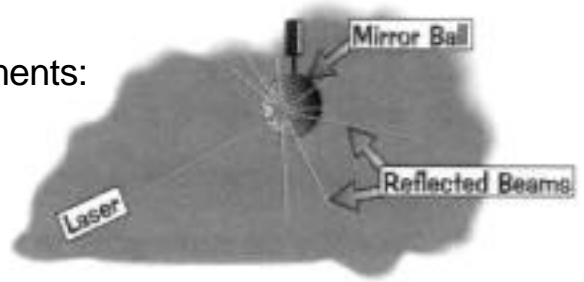
from the sun

just over a second

from a distant star

many years

Standard



4. Write true or false for each of these statements:
- (a) The mirror ball makes its own light
 - (b) The smoke shows you the path of the laser beam
 - (c) The laser could change direction in mid air
 - (d) The laser travels in a straight line until it hits the mirror ball
 - (e) The laser only changes direction at the mirror
 - (f) The reflected laser beams are strong enough to blind a dancer

5. (a) Lisa was outside of town. She saw the flash of a firework rocket exploding and heard the bang. Which sentence is true? (Tick the correct box).

She heard the bang first

She saw the flash first

She heard the bang and saw the flash at the same time

(b) Give the reason for your answer.

6. Use the words in the box to complete the following passage:

straight speed natural sun greater reflected artificial

Outside during the day we mostly see light from the _____ which is a source of light. At night we need to use sources of light like electric lamps. Light from all sources is _____ off the things we see. Light travels in _____ lines and at great _____, _____ much _____ than sound.

Task Two - What Happens When Light Meets an Object?

Core

1. Use the key words in the box to complete the sentences:

transparent translucent opaque absorb reflect transmit

- (a) A mirror will _____ light that hits it.
- (b) An _____ material will stop light altogether.
- (c) Black paint will _____ almost all of the light that lands on it.
- (d) A _____ material will allow light to pass through it easily.
- (e) A _____ material will allow light through it, but scatters it about _____ so you can't see anything.
- (f) A dirty mirror will _____ some light but it will also _____ some, making your face look dull.
- (g) The windows in a car are _____ so that they _____ light.

Standard

2. Look at the list of materials below. Write transparent, translucent or opaque next to each material to show how the material behaves when light is shone on to it.

- | | |
|---------------|-----------------|
| brick | glass |
| cloud | fog |
| air | scratched glass |
| lead | wood |
| steel | water |
| tracing paper | |

Light and Sound - Year 8 Science

Task 2

Standard

3. Write true or false next to the statements below:

Luminous objects need a light source to be seen

The moon makes its own light Dark objects

reflect less light than bright ones Light goes out of

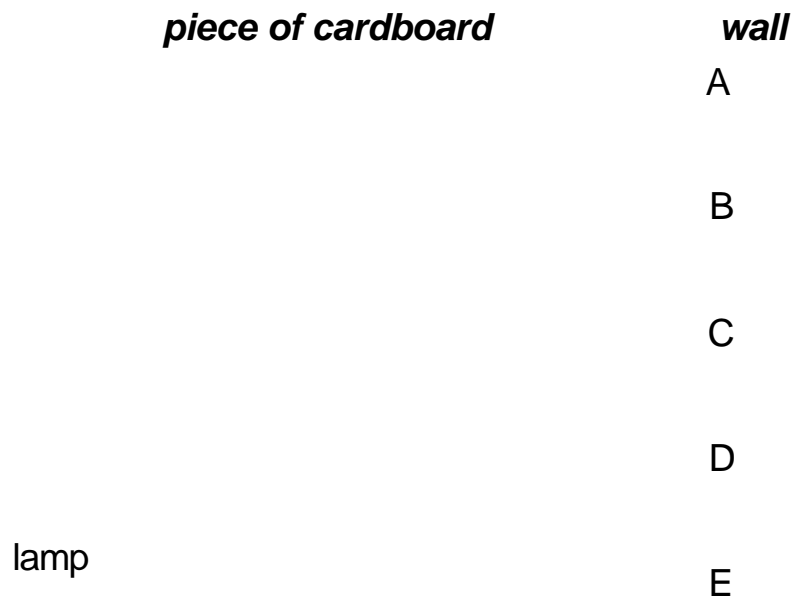
your eyes so you can see things

*In daylight the Sun is the original source of light that you
see things with*

A ray is the name given to the path that light follows

Extension

4. The diagram below shows a lamp and a piece of cardboard. The piece of cardboard has a hole in it. Light from the lamp passes through the hole and forms a bright spot on the wall.



(a) Which point on the wall, A, B, C, D or E will be lit up by the lamp?

(b) Why are the other points on the wall not lit up by the lamp?

Task Three - How do Mirrors Reflect Light?

Core

1. Each key word in the box below matches a sentence. Write the correct key word next to each sentence.

plane inverted reflected ray protractor periscope
incident ray normal image

- (a) The picture that you see in a mirror
- (b) Turned upside down, side to side, or both
- (c) Plastic semicircle used to measure angles
- (d) The ray that goes **into** the mirror _____
- (e) A device with two mirrors used in submarines
- (f) The scientific word meaning a flat surface _____
- (g) A line drawn at ninety degrees to a mirror _____
- (h) The ray that reflects away from the mirror _____

Standard

2. Complete these sentences below. The keywords in question one will give you some hints if you are stuck

'When light _____ from a mirror you should measure all _____ with respect to the _____. The angle that the light goes in at is called the angle of _____. This is equal to the _____ of _____ in a mirror is _____ from side to side but not from top to bottom. This means that it is the right way up but the wrong way round.'

3. (a) Which capital letters look the same in a mirror?

- (b) Why do ambulances sometimes have mirror writing on the front?

- (c) A periscope has two mirror. Why does this make it easier to understand what you see through it?

Light and Sound - Year 8 Science

Task 3

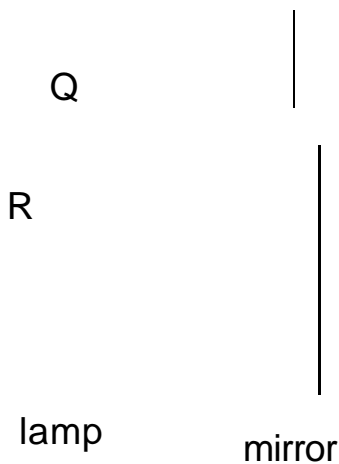
Standard

4. Complete these ray diagrams:



Extension

5. The diagram shows a ray of light from a lamp hitting a mirror.



(a) Which arrow, P, Q, R or S shows the reflected ray?

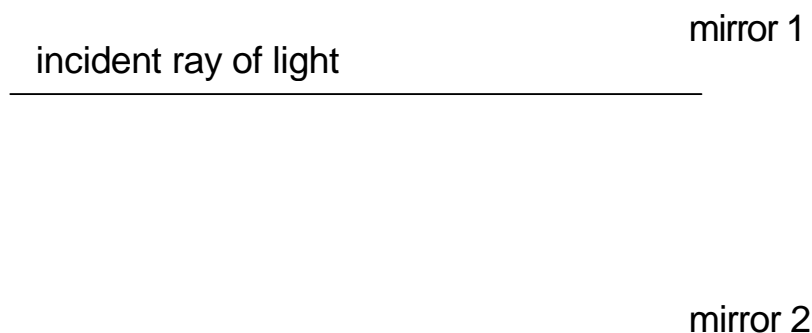
Label the angle of reflection with an 'V'.

Label the angle of incidence with an 'i'.

Which letter, P, Q, R or S shows the normal?

(e) Write down another name for a flat mirror.

6. Two mirrors at 90° to each other always reflect a ray of light back parallel to the incident ray. In the diagram below a ray of light strikes mirror 1 at an angle of 45° . Complete the diagram to show how the mirrors reflect the ray. Use a ruler and a protractor.

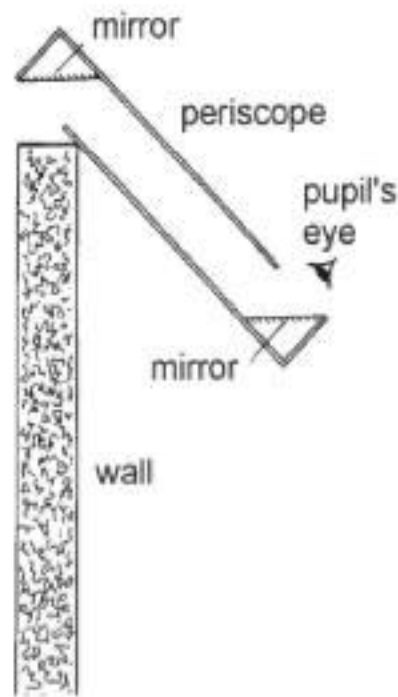


Task Four - Mirrors 2

Core

1. A student is observing the behaviour of a woodpecker. He uses a periscope to look over a wall at a tree and waits for the bird to land on the trunk.

The student can only watch one part of the tree trunk at a time.



- (a) Which point on the trunk can the student see with the periscope in the position shown?

- (b) Draw the path of the ray of light to show how the student sees this point. Use a ruler. Show the direction of the ray of light.
- (c) What should the student do to the periscope to watch point C ?

Standard

2. The diagram shows a lighthouse on a rock.
It is night time and there are boats at A, B, C, D and E.



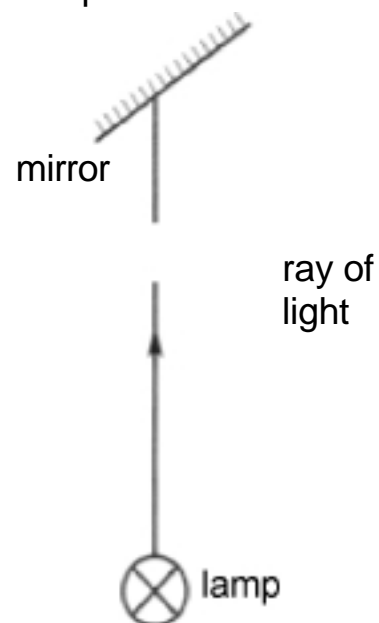
- (a) On which boat A, B, C, D or E would the light from the light house be brightest?

- (b) Each boat makes a shadow on the water.
(i) Draw a cross (X) on the diagram to show where the shadow of boat A will be.
(ii) Explain why the shadow forms there.

- (c) The weather changes and the fog horn on the lighthouse makes a loud sound. On which boat would the sound of the fog horn be quietest?

- (d) Inside the lighthouse there is a powerful lamp and some mirrors.

The diagram shows the lamp and a mirror. A ray of light from the lamp is shown. Carefully draw the ray which is reflected from the mirror. Use a ruler.



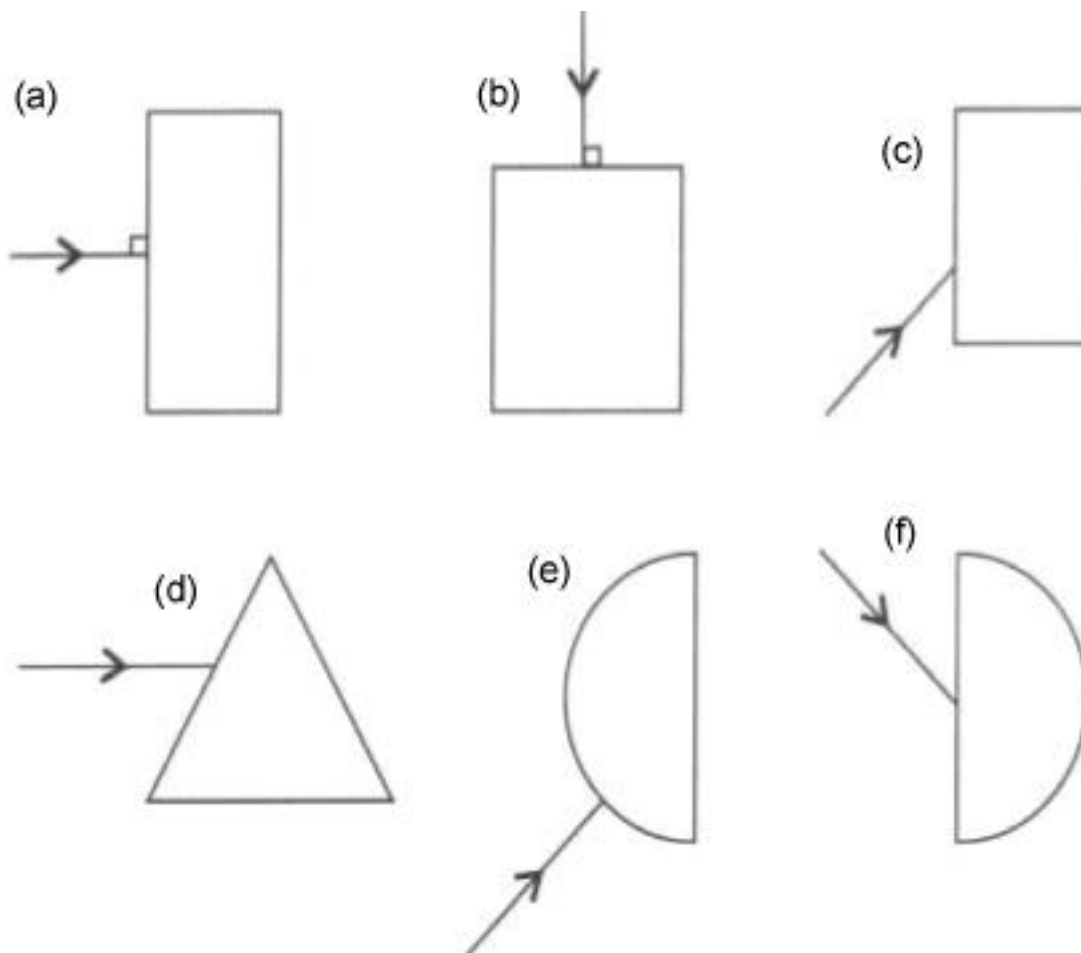
Task Five - Can Light be Bent?

Core

1. For each of these situations say whether it is caused by reflection or refraction.
 - (a) A swimming pool looks shallower than it really is _____
 - (b) You get a nasty glare from a wet road in the sun
 - (c) A pencil look bent when you put it into water
 - (d) You can see the moon
 - (e) Stars twinkle
 - (f) Your legs look shorter when you stand in water

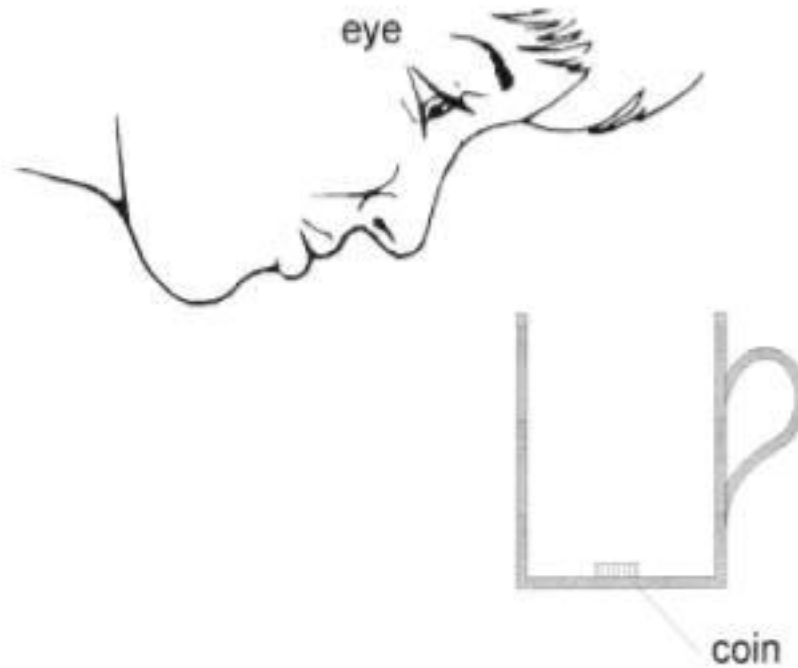
Standard

2. Complete these diagrams showing light being shone onto glass blocks.

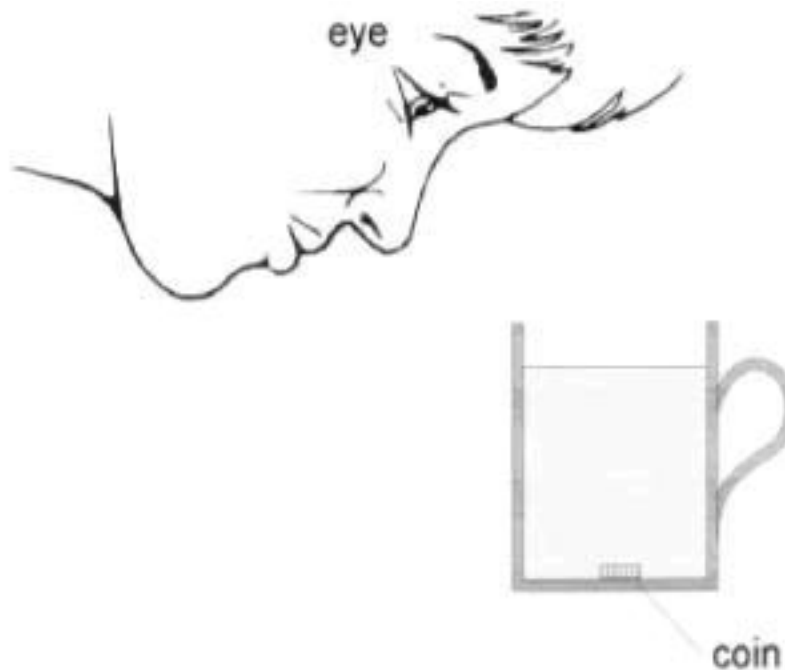


Extension

3. Sophie places the coin at the bottom of an empty mug. She cannot see the coin with her eye in the position shown.



- (a) Sophie fills the mug with water. Her head is in the same position as before but now she can see part of the coin.



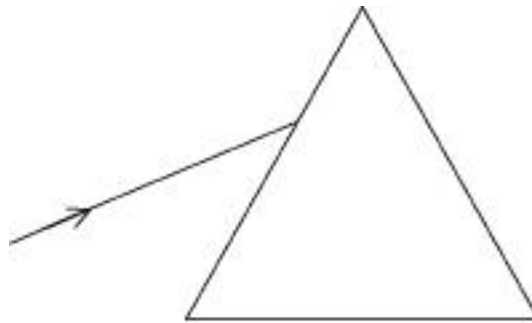
Draw a ray of light onto the diagram to show how Sophie can see part of the coin. Use a ruler.

- (b) Draw an arrow on the ray to show its direction.

Task Six - The Spectrum I

Standard

1. Complete the diagram below to show white light being shone onto a glass prism.



2. What will happen to the ray of white light as it passes through the prism?

3. What would you see if you shone the beam of light from the prism onto a screen (put the colours in order) ?

4. What is this order of colours called (do not say rainbow!) ?

5. Solve these anagrams. The answers all have something to do with the spectrum.

(a) der _____ (e) simpr _____

(b) lube _____ (f) so inspired _____

(c) enger _____ (g) went no _____

(d) to vile (h) go near

6. The answers to these questions are all colours or lists of colours.

- (a) Isaac Newton listed seven colours in the spectrum. Which is the one that most people can't make out as a separate colour?

- (b) What colour would you see if you used a second prism to recombine the spectrum made by a prism?

- (c) Which colour is bent most and which colour is bent least by a prism?

most

least

Task Seven - Colours

Core

1. Which of these statements are true and which are false? (a) the spectrum contains seven colours _____
- (b) the primary colours (of light) are red, green and blue
- (c) the only colour that cannot be made by mixing primary colours is white _____
- (d) white surfaces reflect all colours equally well
- (e) yellow light is made by adding blue and red light together _____
- (f) a filter absorbs the colours of light that it does not transmit _____
- (g) a coloured surface absorbs the colours you see and reflects the ones you don't

Standard

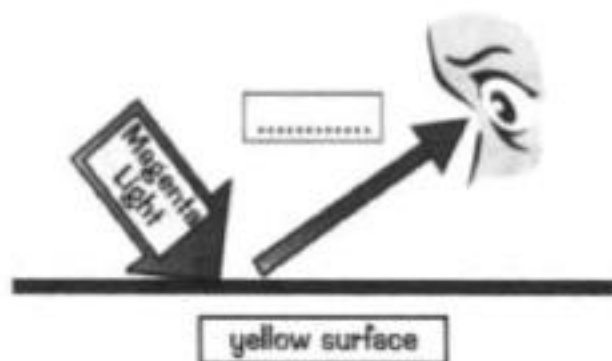
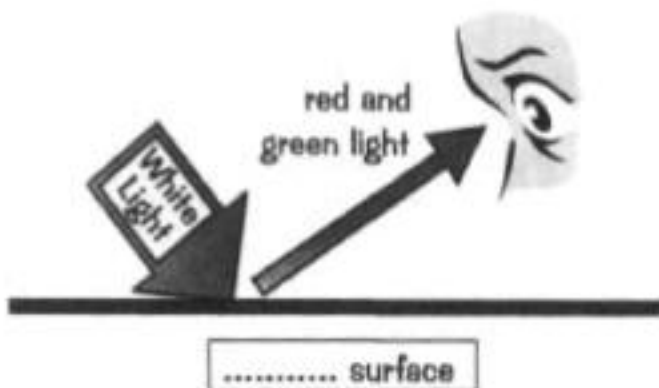
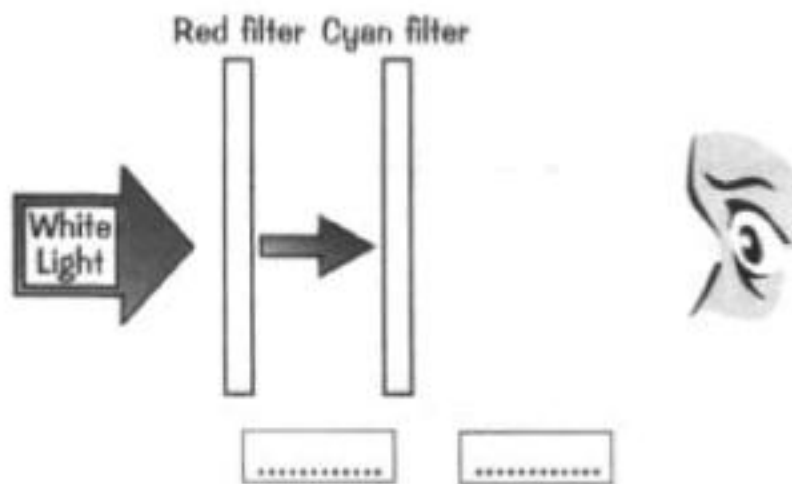
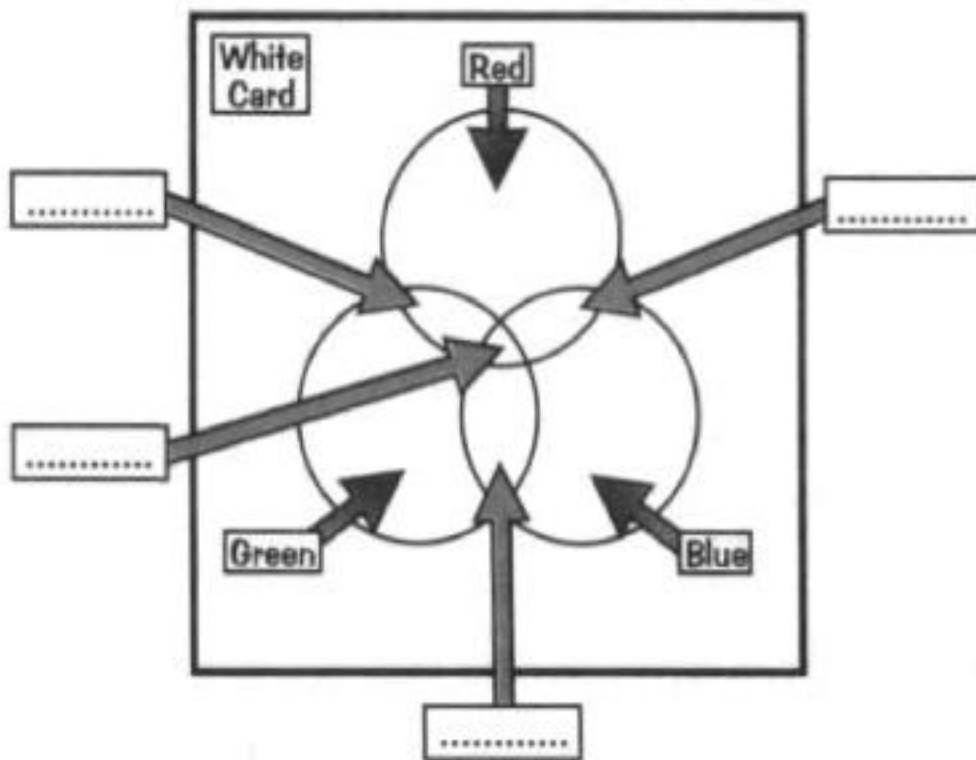
2. Complete the following statements.
- (a) *If white light shines on a red filter, _____ and _____ are absorbed but _____ is transmitted.*
- (b) *If white light shines on a yellow surface, _____ is absorbed absorbed but _____ and _____ are reflected.*
- (c) *If blue light shines on a yellow filter, _____ light is transmitted.*
- (d) *If a coloured pencil reflects red and blue light you would see the colour _____.*
- (e) *If yellow light shines on a green surface then _____ is reflected.*
- (f) *If _____, _____ and _____ are absorbed completely then you see _____.*

continued ->

Light and Sound - Year 8 Science
Extension

Task 7

3. Complete these diagrams:



Task Eight - Pitch and Loudness

Core

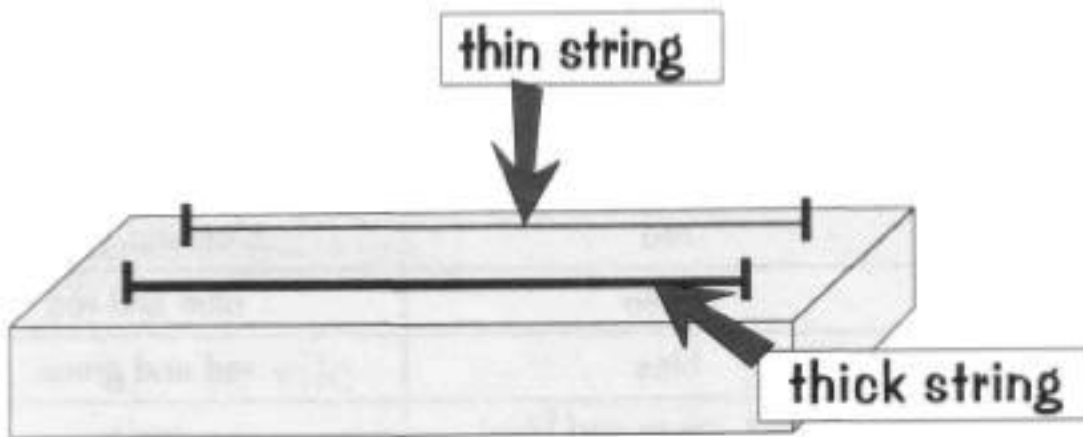
1. Use the words in the box below to fill in the gaps in the sentences below.

quiet high low loud vibrating pitch volume

- (a) Sounds are produced when objects are _____.
- (b) The _____ of the sound from a bass guitar is usually _____.
- (c) The _____ of the sound from a whistle is usually _____.
- (d) A jet engine is _____ because its _____ is high.
- (e) A whisper is _____ because its _____ is low.

Standard

2. A guitar can make different musical notes. The sentences below the diagram are muddled up. Match the start of each sentence with the correct ending by drawing lines from one to the other.



- | | |
|--------------------------------|----------------------|
| (a) Using a thicker string... | .gives a higher note |
| (b) Tightening the string... | .gives a louder note |
| (c) Making the string shorter. | .gives a lower note |
| (d) Making a bigger vibration. | .gives a higher note |

Standard

3. Ahmed is at a disco. He is listening to the music and he decides to move closer to the speakers.

(a) Describe what a speaker is doing to produce a sound.

(b) Describe how the loudness of the sound that Ahmed hears changes as he moves nearer to the speaker.

(c) Describe how the pitch of the sound that Ahmed hears changes as he moves nearer to the speaker.

4. Use the words in the box to complete the passage below.

<i>eardrums solids liquids loud wave amplitude vibration frequency vacuum less high tightening shorter</i>

*'The movement of sound can be described as a _____
and all sounds are produced by some sort of ____
Sound cannot travel through a _____ but it can travel
through gases, _____ and _____. A high
_____ of vibration makes a _____ pitched
sound and a large _____ produces a _____
sound. Sound waves travel _____ quickly than light. We
hear sounds when our _____ vibrate. The pitch of a guitar
string can be raised by _____ the string and
_____ organ pipes tend to produce the highest
frequencies.'*

Task Nine - Sound Waves

Core

1. Fill in the gaps in the sentences below.

The *l*

decided by the *a* _____ of a sound is how loud or quiet it seems to us. It
v _____ . The *p* _____ is

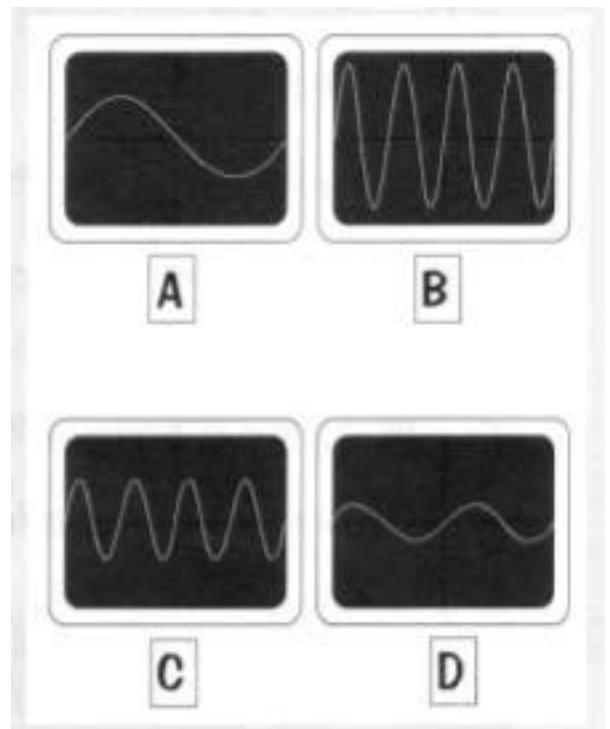
_____ , which is the size of the
_____ of a sound is how high or low
it seems to us. It is decided by the *f* _____ , which is how fast
the object v_

Standard

2. Read the passage, look at the oscilloscope traces and then answer the questions.

The buzzing sound that bees make is caused by their wings beating the air as they fly.

A microphone and oscilloscope was used to show the pattern of sound from four species of bee, A, B, C and D. The oscilloscope pictures show the results.



(a) Which of the bees has

(i) the quietest buzz?

(ii) the loudest buzz? _____

(iii) the lowest frequency buzz?

(b) Which two bees are beating their wings at the same frequency?

Light and Sound - Year 8 Science

Task 9

Standard

3. Here are five different musical instruments.



guitar



trombone



triangle



violin



drum

(a) For each instrument say what you have to do to get a note out of it and what vibrates to make the note. Fill your answers into the table below.

<i>instrument</i>	<i>how to get a note...</i>	<i>what vibrates?</i>
guitar		
trombone		
triangle		
violin		
drum		

(b) For each instrument say what you have to do to make the sound louder and how you make the pitch higher. Fill your answers into the table below.

<i>instrument</i>	<i>to make the sound louder...</i>	<i>to make the pitch higher...</i>
guitar		
trombone		
triangle		
violin		
drum		

Task Ten - The Speed of Sound

Core

1. Jermaine watched a storm from his house. Using his watch he discovered that the gap between seeing the lightning and hearing the thunder was 6 seconds.
- (a) Why is there a gap between seeing the lightning and hearing the thunder?

 - (b) Describe how the sound travels through the air to get to Jermaine.

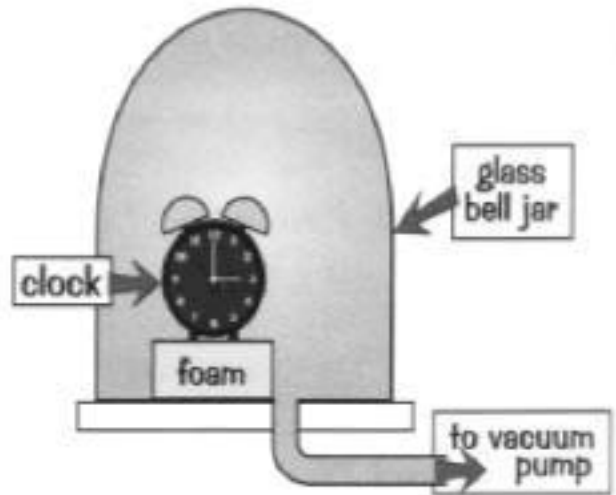
 - (c) Sound travels about 1 km in three seconds. How far away from the house was the lightning strike?

Standard

2. Here is a diagram of a famous experiment.

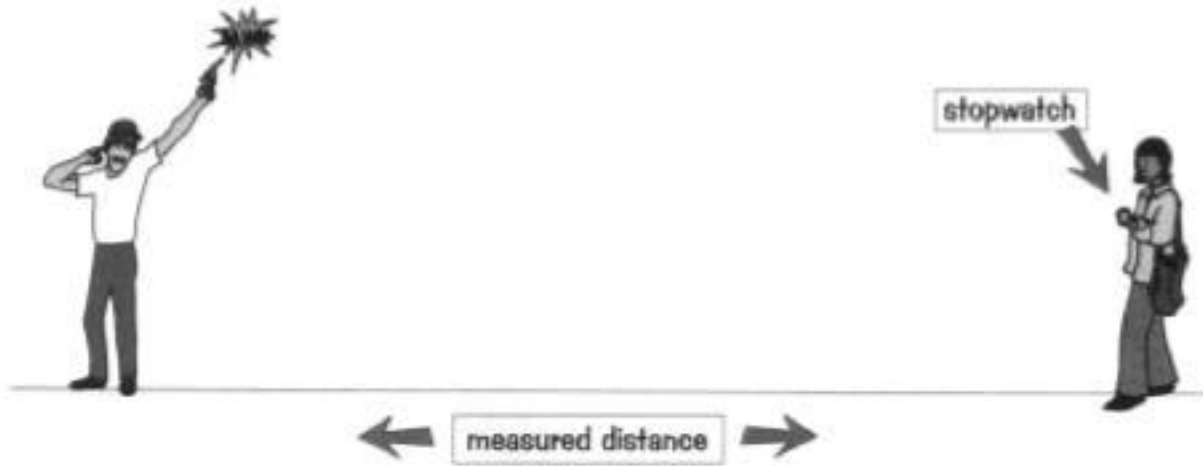
- (a) Describe what you would notice as the pump took the air out of the jar.
- (b) How could you be sure that the alarm clock was still ringing?
- (c) Aside from the foam and the clock, what is in the jar
 - (i) at the start? _____
 - (ii) at the end? _____
- (d) Why is the clock on a foam block rather than resting on the jar base?

- (e) What can you conclude from this experiment?



continued ->

3. Some students wanted to measure the speed of sound in air. They start the stopwatch as soon as they see the flash of the starting pistol and stop it when they hear the sound. Use the results to work out the speed of sound they measured. Show how you worked it out.



Distance = 108m Time delay between seeing flash and hearing sound = 0.6s
Speed of sound =

Standard

4. Sound travels faster through some substances than others. Here are some examples.

substance	air	water	concrete	steel
speed of sound (m / s)	340	1500	1500	5000

(a) Plot these figures as a bar chart on the grid below.



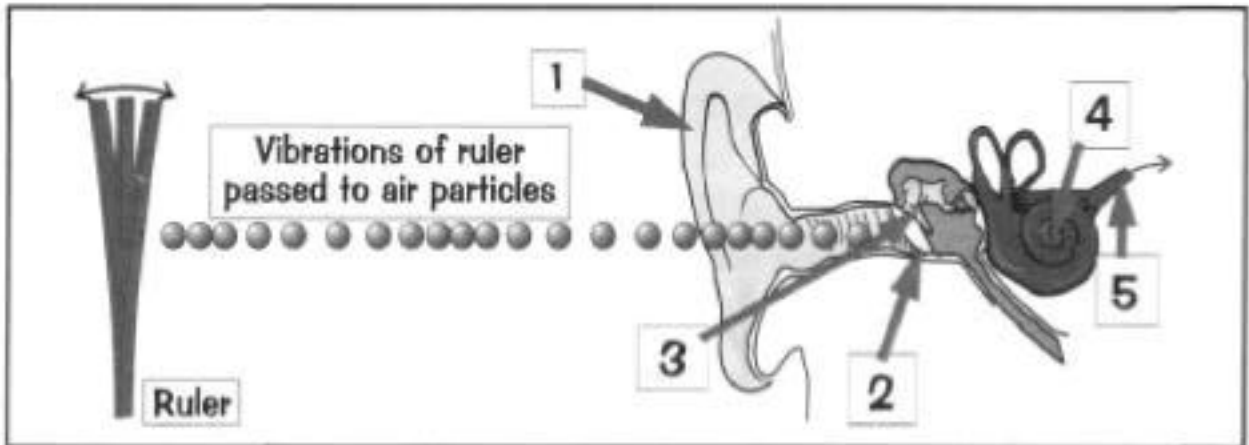
(b) Fill in the blanks below. Use the words solids, liquids or gases.

'Sound travels fastest through _____ and slowest through _____. Sound travels faster through _____ like water than through _____

Task Eleven - Hearing

Core

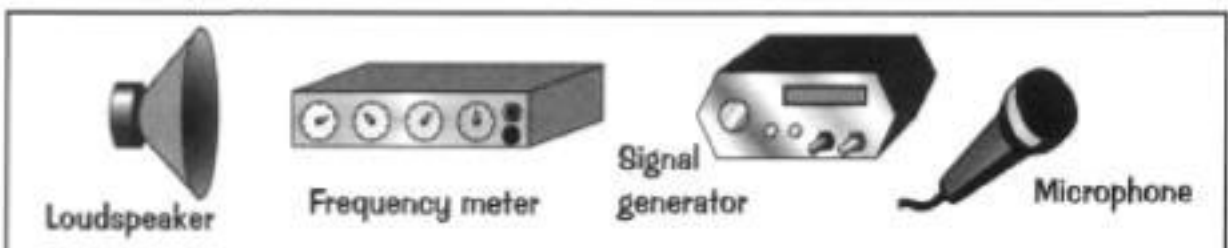
1. The diagram shows the structure of a human ear.



Write the name and number of the parts of the ear that carry out the functions below.

	name	number
(i) passes sound along the middle ear	_____	_____
(ii) vibrates when sound hits it	_____	_____
(iii) collects sound and funnels it down the ear canal	_____	_____
(iv) sends electrical signals to brain	_____	_____
(v) translates sound into electrical signals	_____	_____

2. The equipment in the diagram can be used to compare the audible range



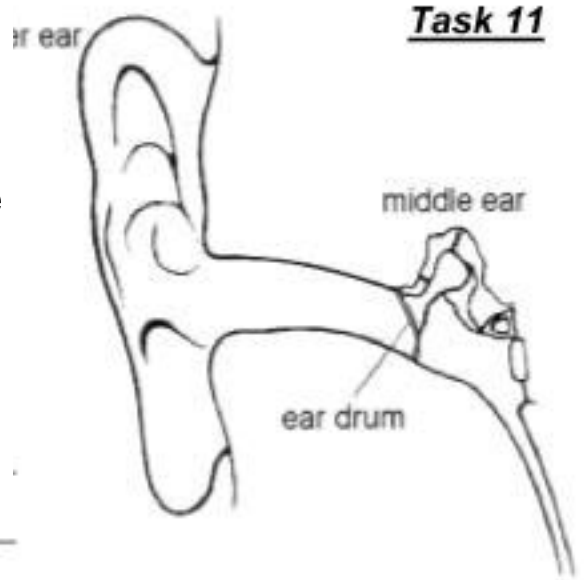
(a) What is the job of the signal generator?
of different people.

(b) What is the job of the loudspeaker?

(c) What should they keep the same for each person to make it a fair test?

Light and Sound - Year 8 Science

3. The diagram shows part of an ear.
Sound waves enter the ear and make the ear drum vibrate.



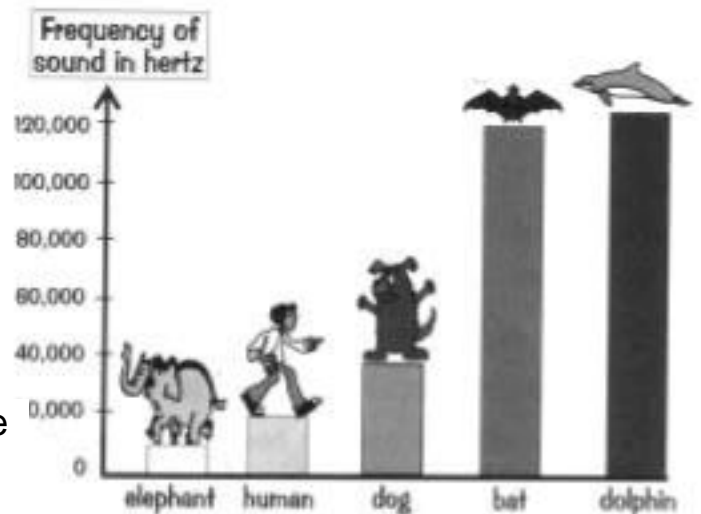
- (a) The pitch of the sound is increased. What difference will this make to the way the drum vibrates?
- (b) The sound is made louder. What difference will this make to the way the ear drum vibrates?

(c) Explain how a person's ear can be damaged by loud sounds.

(d) When people speak sounds are made by their vocal cords. How do the vocal cords make a sound?

(e) What job does the outer ear do?

4. Different animals can hear different ranges of sound pitch. This is called their audible range. The chart shows the audible range for some animals.



(a) Which of these animals can hear sounds higher than humans?

(b) Which of these animals have a smaller audible range than humans?

(c) What do we call sounds that are too high for humans to hear?

(d) What do bats use high pitched sound for?

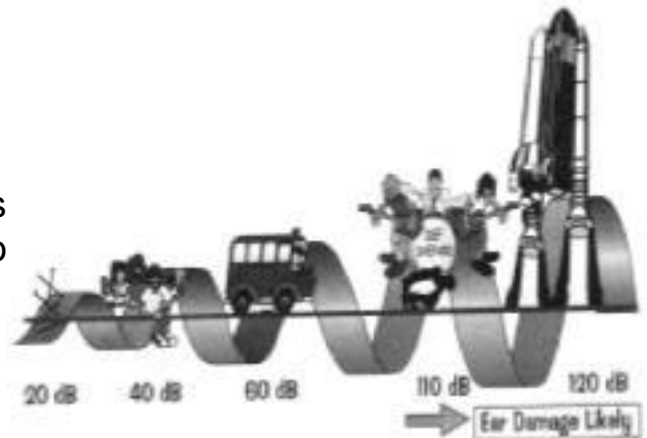
Task Twelve - Investigating Sound

Core

1. The diagram shows the intensity of some sounds.

(a) What does dB stand for?

(b) People working in noisy places have to wear ear defenders to reduce the sound intensity. Why?



Standard

2. The table shows how the pitch of a sound produced by a string depends on how long the string is.

Length of string (cm)	10	20	30	40	50
Pitch of sound (Hz)	500	250	168	125	100

(a) What factors have to be kept the same to make it a fair test?

(b) What is Hz short for? _____

(c) Draw a line graph of the results on the grid below.

(c) Use your graph to answer these questions.

(i) What would be the pitch of the sound if the string was 15cm long?

(ii) How long would the string be if the pitch was 200Hz?

(d) Complete these sentences to write a conclusion for this experiment,

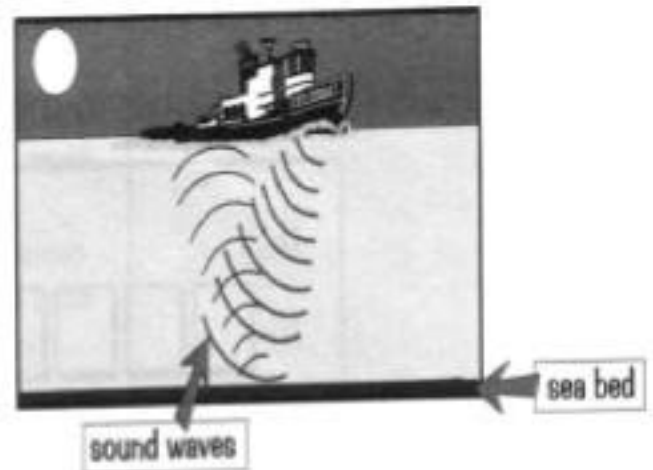
(i) *The longer the string the* _____

(ii) *If we halve the length of the string the pitch*

Extension

3. Sailors can use sound waves to measure how deep the sea is. The diagram shows how it is done.

The boat sends out a loud PING! which hits the sea bottom and comes back. Equipment on board picks up the returning (quieter) ping and measures how long it took to come back. Sound travels at 1500m/s in sea water.



(a) What do we call the sound that hits the sea bed and comes back?

(b) The sound takes 3 seconds to get back to the boat,

(i) How long did it take to get to the sea bed?

(ii) How long did it take to get back to the boat from the sea bed?

(iii) Use this information to work out how deep the sea must be in this place.
