8Ja LIGHT ON THE MOVE

1 Write the correct scientific term next to each definition.

absorb — to take in

transmit — to pass through a substance

reflect — to bounce off a surface

scatter — to send things off in different directions

2 In a thunderstorm, you see the flash of lighting before you hear the thunder. Give the reason why this happens.

light travels much faster than sound

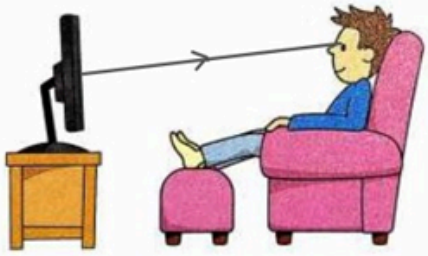
3 Light and sound both travel as waves. Write down two differences between light waves and sound waves.

i sound waves are longitudinal waves and light waves are transverse waves.

ii Light can travel through vacuum but sound needs a medium. iii Light is faster than sound

4 Add light rays to the drawings to show how the boy can see a programme on TV, and how the girl can read a book.

Use a ruler and a pencil
Pay attention to the direction of arrow heads



SB **5** Look at the diagram.

Which material (X, Y or Z) is:

a translucent Z

b opaque? Y

c Explain your answers.

Z is letting most of the light to pass through, but the direction of the light is changed.

Y is reflecting or absorbing all the light that hits it (no light can pass through)

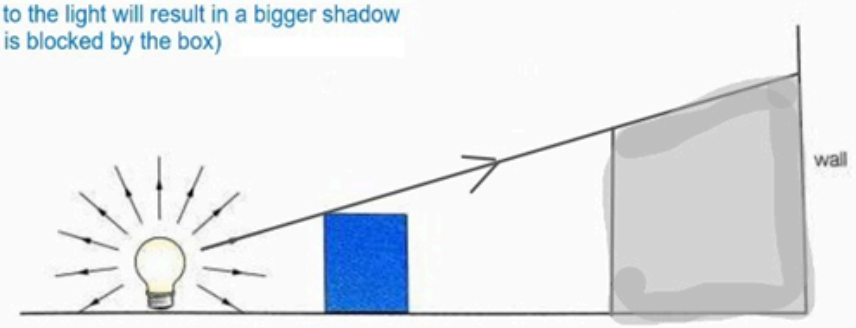
8Ja LIGHT ON THE MOVE

6 Someone is singing in another room with the door closed. Explain why you can hear (sound) them but not see (light) them.

Sound can pass through the materials that the door/ wall is made of, but light cannot.

7 The diagram shows a box standing next to a light source.

Box closer to the light will result in a bigger shadow
(more light is blocked by the box)

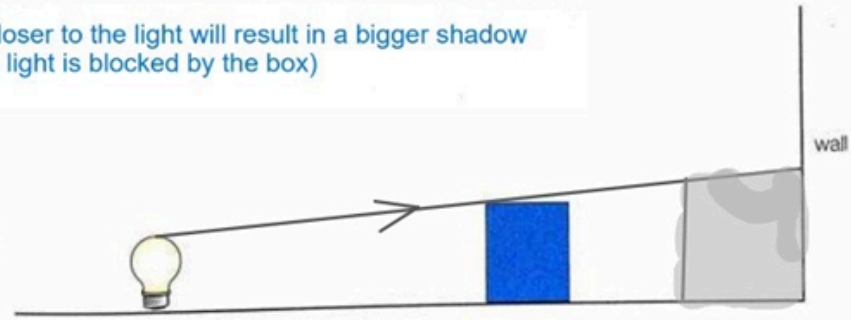


a Explain why the box makes a shadow on the wall.

b Finish drawing one of the rays to work out where the top of the shadow will be. Shade in the shadowed part of the wall.

c The box is moved closer to the wall. Draw lines on the diagram to help you to work out the new size of the shadow.

Box closer to the light will result in a bigger shadow
(more light is blocked by the box)



d Draw a smile on the face to show how confident you are that your answers to parts **a** to **c** are correct – the bigger the smile, the more confident you are.

8Jb DRAWINGS AND CONVENTIONS (WS)

SB **1** Why do we need to use ray boxes and paper when we investigate light?

The box produces a narrow beam or beams of light that can be marked on paper.

This makes it easier to follow and measure the paths of light rays.

SB **2** Why is it important to use agreed symbols and conventions in science?

So that all scientists can understand the diagrams.

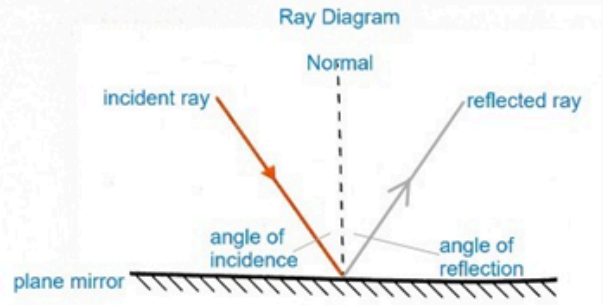
3a Draw *one* line from each scientific term to its correct definition.

Scientific term	Definition
angle of incidence	a diagram showing rays of light as straight lines with arrows showing which way the light is going
angle of reflection	a flat mirror
incident ray	a line drawn at right angles to the mirror
normal	a ray of light travelling away from the mirror after being reflected
plane mirror	a ray of light travelling towards a mirror
ray diagram	the angle between the incident ray and the normal
reflected ray	the angle between the reflected ray and the normal

b The diagram shows light being reflected by a mirror.

i Complete the diagram using the standard conventions for ray diagrams.

ii Label your diagram using words from part **a**.



8Jb REFLECTION

SB **1** Light hits a plane mirror with an angle of incidence of 20°. What will the angle of reflection be? 20°

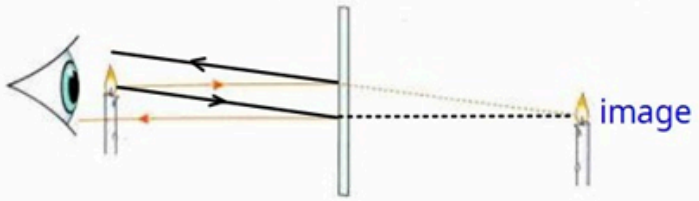
2 These statements are about different kinds of reflection. Tick (✓) the boxes to show whether each one is true or false. Draw a smile on the face for each statement to show your confidence—the bigger the smile, the more confident you are.

Statement	True	False	
a Transparent materials do not reflect any light.	☐	✓	☺
b The law of reflection states that the angle of incidence is equal to the angle of reflection.	✓	☐	☺
c Smooth surfaces like mirrors produce diffuse reflection.	☐	✓	☺
d Rough surfaces scatter reflected light in all directions.	✓	☐	☺
e Paper produces diffuse reflection.	✓	☐	☺
f Specular reflection is when all the reflected rays of light go off in the same direction.	✓	☐	☺

SB **3** Explain why you can see your reflection better in a piece of metal if you polish the surface.

polishing makes the surface smoother, so light will more likely be reflected evenly / less scattered.

4a Complete the ray diagram below to show how we can see the reflection of a candle in a mirror. (*Hint*: You need to draw *two* rays and a dashed line.)



b Write 'image' next to the image on the diagram.

8Jb REFLECTION

5a How big is the image in a plane mirror compared to the object being reflected? Tick (✓) *one* box.

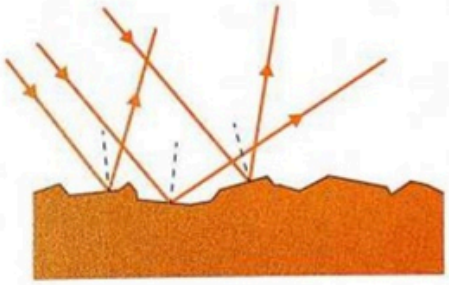
- ☐ **A** The image is smaller than the object.
- ☑ **B** The image is the same size as the object.
- ☐ **C** The image is larger than the object.
- ☐ **D** The object is larger than the image.

b How far behind the mirror does the image appear to be? Tick (✓) *one* box.

- ☐ **A** The image appears further away from the mirror than the object.
- ☐ **B** The image appears closer to the mirror than the object.
- ☑ **C** The image appears the same distance from the mirror as the object.
- ☐ **D** The distance depends on the kind of object being reflected.

6 Hani says: 'The law of reflection works on all surfaces, even when the surface scatters light.'

a Explain why Hani is correct. You may refer to the diagram in your answer.



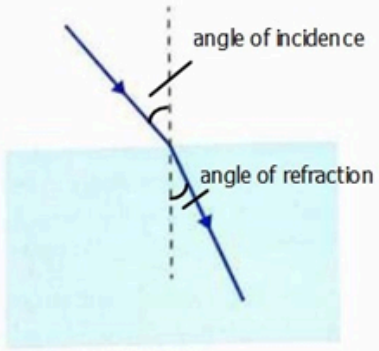
The law of reflection is obeyed for each part of the surface, but because the surface is rough (has lots of different angles) the reflected rays go offin different directions.

b Compare your answers to part **a** with a partner. Work together to improve your answers. Write your improved answer below.

8Jc REFRACTION

1 Label the diagram on the right using words from the box.

angle of incidence	angle of refraction	normal



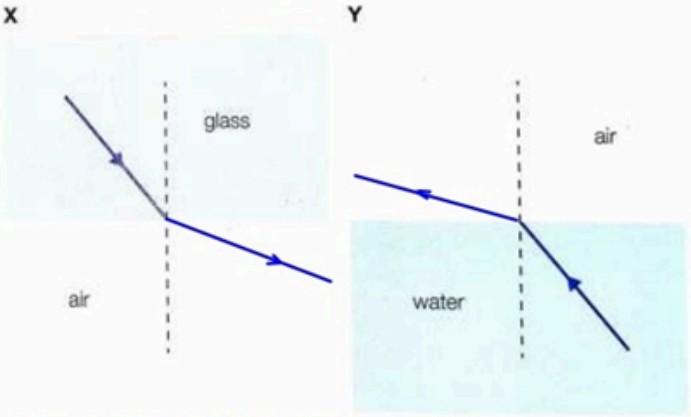
2 Complete these sentences by crossing out the incorrect words.

Note: this paragraph explains refraction of light

Refraction happens when light travels from one ~~opaque~~ / *transparent* substance to another. It occurs when light travels from air into glass because light travels more ~~quickly~~ / *slowly* in glass or water than in air.

When a ray of light enters glass, it changes direction ~~away from~~ / *towards* the normal. When it goes from glass to air, it bends *away from* / ~~towards~~ the normal.

3 Diagrams X and Y show a ray of light going from glass to air, and from water to air. Finish drawing the light rays.



4 When you look into water in a swimming pool, objects on the bottom often appear to be closer to you than they really are. Explain why this happens.

Rays of light reflected by the object bend away from the normal as they leave the water.
The rays of light appear to be coming from a place above the bottom of the water, so the water looks shallower than it really is.

SB

5 Describe the shape of a converging lens.

Thicker/fatter in the middle than at the edges.

6a Describe what a converging lens does to a beam of light.

Makes the beam come together/makes rays of light converge.

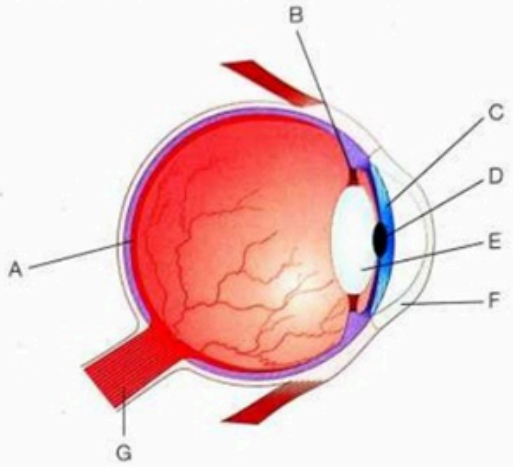
b Explain how the thickness of a converging lens affects the position of the focal point of the lens.

The thicker the lens, the closer the focal point is to the lens.

8Jd CAMERAS AND EYES

1 The diagram shows a human eye.

a Write the correct letter next to each part of the eye.



i cornea F

ii iris C

iii lens E

iv muscles B

v optic nerve G

vi pupil D

vii retina A

b Which part (or parts) of the eye:

i focuses light the lens and the cornea

ii lets light enter the eye the pupil

iii detects light and produces nerve impulses the retina

iv helps the eye to focus on objects at different distances. the lens and the muscles

c Ask your teacher how many of your answers to parts **a** and **b** are correct. Then work with others and the Student Book to identify your incorrect answers. Make corrections and check with your teacher. Do this until they are all correct.

2 The iris can change the size of the pupil.

a How does the size of the pupil change when there is only dim light? it gets bigger

b Explain how this helps the person to see. it allows more light into the eye.

3 In a camera, electronic sensors detect light and produce electrical signals. Describe *one* difference between the electrical signals produced by a digital camera and an eye.

not included

4 Name the primary colours of light. red, green, blue

8Je COLOUR

1 Complete these sentences using words from the box.

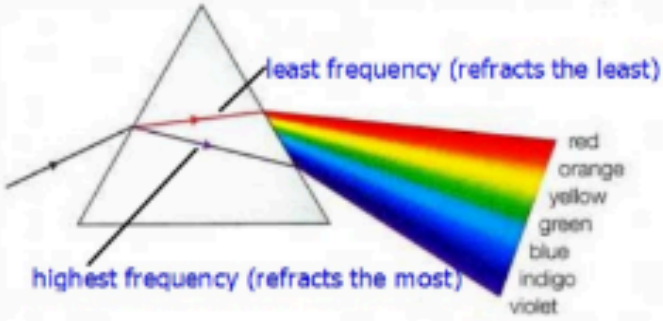
dispersion	frequency	refracted	spectrum	water	white

Explain how rainbows are formed.

Rainbows form when water drops in the air split up white light into the different colours of the spectrum.

We can also split up white light using a prism, because each frequency of light is refracted by different amounts. This effect is called dispersion.

2 The diagram shows white light passing through a prism. Violet light has the highest frequency of all the colours that make up white light.



a Explain how you can work out the relationship between the frequency of a ray of light and its angle of refracton.

violet light is bent / refracted the most and it has highest frequency of all the colours . So higher frequencies must be refracted more than lower frequencies of light.

b Share your explanation with others. Discuss how clear it is. Write down one thing you could improve about your explanation.

3 Which colours in white light does a blue object:

a reflect blue

b absorb? red, orange, yellow, green, indigo, violet

4 Explain how a blue filter makes blue light.

It transmits the blue light and absorbs all the other colours

5 Blue light shines on a red ball. Explain why the ball appears to be black.

The red ball absorbs all the colours except the red (the red ball only reflects red light).

If there is only blue light the red ball will absorb it and reflect nothing.