Science
Topic 8: Light and Heat

Topic 8: Light and Heat

1. Draw a line between each word about **heat travel** and its correct definition.

radiation	Heat travels through solids in this way. If you put one end of a metal bar in a fire, the solid metal conducts heat from hot to cold – the far end of the bar gets hot too.
conduction	Heat can travel through liquids and gases in this way. When water is heated in a pan, the hot water at the bottom rises up to the surface. Cool water sinks to take its place. These movements are currents that carry heat to all parts of the liquid.
convection	The sun's heat is carried through empty space by invisible heat rays. You can feel them warm your body when you stand in the sunshine. Heat rays do not need a solid, liquid or gas to travel. We say that heat is transferred in this way when rays carry heat from one place to another.

2. Choose the correct words from the list to fill the gaps in the text about **conductors and insulators**.

prevent	allow	cooking	conductors
conduct	poor	insulators	

Most metals are good a) _____ of heat. This means that they allow heat to pass through them easily. This is why we use them to make b) _____ pots. They c) _____ heat to the food inside. Materials like plastic, cork, cloth and wood are d) _____ conductors of heat – they are heat e) _____ . These materials do not f) _____ heat to pass through them. A wooden spoon and a plastic handle insulate the cook's hands from the heat. We can use insulators to g) _____ heat leaving or entering an object so that it stays hot or cold.

3. Make sentences about **conductors and insulators** by matching the beginnings and endings. Write your answers in the grid below.

a)	A metal iron	1	insulate our bodies to keep us warm when the air is cold.
b)	A metal radiator in a car	2	keeps a picnic cool.

c)	A cloth,	3	conducts heat away from the engine.
d)	Blankets stop heat from escaping and	4	conducts heat to the clothes.
e)	An insulated box	5	insulates a hot metal cake tin.

Write your answers here:

a)	b)	c)	d)	e)

4. Underline the correct word to complete the text about **light and seeing**.

We need a) **light / night / bright** to see. Light comes from the sun and other sources. Light b) **(burns / boils / bounces)** from objects and surfaces into our eyes. Light travels in c) **straight / curved / bent** lines through empty d) **shadows / space / stars**, but when light strikes materials different things can happen. When light enters our eyes we see the world around us. The light may bounce back, change direction or e) **steam / sink / split** into different colours. It may be f) **scattered / prevented / reversed** in all directions. Different surfaces g) **reach / reflect / react** different amounts of light. This is why some things look shiny and h) **transparent / invisible / bright**, and others look i) **dull / lunar / solar**. At night the moon reflects some light from the sun and stars give a little light, but there is usually not enough light to read or to work so people use j) **artificial / straight / opaque** light to see when it is dark.

5. Make sentences about **different materials and light** by matching the beginnings and endings. Write your answers in the grid below.

a)	A mirror reflects light and	1	scatters the rays so a clear image cannot be seen.
b)	A glass prism bends light and	2	transmit other colours.
c)	Coloured filters absorb some colours of light and	3	it absorbs any light that falls on it.
d)	A translucent piece of glass allows light to pass through, but	4	may disperse or separate the light into the colours of the rainbow.
e)	Black paper is opaque and	5	if the mirror is curved it distorts the image.

Write your answers here:

a)	b)	c)	d)	e)

6. Read the text below and fill in the table with information about **materials and light**.

Transparent materials

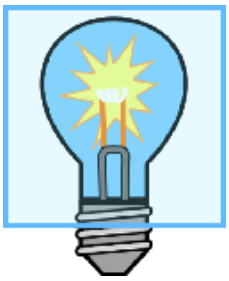
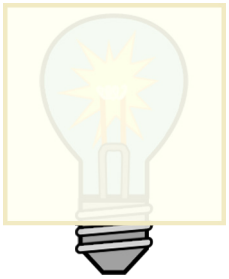
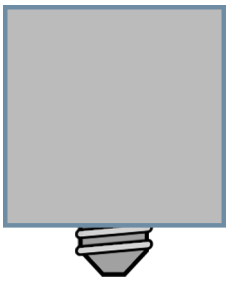
Water, clear glass and clear plastic are **transparent** materials. They allow light to pass straight through them. This explains why we can see through transparent substances.

Translucent materials

Frosted glass, greaseproof paper and milk are **translucent**. You can see light pass through them, but the light is scattered on the way, so you cannot see clearly what is on the other side. A pearl light bulb is made with translucent glass, and it gives a more even light than a clear bulb.

Opaque materials

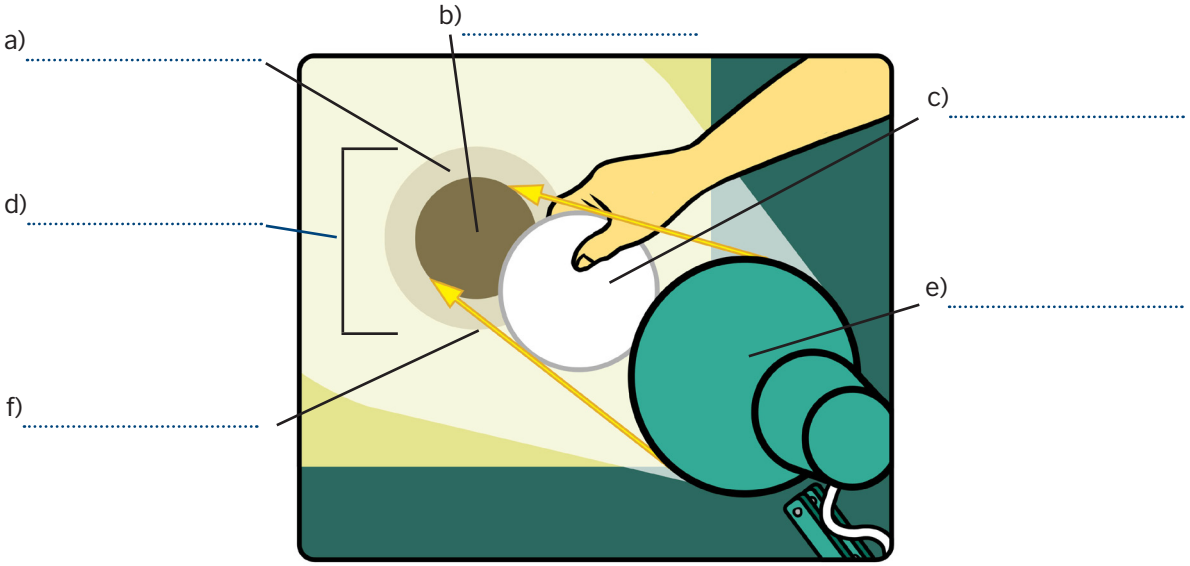
Metals, woods, thick card and stone are **opaque**. They do not allow any light to pass through.

Type of material	Example material(s)	Reaction to light
transparent 		
translucent 		
opaque 		

7. Use the words about **making shadows** to label the picture..

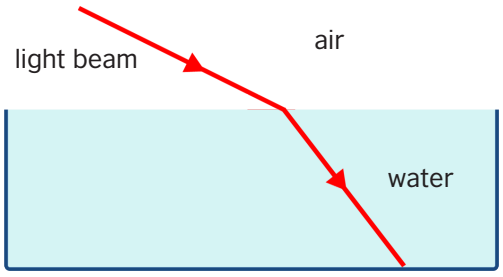
light ray	light source	opaque object
penumbra	shadow	umbra

Light waves travel in straight lines from a source. The lines the light follows are called rays. Because rays do not bend around corners, an opaque object blocks light from the side facing away from the light source. The object casts a dark shadow. The shadow cast by the sun or a light bulb has two parts. The middle part of a shadow is very dark. It is called the umbra. All the light from the light source is blocked from reaching this part of the shadow. This area is surrounded by an area that is only partly in shadow. This is called the penumbra. Here, light from only some of the source is blocked.

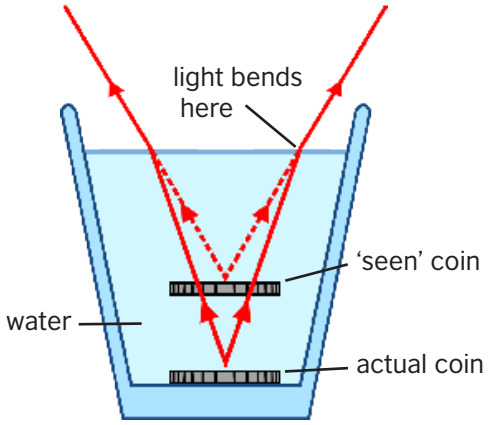


8. Choose the correct words from the list to fill in the gaps in the text about **refraction**. Some words are used more than once.

straight	shallower	refraction
transparent	change	bent



A straight straw in a glass of water looks a) _____ . The water in a swimming pool looks b) _____ than it really is. Light doesn't bend but when light passes at an angle from one c) _____ material into another (from air into water or glass, for example) the light rays d) _____ direction. This change in direction is e) _____ .



This diagram shows how refraction makes water look f) _____ than it is. Our brain thinks that light travels in g) _____ lines, so we 'see' the coin in the position shown by the dashed lines.

9. Put the words in the correct order to make sentences about **images in flat mirrors**.

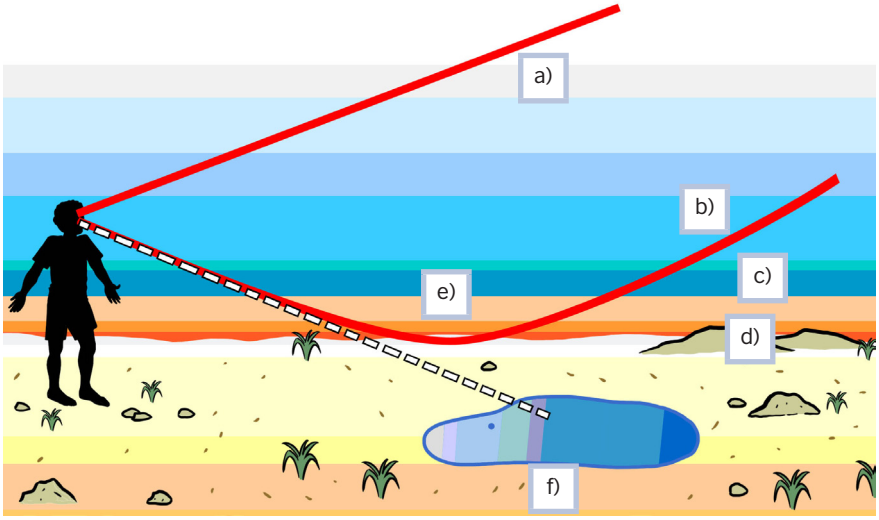
In a flat mirror the image is:

a)	which means	as the object.	upright	it's the same way up
Correct sentence:				
b)	size	as the object.	the same	
Correct sentence:				
c)	it's not really	there.	virtual	which means
Correct sentence:				
d)	and so	laterally inverted,	are reversed.	left and right
Correct sentence:				
e)	is in front.	as far behind	the mirror	as the object
Correct sentence:				

10. Use the word about **mirages** to label the picture.

Have you ever been driving along a hot road and seen what looks like shimmering pools of water in the distance? This is a mirage caused by refraction. Light rays from the sky are refracted by layers of air at different temperatures. The air temperature near to the earth's surface is hotter than the air higher up. The 'water' is really an image of the sky that appears in the wrong place.

cool air	direct sight to sky	hot air
image of sky	light ray from sky	refraction



Write your answer here:

a)		b)	
c)		d)	
e)		f)	

11. Make compound phrases according to the definitions about **light and heat** by matching the two words. Write your answers in the grid below.

a)	The process of moving energy from one place to another.
b)	The spreading of something in a line formation.
c)	Very light thin sheets used for wrapping things, especially food.
d)	Brightness from the sun that allows you to see things.
e)	A piece of special glass in which you can see yourself or see what is behind you.
f)	Instrument used for mixing food when cooking that is a poor conductor of heat.
g)	Reflection of an object exactly the same as another, but with the left and right sides the other way round.

Use these words to make a compound phrase:

heat	foil
linear	image
metal	light
mirror	mirror
natural	propagation
plane	spoon
wooden	transfer

Write your answers here:

a)	_____ _____
b)	_____ _____
c)	_____ _____
d)	_____ _____
e)	_____ _____
f)	_____ _____
g)	_____ _____

12. Find the words about **light and heat** in the word search.

P	C	B	X	I	I	Q	C	W	E	E	E	C	H	Q	T
R	E	E	N	S	T	A	R	P	D	S	H	A	D	O	W
Q	T	A	E	Y	Z	O	N	E	S	I	P	N	H	J	X
F	L	M	I	X	T	U	R	E	C	F	E	D	I	I	Y
C	T	I	U	N	C	M	N	C	D	P	E	L	C	N	N
E	E	F	E	Z	G	A	S	F	H	C	S	E	O	T	D
Y	C	E	L	P	G	R	X	U	A	J	I	I	W	E	M
S	U	L	O	O	N	A	E	F	B	N	S	N	H	N	F
H	I	S	I	J	W	Q	R	D	C	S	O	B	M	S	S
E	C	O	I	P	R	U	E	M	I	I	T	T	O	I	T
S	E	L	A	N	S	E	A	M	T	E	L	A	D	T	N
F	L	A	M	E	P	E	S	A	A	N	N	D	N	Y	B
F	I	R	E	S	T	N	M	A	G	N	S	T	D	C	T
L	A	M	P	S	A	R	N	T	X	V	N	E	S	H	E
H	D	D	P	R	O	P	A	G	A	T	I	O	N	C	L
G	H	R	T	F	R	W	I	B	G	Q	A	T	E	I	T

beam
candle
eclipse
fire
flame
flow
formation
ice
ingredients
intensity
lamp
mixture
propagation
shadow
solar
speed
star
steam
substance
surface
torch
transmission
wax
zones

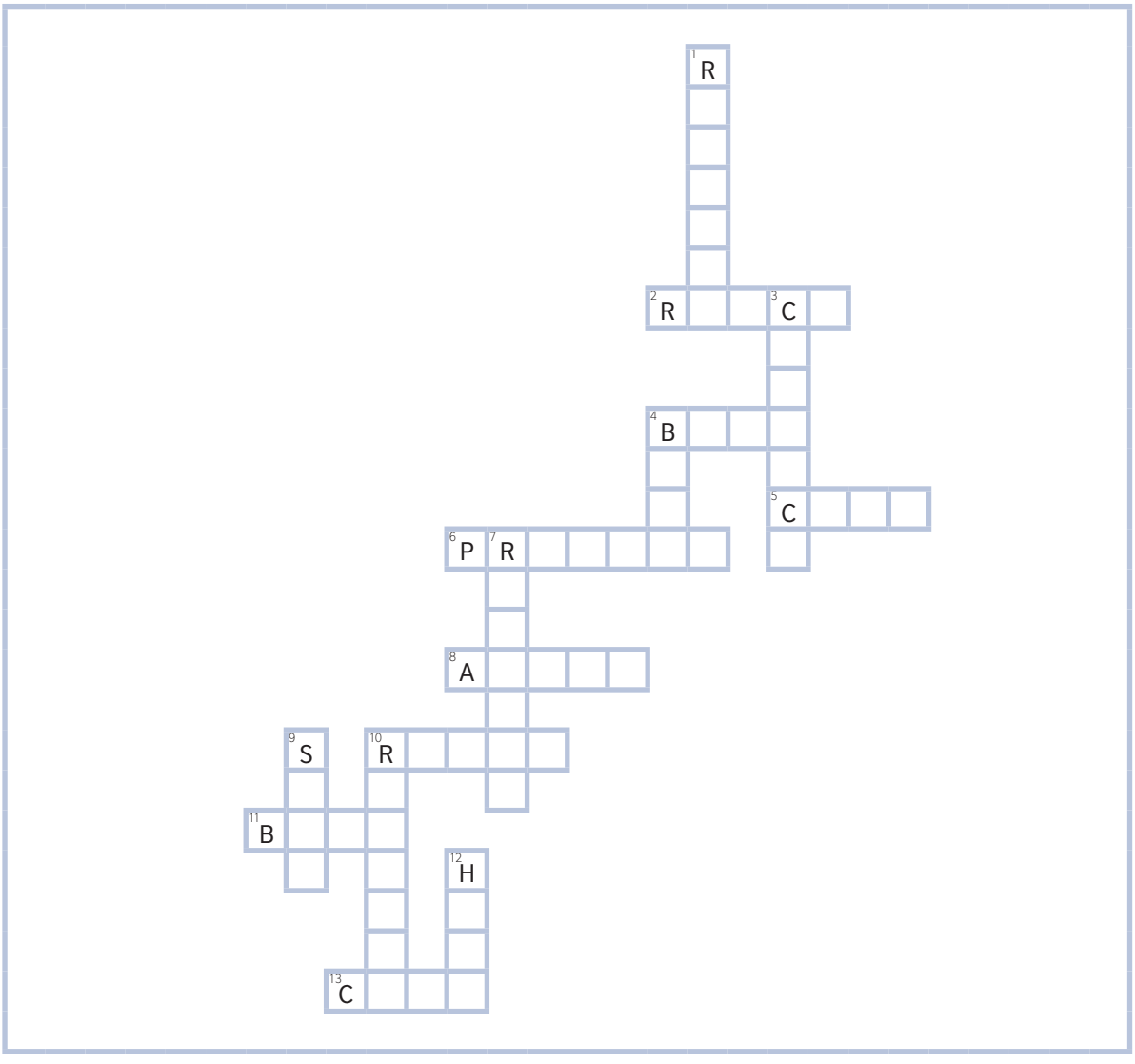
13. Complete the crossword by answering the following questions. All the correct answers are words about **light and heat**.

Across

2. To behave in a particular way because of contact with another object.
4. To give an object a curved or twisted shape.
5. To create a shadow.
6. To stop something from happening.
8. To give someone or something permission to do or have something.
10. To get to a particular place, point in time or stage in a process.
11. To make a liquid become so hot that there are bubbles in it and it starts to become a gas.
13. To change a solid substance into a liquid.

Down

1. To change the order or development of a thing to be the opposite of what it was.
3. To move heat or electricity through an object.
4. To make a fire and flames producing light and heat.
7. To shine back the light off an object.
9. To travel or move with less speed.
10. To let energy spread into the area around an object, especially in a chemical reaction.
12. To make something warm.



Glossary

absorb	/əbˈzɔː(r)b/ verb [T] take in a gas, liquid, or other substance
allow	/əˈlaʊ/ verb [T] give someone or something permission to do or have something.
artificial light	/ˌɑː(r)tɪˈfɪʃ(ə)l laɪt/ light produced from electricity or made by people and used instead of natural light to see things.
awkward	/ˈɔːkwə(r)d/ adj difficult to deal with and embarrassing.
back-to-front	/bæk tuː frʌnt/ adv with the back part at the front.
beam	/biːm/ noun a line of light or other form of energy. Diverging beam - a line of light starting to go in a separate direction.
bend	/bend/ verb [I/T] (bend, bent, bent) if you bend an object you give it a curved or twisted shape.
boil	/bɔɪl/ verb [I/T] if a liquid boils, or if you boil it, it becomes so hot that there are bubbles in it and it starts to become a gas.
bounce back	/baʊns bæk/ verb [I/T] if an object bounces back it moves back in the opposite direction.
bright	/braɪt/ adj full of strong shining light.
burn	/bɜː(r)n/ verb [I/T] if a fire or flame burns, it produces light and heat.
candle	/ˈkænd(ə)l/ noun [C] a stick of wax with a string in it called a wick that you burn to give light.
cast a shadow	/kɑːst ə ˈʃædəʊ/ phr v something has an area of darkness that is created when something light is blocked.
change direction	/tʃeɪndʒ dɪˈrekʃ(ə)n/ start going in a completely new or different path.
conduct	/kənˈdʌkt/ verb [C/U] to move heat or electricity through an object.
conduction	/kənˈdʌkʃ(ə)n/ noun [C/U] the transfer of heat between two parts of a stationary system, caused by a temperature difference between the parts.
conductor	/kənˈdʌktə(r)/ noun [C] a substance that allows heat or electricity to pass through it: good conductor, poor conductor.
convection	/kənˈvekʃ(ə)n/ noun [U] the process by which very small parts in a liquid or gas move and give out heat.
cooking	/kʊk/ verb [I/T] preparing food and heating it so that it is ready to eat.
current	/ˈkʌrənt/ noun a flow of electricity.
curve	/kɜː(r)v/ noun [C] a shape or line with a gradual smooth bend.
dull	/dʌl/ adj boring, or not interesting.
eclipse	/ɪˈklɪps/ noun [C/U] a short period when all or part of the sun or moon becomes dark, because of the positions of the planets and the sun in relation to each other.

empty space	/ˈempti speɪs/ an area containing nothing.
fire	/ˈfaɪə(r)/ noun [C/U] flames and heat from something that is burning.
flame	/fleɪm/ noun [C/U] the brightly burning gas that you see coming from a fire.
flow	/fləʊ/ noun [C/U] the continuous movement of a liquid in one direction.
formation	/fɔː(r)ˈmeɪʃ(ə)n/ noun [C/U] the process during which something develops or is created.
glass prism	/glɑːs ˈprɪz(ə)m/ a solid object, made of the same material that windows and bottles are made of, with a regular shape and can be cut into slices that all have the same shape.
greaseproof paper	/ˌgriːspruːf ˈpeɪpə(r)/a special type of paper that does not allow oil or grease to pass through it, used in cooking and for wrapping food.
heat energy	/hiːt ˈenə(r)dʒi/ a supply of power, characterized by the quality of being hot.
heat rays	/hiːt reɪz/ an amount of light or heat from the sun, in the form of beams.
heat source	/hiːt sɔː(r)s/ place or thing that provides hot energy.
heat transfer	/hiːt trænsˈfɜː(r)/ the process of moving energy from one place to another.
heat transmission	/hiːt/trænzˈmɪʃ(ə)n/ the process of sending power or energy from one place to another.
heated	/ˈhiːtɪd/ adj made warm enough for people to use.
hotter	/hɒtː(r)/ adj superlative form very high in temperature.
ice	/aɪs/ noun [U] water that has frozen and become solid.
ingredients	/ɪnˈgriːdiənts/ noun plural foods or liquids that you use in making a particular meal.
insulator	/ˈɪnsjʊˌleɪtə(r)/ noun [C] a substance that reduces the amount of heat, cold, noise, or electricity that can pass through something.
intensity	/ɪnˈtensɪti/ noun [C/U] strength, power.
invisible	/ɪnˈvɪzəb(ə)l/ adj something that is invisible cannot be seen.
lamp	/læmp/ noun [C] a small light that stands on a table or desk: kerosene lamp.
laterally inverted	/ˈlæt(ə)rəli ˌɪnˈvɜː(r)tid/ turned so that left and right are reversed.
light	/laɪt/ noun [C/U] brightness from the sun or from a light, which allows you to see things.
linear propagation	/ˈlɪniə(r) ˌprɒpəˈgeɪʃ(ə)n/ the spreading of something in a line formation.
lunar	/ˈluːnə(r)/ adj relating to the Moon.

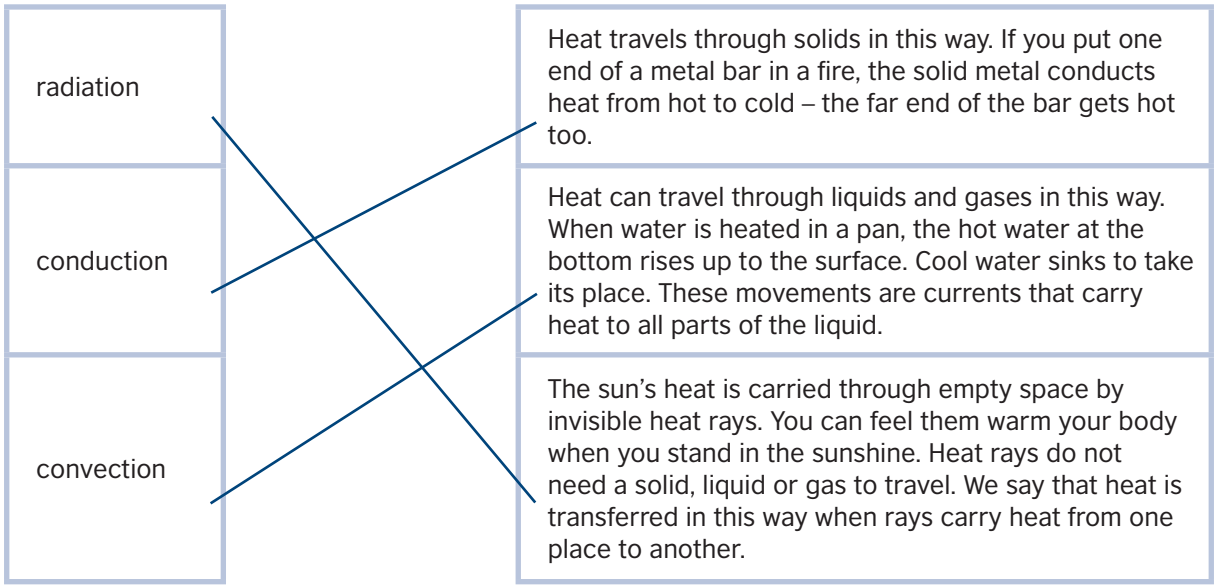
magnify	/ˈmægnɪfaɪ/ verb [T] make something appear bigger than it really is.
melt	/melt/ verb [I/T] change a solid substance into a liquid.
metal bar	/ˈmet(ə)l bɑː(r)/a long narrow piece of a hard, usually shiny element that exists naturally in the ground or in rock, for example lead, gold, or iron.
metal foil	/ˈmet(ə)l fɔɪl/ very light thin sheets of metal used for wrapping things, especially food.
mirage	/ˈmɪrɑːʒ/ noun [C] a strange effect in deserts or at sea in which you see something that is not really there.
mirror image	/ˈmɪrə(r) ˈɪmɪdʒ/ an image or object that is exactly the same as another, but with the left and right sides the other way round, as in a mirror: dentist's mirror; shaving mirror; car mirror; security mirror.
mirror's focus	/ˈmɪrə(r)z ˈfəʊkəs/ if a mirror focuses rays of light, they meet at a particular point.
mixture	/ˈmɪkstʃə(r)/ noun [C/U] a combination of two or more different things, people, qualities etc.
natural light	/ˈnætʃ(ə)rəl laɪt/ brightness from the sun which allows you to see things.
opaque	/əʊˈpeɪk/ adj opaque glass, liquid etc does not allow light to pass through.
pass through	/pɑːs θruː/ phr verb go up to a place or an object and continuing beyond the place or object.
penumbra	/pəˈnʌmbrə/ noun [C] an area covered by the outer part of a shadow, so that it is not completely dark.
plane mirror	/pleɪn ˈmɪrə(r)/ a piece of special glass in which you can see yourself or see what is behind you.
pool	/puːl/ noun [C/U] a small area of still liquid.
poor conductor	/pɔː(r) kənˈdʌktə(r)/ noun [C] a substance that does not easily allow heat to pass through it.
prevent	/prɪˈvent/ verb [T] stop something from happening.
propagation	/ˌprɒpəˈgeɪʃ(ə)n/ noun [U] the spreading, distribution of something.
radiation	/ˌreɪdiˈeɪʃ(ə)n/ noun [U] a type of energy that is sent out in the form of electromagnetic waves, for example, heat, light, or radio waves.
rainbow	/ˈreɪnˌbəʊ/ noun [C] a curved line of colours in the sky when the sun shines while it is raining.
ray	/reɪ/ noun [C] a narrow line of light that you can see coming from the sun or a lamp.
reach	/riːtʃ/ verb [I/T] get to a particular point in time or a particular stage in a process.
react	/riˈækt/ verb [I] behave in a particular way because of contact with another object.
reflect	/rɪˈflekt/ verb [I/T] if something reflects light the light shines back off that thing.
reflection	/rɪˈflekʃ(ə)n/ noun [C] the process of reflecting light, sound, or images.

refraction	/rɪˈfrækʃ(ə)n/ the change of direction of a ray of light, sound, heat.
release heat	/rɪˈliːs hiːt/ let energy spread into the area around an object, especially in a chemical reaction.
reversed	/rɪˈvɜː(r)st/ adj changed order or development of a thing to be the opposite of what it was.
scatter	/ˈskætə(r)/ verb [I/T] throw or drop things so that they spread over an area.
shadow	/ˈʃædəʊ/ [C/U] [often plural] an area of darkness that is created when something blocks light.
shimmering	/ˈʃɪmə(r)ɪŋ/ adj reflecting light, shiny, glimmering.
shiny	/ˈʃaɪni/ adj having a bright surface that reflects light.
sink	/sɪŋk/ verb [I/T] disappear below the surface of the water.
slow down	/sləʊ daʊn/ phr verb [I/T] travel or move at a slower speed.
solar	/ˈsəʊlə(r)/ adj relating to the Sun, or coming from the Sun.
source	/sɔː(r)s/ noun [C] a person, place, or thing that provides something that you need or want.
speed	/spiːd/ noun [C/U] the rate at which someone or something moves.
shallow	/ˈʃæləʊ/ adj with only a short distance from the top or surface to the bottom.
split into	/splɪt ɪnt/ verb [I/T] divide into smaller groups, or to divide people into smaller groups.
star	/stɑː(r)/ noun [C] a very large hot ball of gas that appears as a small bright light in the sky at night.
steam	/stiːm/ noun [U] the hot wet substance like a thin cloud that is produced when water is heated.
straight	/streɪt/ adj without a bend or curve: straight lines.
substance	/ˈsʌbstəns/ noun [C/U] a particular type of liquid, solid, or gas.
sun	/sʌn/ noun [C/U] the star in the sky that provides light and warmth to the Earth.
surface	/ˈsɜː(r)fɪs/ noun [C] the top layer or outside part of something.
torch	/tɔː(r)tʃ/ noun [C] a small electric light operated by batteries that you hold in your hand.
transfer	/ˈtrænsfɜː(r)/ noun [C/U] the process of moving something from one position or form to another.
translucent	/trænsˈluːs(ə)nt/ adj clear enough for light to pass through but not completely clear.
transmission	/trænzˈmɪʃ(ə)n/ [U] the process of sending power or energy from one place to another.

transmit	/trænzˈmɪt/ verb [T] if a substance transmits light, sound, or energy, the light, sound, or energy can pass through it. Synonym for let through.
transparent	/trænsˈpærənt/ adj clear or thin enough for you to see things through.
umbra	/ˈʌmb(r)ə/ [C] the complete or perfect shadow of an opaque body, as a planet, where the direct light from the source of illumination is completely cut off.
upright	/ˈʌpraɪt/ adv in or into a straight standing position.
virtual	/ˈvɜː(r)tʃʊəl/ adj almost the same as the thing that is mentioned.
wax	/wæks/ noun [U] a soft substance that becomes liquid when heated, used for making candles.
wider view	/waɪdː(r) vjuː/ noun [C] a perspective which allows the viewer to see more.
wooden spoon	/ˈwʊd(ə)n spuːn/ noun [C] a spoon made from wood, used for mixing food when cooking.
zones	/zəʊns/ noun plural divisions of a larger area: zones of a shadow.

Key:

1.



2. a) conductors, b) cooking, c) conduct, d) poor, e) insulators, f) allow, g) prevent

3. a) 4, b) 3, c) 5, d) 1, e) 2

4. a) light, b) bounces, c) straight, d) space, e) split, f) scattered, g) reflect, h) bright, i) dull, j) artificial

5. a) 5, b) 4, c) 2, d) 1, e) 3

6.

Type of material	Example	Reaction to light
transparent	water, clear glass, and clear plastic	allows light to pass straight through
translucent	frosted glass, greaseproof paper, and milk	light passes through but is scattered on the way
opaque	metals, woods, thick card, and stone	does not allow any light to pass through

7. a) penumbra, b) umbra, c) opaque object, d) shadow, e) light source, f) light ray

8. a) bent, b) shallower, c) transparent, d) change, e) refraction, f) shallower, g) straight

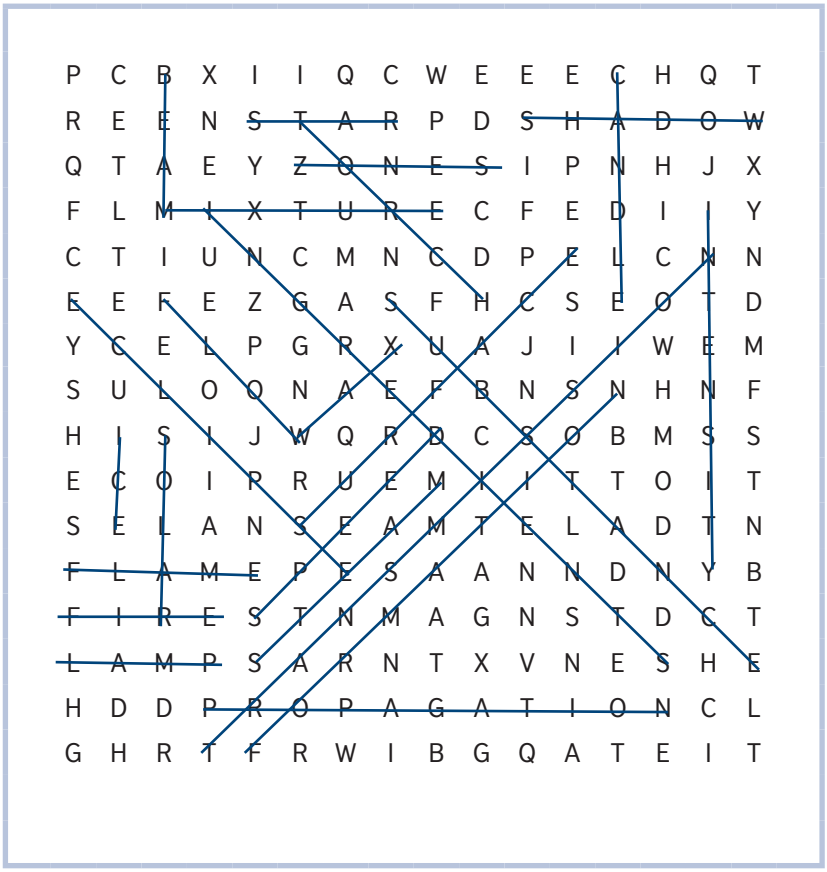
9.

a)	upright which means it's the same way up as the object.
b)	the same size as the object.
c)	virtual which means it's not really there.
d)	laterally inverted, and so left and right are reversed.
e)	as far behind the mirror as the object is in front.

10. a) direct sight to sky, b) light ray from sky, c) cool air, d) hot air, e) refraction, f) image of sky

11. a) heat transfer, b) linear propagation, c) metal foil, d) natural light, e) plane mirror, f) wooden spoon, g) mirror image

12.



13. **Across:** 2. react, 4. bend, 5. cast, 6. prevent, 8. allow, 10. reach, 11. boil, 13. melt;
Down: 1. reverse, 3. conduct, 4. burn, 7. reflect, 9. slow, 10. release, 12. heat