Cambridge Checkpoint Lower Secondary Science Workbook 7 (2021) Answers

Most of the questions aim to test your knowledge and understanding of science, but some questions have this icon. These questions aim to test your science enquiry skills.

Some other questions have this icon. These are questions about using models to help you learn about and understand scientific ideas.

Yet other questions have this icon. These questions put science in context.

1 The characteristics of living things

Workbook answers

Living and never lived

1 Yes, the hypothesis is testable. A plant can be given the right conditions and then its growth can be measured over a period of time.

Looking for characteristics of life

2 a 3
b Feeding: The rabbit is eating grass.
Sensitivity: The ears face a sound and the rabbit stops eating.
Movement: The rabbit hops away.

Nutrition

3 Use the same mass of clay for each tooth; drop them from the same height.

Respiration

4 All living things respire.
Many aquatic animals have gills which take up oxygen dissolved in water.

Movement

5 a Muscles.
b To find food, avoid enemies, find shelter.
c Pump blood around the body.
d Churn up food to help it digest.

Sensitivity

6 Skin: Touch.
Eyes: Sight.
Ears: Hearing.
Nose: Smell.
Tongue: Taste.

Growth and reproduction

7 a Abena.
b Chipo.
c 85 cm.
d Abena 48 cm, Bisa 45 cm, Chipo 50 cm, Doli 45 cm.
e Abena 5 cm, Bisa 5 cm, Chipo 3 cm, Doli 5 cm.
f The elephants grow most in their early years and their growth slows down as they get older and almost stops by 20 years of age.
g About 207 cm.

Excretion

8 a They are poisonous and, if they build up in the body, they can kill it.
b Urine, sweat.
c Carbon dioxide.

Plant life

9 a Reproduction.
b Movement and growth.
10 **Plan 1:** Use the same equipment several times with the different coloured filters.
Plan 2: Make two or more sets of equipment to be used simultaneously to test different colours.
For both plans: a regime for opening the box and recording the plant development. This could be length of stem measurement and a photograph to show leaf development. This may be done daily or every other day.
a The colour of light.
b The development of the plant.
c The temperature; the amount of water given to the plant.

Looking for life beyond the Earth

11 a Water containing food.
b Carbon dioxide.
c It is limited as there might be signs of life on other parts of the planet.

© Peter D Riley Ltd and Judith Amery 2021

2 Identifying species

Workbook answers

1 a A group of living organisms that have very similar features and that produce fertile offspring.
b It is usually sterile (cannot breed).
c The cross between a male donkey and a female horse.

Making observations

2 – The finger drawing will probably be life-size but should have a ×1 symbol, next to it. Be prepared for some students drawing it larger than life, such as ×2 or even smaller ×½.
– There should be little or no shading (some students may decide to add some hairs between the joints on the top of their finger but there must be a label for this).
– The labels should be written horizontally.
– The label lines should be horizontal and from the label to the centre of the feature being labelled.
– The drawing should have a title.

Strengths:
– Allows close observation – an essential thinking and working scientifically (TWS) skill.
– Generates questions to be asked when new features are seen.

Limitations:
– Not detailed – just a line drawing (no shading).
– Not to scale.

Observing and classifying

3 a

Feature	Plant	Animal
Cannot make own food		✔
Has cellulose for support	✔	
Has chlorophyll	✔	
Can move about		✔

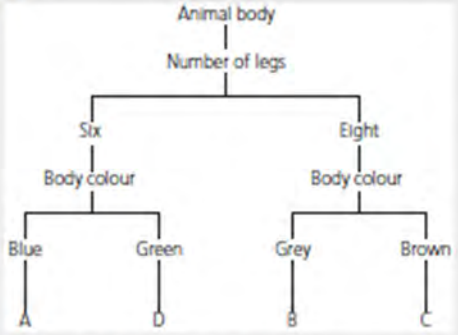
b Classify: Organise into different groups based on certain features.
c Examples could include plants and animals, vertebrate or invertebrate groups of animals. (If they have studied the Chemistry or Physics chapters, they might also mention metals and non-metals or energy.)

4 a Species or special group.
b Greek and Latin.
c So that everyone, wherever they are working, uses the same name for each species.

5 a Pour water into the balloon so that it swells up, then tie the end of the balloon.
b Place a small weight on top of the balloon to see if the balloon can hold it up without becoming squashed.
c **Strength:** The model can be used to investigate how much water is needed to support the balloon, which is a model of the slug.
Limitation: The model cannot show the slug moving and whether more support is needed for this to happen.

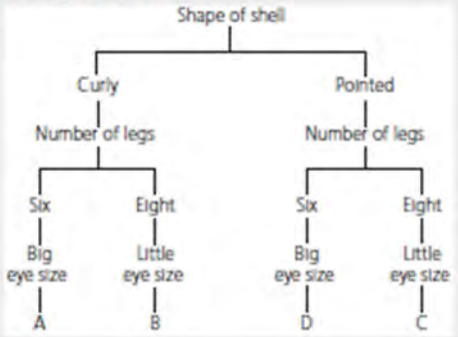
Keys

6



7 **B** = 1a, 2a. B is an avocet.
C = 1b, 3a. C is a warbler.
D = 1b, 3b. D is a finch.

8



© Peter D Riley Ltd and Judith Amery 2021

3 Cells

Workbook answers

What is a cell?

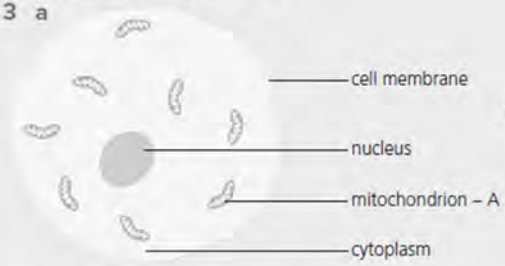
1 a He saw the cork had little compartments in it.
b Cells.
c Because they looked like the small rooms in monasteries.
d Nucleus.

The microscope

2 Forceps, microscope slide, a dropping pipette for water, mounted needle, cover-slip, microscope.

Basic parts of a cell

3 a



b Chemical reactions occur in mitochondria which release energy for life processes in the cell.
c Cell wall, vacuole, chloroplast.

4 a The box surrounds the blanket which encloses the ball.
b Box: Cell membrane.
Blanket: Cytoplasm.
Ball: Nucleus.
c It is larger.
The cardboard is rigid and the cell membrane is not.
The blanket is made of cloth and the cytoplasm is a water jelly.
The ball is round and the nucleus is not.
d **Strength:** It shows the relationship between the cell membrane, nucleus and cytoplasm.
Limitation: The cell membrane is not shaped like a box. The cytoplasm is a watery jelly so the blanket is not a very good representation.

5 a

Time in hours	Number of cells
0	8
1	16
2	40
3	64
4	128

© Peter D Riley Ltd and Judith Amery 2021

b The number of cells doubles every hour.
c 2 hours, 40 cells.
d 512 cells.
e i Increased by making warmer and by giving more food.
ii Decreased by making cooler and giving less food.

Adaptation in cells

6 a In leaves.
b Chloroplasts.
c They trap as much light as possible.
7 a



b A biconcave disc.
c The nucleus.
d Haemoglobin.
8 a Nerve cell.
b Neurone.
c An electrical signal.
9 a In the throat lining.
b Cilia (hairs).
c Wave backwards and forwards and carry dust trapped in mucus away from the lungs.
10 a Adaptation: The way a living thing is suited to its habitat so that it can survive there. Adaptation can also mean the process by which living things become more suited to their habitat.
b Root hair cells have long, thin extensions that allow them to grow easily between the soil particles to take up water.
Pallisade cells have a shape that allows them to pack closely together in the upper part of the leaf to trap as much light as possible.
c Skin cells form a layer of dead cells on the surface of the body to stop water and microorganisms from entering.
Red blood cells lose their nucleus when they have formed to increase the amount of oxygen they can carry.

Cells, tissues, organs and organisms

11 A group of the same kind of cells that do a special task.
12 a An organ system is a group of organs that performs a vital task in the survival of the body.
b An organism is formed from all the organs and organs systems that make up a body.

Microorganisms

13 Microorganisms are normally single-celled. Organisms are usually multicelled and can be made up of the organs and organ systems.

Viruses

14 They do not show the characteristics of living things. They can only replicate inside other living cells and they don't grow.
15 a A range of answers would be acceptable, but could include a plastic bag for the cell membrane, a small ball or nut for the nucleus and several beads for the viruses.
b **Strength:** It shows how the viruses can fill the cell.
Limitation: It doesn't show how one virus can replicate to form so many in the cell, nor how they escape from the cell.

© Peter D Riley Ltd and Judith Amery 2021

4 Microorganisms

Workbook answers

Decomposers

1 They are made from bodies of only one single cell.

2 a The dead remains of plants and animals.

b i Plants can use the nutrients which are released into the soil, air and water by decomposers to help them grow.

ii Herbivores use the nutrients released by the decomposers when they eat the plants.

iii Predators use the nutrients released by the decomposers when they eat the animals that are herbivores or that have eaten herbivores.

3 a No, the hypothesis is not testable. Fruit and vegetables are all totally unique, so showing that some break down more quickly than others will not allow good conclusions to be made regarding all fruit and vegetables.

b This hypothesis is almost testable. By setting up equal samples of decomposers and fruit or vegetables, some could be left outside on clear nights when the stars are shining and others on different nights when they are not shining, but it is difficult to control when the stars will be shining.

c No, this hypothesis is not testable. We cannot control the spin of the Earth.

4 a Carina needs to use the same sized containers and the same amount of grass cuttings in each container. One should be placed in sunny conditions and one in the shade. They should both be tested after the same length of time.

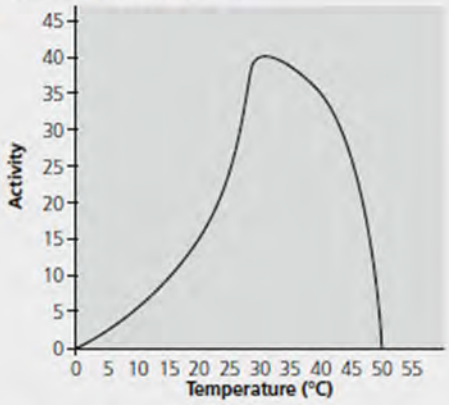
→

© Peter D Riley Ltd and Judith Amery 2021

b i The compost left in shady conditions has decomposed more than the compost left in sunny conditions.
ii The compost left in sunny conditions has decomposed more than the compost left in shady conditions.

5 a Moderate hazard.
b Hazardous to the environment.
c The second container.

6 a



b They used the same sample of yeast and sugar and measured them all after 20 minutes.
c If the temperature is too low then the reaction cannot take place, so if the sample at 0 °C is warmed up then the reaction can start. At 50 °C the yeast is killed, so even if this sample is cooled down, the reaction cannot take place.
d i The independent variable is the variable the experimenter controls, so it is the temperature of the samples.
ii The dependent variable is the one that is measured, so it is the height of the froth.

7 a This was the belief that living things could be created from non-living things.
b i The broth went bad.
ii He thought there was something in the air that made the broth go bad.
c The milk is heated to 72 °C for 16 seconds which kills off the spores, yeast and bacteria that turn the milk sour.
d i The theory that many diseases are caused by microorganisms invading the body.
ii Scientists began looking for the microorganisms that might be causing disease.

Microorganisms in food chains and food webs

8 The word 'decomposers' should be added to the left of grass with an arrow between them.
9 The word 'decomposers' should be added under wildflowers and grass. (Just one word is acceptable.) There should be arrows up from the word 'decomposers' to each of wildflowers and grasses. There should also be arrows down from mouse, hawk and wildflowers to 'decomposers'.
10 They release the minerals that were in the bodies of plants and animals back into the soil, where plants may take them up again as they grow and the minerals enter the food chain again.
11 They investigate the factors which help to improve soil, so crops grow better and it is easier to feed livestock (cattle).

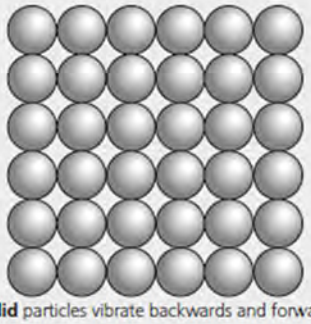
© Peter D Riley Ltd and Judith Amery 2021

5 The states of matter

Workbook answers

Matter everywhere and The particle theory of matter

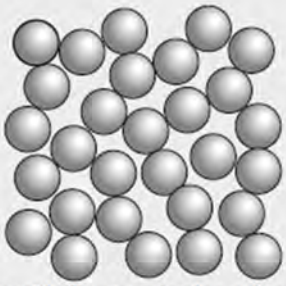
1 Easy to compress.
2 Fixed shape.
3 Flows.
4 a



solid particles vibrate backwards and forwards

b In a solid, the particles are close together, arranged in a regular pattern and are vibrating around a fixed position.

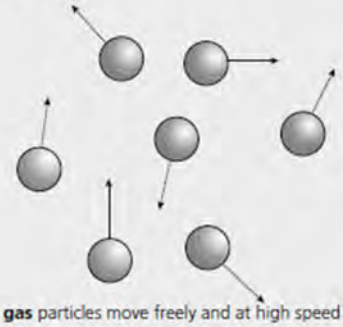
5 a



liquid particles have some freedom and can move over each other

b The particles in a liquid are close together, but not arranged in a regular pattern and they can move around each other.

6 a



gas particles move freely and at high speed

b In a gas, the particles are far apart and are randomly arranged. They can move quickly in all directions.

7 a **Strength:** The model shows how particles in a solid are close together in a regular pattern. It shows why solids cannot be compressed.
Limitation: The model does not show the particles in a solid vibrating about a fixed position.

b **Strength:** The model shows that particles in a liquid can move around each other.
Limitation: The model leaves too much space between the particles in a liquid, which should be close together, though not in a regular pattern. This would show why a liquid cannot be compressed.

© Peter D Riley Ltd and Judith Amery 2021

c **Strength:** The model shows the particles of a gas widely spaced and with random movements.
Limitation: The model does not indicate how fast the particles are moving, nor what happens when a gas is compressed.

A vacuum

8 a A vacuum is a space in which there are no particles of matter.

b Although space is sometimes described as a vacuum, this description is not correct because space contains a few particles, but they are spread out over great distances from each other.

9 a In a complete vacuum there would be no marbles in the box.

b In a partial vacuum there would only be one or two marbles in the box.

10 a Aristotle believed that sound could not pass through a vacuum.

b Von Guericke tested Aristotle's belief by putting a bell inside a vessel and removing all the air – he found that the bell could not be heard!

© Peter D Riley Ltd and Judith Amery 2021

6 Atoms and elements

Workbook answers

The discovery of the elements

1 An element is a substance made from just one kind of atom.

2 Elements which should be circled are iron, silver, gold, tin, copper, sulfur and lead.

3 a The evidence from Galvani's experiments that Davy used in his own was that some chemical reactions which make new substances also produce an electric current.

b Volta had made a battery which produced a current of electricity; Davy used this invention in his work.

c The following should be underlined:
'Humphrey Davy reasoned that as an electric current is produced when some new substances are made, then perhaps an electric current could be used to break down a substance into its elements.'

d Hydrogen and oxygen

e The prediction that resulted in Davy investigating potash was that potash contains an unknown element.

f Each of the following two sections of text should be circled:
'He continued his investigation by heating some solid potash on a platinum spoon ...'
'Next, he added a small amount of water to the potash ...'

The physical properties of elements

4 An element is made from one type of atom.

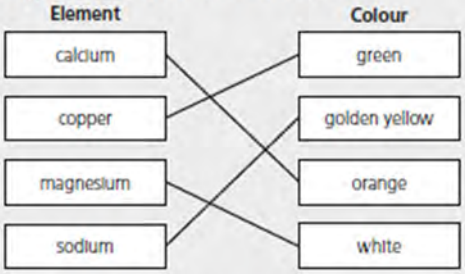
5 An element cannot be split up into simpler substances by chemical reactions.

6

Element	Colour
mercury	silver
bromine	red–brown

7 Accept any five from oxygen, nitrogen, hydrogen, helium, chlorine, fluorine, argon, krypton, neon, xenon and radon.

8



9 1 Light the Bunsen burner.
2 Set the Bunsen burner on a small flame.
3 Dip one end of a clean nichrome wire into the sample solution.
4 Hold the dipped end of the wire in the Bunsen flame.
5 Note the colour of the flame on the end of the wire.
6 Dip the wire in dilute hydrochloric acid to clean it for the next test.

Chemical symbols

10 Collect gold, copper, mercury, tartar, vinegar and soap. Mix in a crucible for an hour. Heat in a bath for a day. Leave for a month. Then put in a bottle.

11 a The diagram shows the periodic table, which shows the arrangement of elements in rows and columns depending on their properties.

b The periodic table got its name because, as you move along the rows, elements with certain properties appear periodically.

c The letters in each of the boxes represent the names of the elements; they are the chemical symbols for each element.

© Peter D Riley Ltd and Judith Amery 2021

7 Elements, compounds and mixtures

Workbook answers

Elements, atoms and compounds

1 An element is a substance that is made from only one type of atom.
A compound is made from more than one type of atom joined together. The number of each element in a compound is fixed.

2 An element is made up of only one type of atom.
A mixture is made up of two or more types of atoms. The different atoms in a mixture can be separated.

3 In a compound, the different elements join together and the compound has new properties.
A mixture is made up of more than one element, but each element keeps its own properties. The elements are not joined together in a mixture.

4 a



b The alloy is harder than the pure metal, because the particles of the new element that form the alloy stop the particles of the original metal from moving about as freely – this makes the alloy harder.

Mixing elements and making compounds

5 a

Property	Iron	Sulfur
colour	grey-black	yellow
test with a magnet	magnetic	not magnetic
mix with water	sinks	tends to float

b The iron filings are attracted to the magnet.

c The sulfur floats and the iron filings sink.

d **Bunsen burner (or spirit burner):** Provides heat.
Crucible: The dish in which to mix the elements.
Pipe clay triangle: To support the crucible when it is being heated by the Bunsen burner or spirit burner.
Tripod: To support the pipe clay triangle.

e A black, non-magnetic solid.

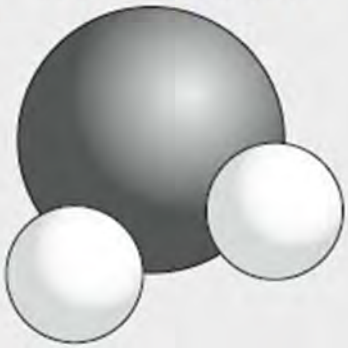
f Iron sulphide.

© Peter D Riley Ltd and Judith Amery 2021

g i A series of small yellow balls of modelling clay.
ii A series of small black balls of modelling clay.
iii A series of particles made up of one yellow ball joined to one black ball.

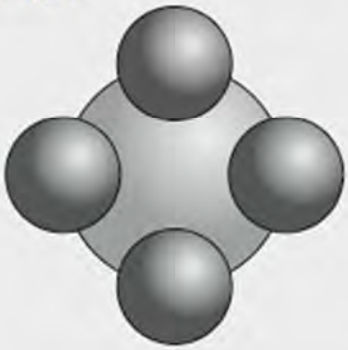
h i **Strength:** It shows sulfur is formed from atoms which are all the same.
Limitation: It does not show that the particles are moving.
ii **Strength:** It shows iron is formed from atoms which are all the same.
Limitation: It does not show that the particles are moving.
iii **Strength:** It shows that iron sulphide is made from one sulfur atom combined with one iron atom.
Limitation: It does not explain why this has different properties from a mixture of iron and sulfur.

6 a



b **Strength:** It shows that carbon dioxide is made up of one carbon atom and two oxygen atoms.
Limitation: It does not explain why this is different from a mixture of carbon and oxygen.

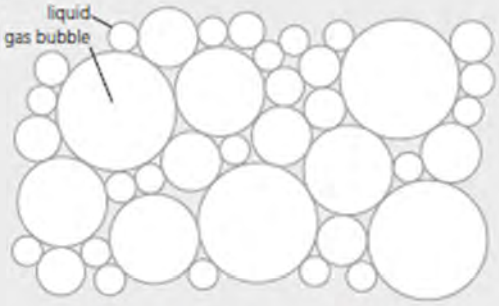
7 a



b **Strength:** The model shows how the hydrogen atoms are arranged around the carbon atom. (It does not show, for example, all the atoms in a line.)
Limitation: The model is only in two dimensions and the atoms in the real compound would be arranged in three dimensions.

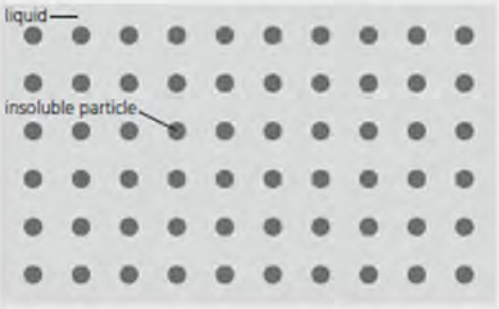
Different types of mixtures

8 a i



ii **Strength:** It indicates how bubbles are surrounded by liquid.
Limitation: Only two-dimensional; in reality, the bubbles are arranged in three dimensions.

b i



ii **Strength:** It shows how particles are spread out in a liquid.
Limitation: Only two-dimensional; in reality, the particles are arranged in three dimensions.

© Peter D Riley Ltd and Judith Amery 2021

c i



ii **Strength:** It shows how the tiny water droplets are spaced out in the air.
Limitation: Only two-dimensional; in reality, the droplets are arranged in three dimensions.

Alloys

9 An alloy is a metallic substance, usually made from a mixture of two or more elements which are metals.
Steel is an alloy of iron and the non-metal carbon.

10 a Bronze is an alloy of copper and tin.
b It is used to make bells and cymbals.
c Brass is an alloy of copper and zinc.
d It is used to make ornaments.

11 a B
b It is made of two kinds of atoms – one kind is larger than the other.
c The large atoms in B prevent the layers of smaller atoms from sliding over each other.

© Peter D Riley Ltd and Judith Amery 2021

8 Physical properties of matter

Workbook answers

Metals and non-metals

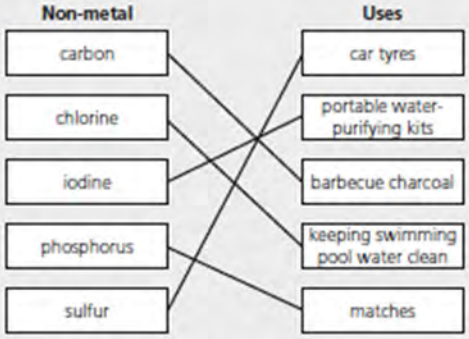
1 a

Substance	Metal	Non-metal
A	✔	
B		✔

b Any two from: oxygen, nitrogen, carbon dioxide, water vapour.

c It is shiny, and a non-metal surface is dull.

2



The properties of materials

3 a A Cannot be bent; snaps if a large force is applied to it; you can see through it.
Properties: rigid, brittle, transparent.

B You cannot see through it; it takes up water and bends.
Properties: opaque, absorbent, flexible.

C You cannot see through it clearly; it cannot be bent; does not let heat pass along it.
Properties: translucent, rigid, heat insulator.

D You cannot see through it; it bends; when placed in a circuit, it makes a lamp light up.
Properties: opaque, flexible, electrical conductor.

b D

c A

4 Three materials feel soft. You can use a large, heavy ball and other items to compare the softness of the materials.

a Hypothesis: If a heavy ball is dropped on a soft material, it will leave a mark on the soft material.

b Prediction: The softer the material, the easier it will be to see the mark caused by the heavy ball.

c For example: Drop the heavy ball from the same height onto each of the three materials. Record the changes. (This could be done by measuring the mark or photographing the changes.)

d Repeat the experiment several times.

e If there are differences in the marks left on the different soft materials.

f It may be difficult to judge the changes caused by the heavy ball.

5 Example of a possible plan:

- Place each twig in turn between the two laboratory stools.
- Make sure the same length of twig rests in the open space between them.
- Place the metre ruler vertically behind the centre of the twig between the stools and note its position (measure the height of the twig).
- Hang the bucket by the handle on the centre of the twig.
- Record the height of the twig on the metre ruler again.
- Place a 10 g mass in the bucket and record the height on the metre ruler again.
- Keep adding 10 g masses and noting each position change, but do not let the twig snap or fall between the stools.
- Repeat the above with each twig and compare the results.

a The independent variable is the one that the experimenter changes. In this experiment, it is the type of twig.

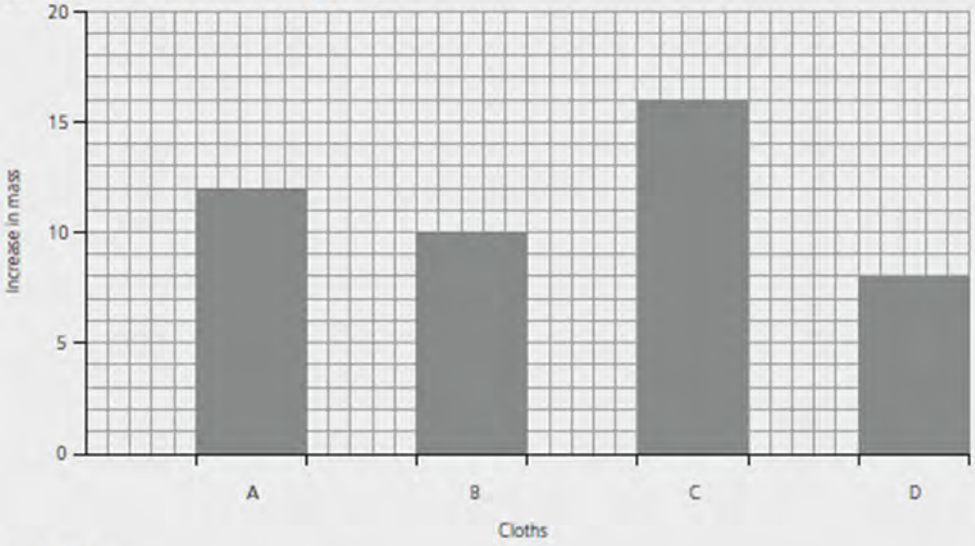
b The dependent variable is the one that is measured. In this experiment, it is how much the twig bends.

c From the data collected, students should be able to see that the most flexible twig will have bent down the most, and the most rigid twig will have bent the least.

© Peter D Riley Ltd and Judith Amery 2021

6 a Yes, Ahmed did make a fair test. He used the same mass of cloth, soaked each one for 10 seconds (making sure they were fully submerged), and allowed the water to drop off for 30 seconds before reweighing them.

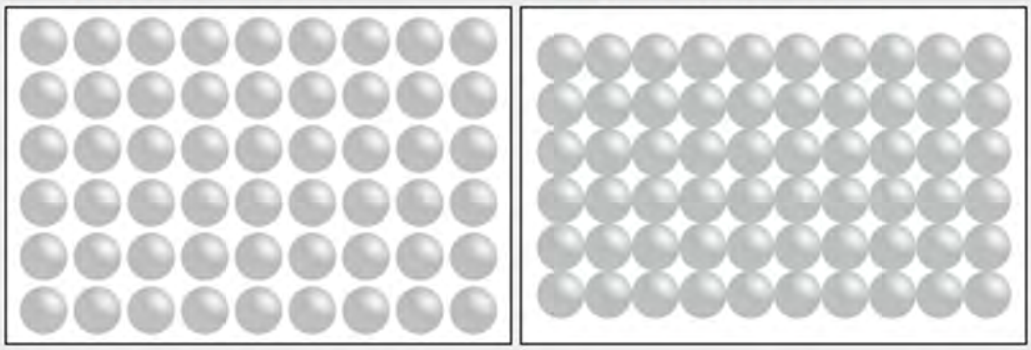
b



c C, A, B, D

d Yes, he could have used samples of cloth that all had the same area, for example.

7 a **Box A: Absorbent material** **Box B: Non-absorbent material**



b The water can enter the material through the openings (spaces) in it and pass into the spaces in-between them. Water cannot enter and stay *in* the material because there are no openings to the outside.

© Peter D Riley Ltd and Judith Amery 2021

Property profiles

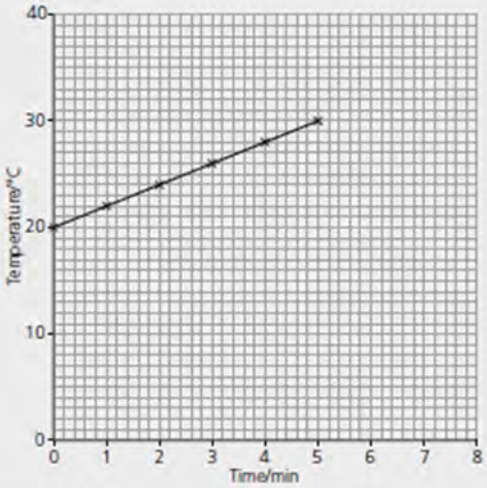
8 a It is malleable (it can be pressed into a shape), it is a good conductor of heat and it is waterproof.

b It is a heat insulator (an insulator of heat), it is soft enough to be carved into shape and it is rigid.

9 a B

b C

c The best heat-conducting material is rod C.



d 7.4 minutes (accept approx. 7.5 minutes).

© Peter D Riley Ltd and Judith Amery 2021

9 Chemical reactions

Workbook answers

When a candle burns

1 A substance takes part in an activity with other substances to make new substances.

2 A pile of green beans and yellow beans on one side, and a pile of green beans and yellow beans stuck together on the other side.

3 a The suction pump: To draw the air away from the candle and to draw the air out of the test tube containing limewater.
b The cobalt chloride paper: This turns from blue to pink in the presence of water, so it is a test for water.
c The limewater: It turns cloudy in the presence of carbon dioxide, so it is a test for carbon dioxide.

4 a A
b The oxygen in the air under the beaker had been used up.
c The candle would burn for a shorter time before going out.
d **Possible plan:** Set up a small candle on a dish and light it. Place a small beaker over it, making sure the flame does not reach the top (the base) of the inverted beaker. Time how long the candle burns. Repeat this procedure with a medium-sized and large beaker. If a beaker has a spout on it which will let air in, this could be closed by placing a small piece of modelling clay in the spout.
Control variables: The same candle and dish; the same person timing the duration of the flame.
i The size of the beaker.
ii The time it takes to burn.

The chemical reaction when calcium hydroxide (limewater) turns milky

5 a Calcium hydroxide.
b Calcium carbonate.

6 a Limewater.
b A cloudy or milky colour.
c When the first pair of reactants are put together, start a stop-clock or timer and time how long it takes for the limewater to go milky.
Repeat with the second pair of reactants and compare the time taken for the limewater to go milky.
Compare the results.

© Peter D Riley Ltd and Judith Amery 2021

10 Acids and alkalis

Workbook answers

Early acids and alkalis

1 Acid: Sour.
Alkali: The ashes.

Detecting acids and alkalis

2 Boyle.

Using indicators

3 a X is on 7.
b The circle is around 0–2.
c The circle is around 8–11.
4 Purple.

Neutralisation

5 a The acid, which had a pH between 1 and 6, and the alkali, which had a pH between 8 and 14, form a solution that has a pH of 7, which is neutral.
b i Red to orange.
ii Blue to purple.
iii Green.
6 a Soap, because the sting is acidic and soap is alkaline.
b Vinegar, because the sting is alkaline and vinegar is a weak acid.
7 a It goes up (becomes higher).
b The vinegar without water would produce the most bubbles.
c i The two samples. One would be just vinegar and one would be vinegar and water.
ii The volume of the bubbles.
iii The amount of each sample used; the amount of sodium bicarbonate added; the temperature of the solutions.
8 a The stomach makes too much acid as it digests food.
b It dissolves to make an alkaline solution which neutralises the acid.
9 a It contains two solids which will only react together when they dissolve in water.
b Carbon dioxide, which makes the texture light.
10 a A solid.
b Insoluble.
c It becomes cloudy, milky or has coloured particles in it.
d Calcium carbonate.
11 That a chemical reaction has taken place/ that a new product has been made.

© Peter D Riley Ltd and Judith Amery 2021

11 Measurement

Workbook answers

Length, mass and time

1 a It is not testable because James can find out if he can kick further with his right foot, but he cannot test if this is because he is right-handed.

b He could ask a group of people, some of whom are right-handed and some of whom are left-handed, to see if they kick further with their right or left foot.

c **Equipment and location:** A football, a measuring tape and a field.
Measurements: The distance the football is kicked.
Number of measurements: Each person should be asked to kick the football more than once and maybe three times.
Safety precautions: There should be a clear space in front of the person kicking the football.
How the test could be unfair: If some people kicking the ball are larger or stronger than others, they may be able to kick it further with either foot.
How you will try to make sure the test is fair: Try to use people of the same size and strength to find the results.

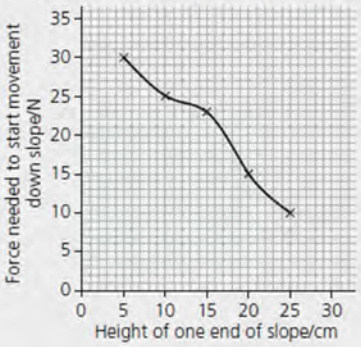
d If left-handed people can kick further with their left foot and right-handed people can kick further with their right foot, the hypothesis is supported. If not, it is contradicted.

e There might not be enough people being tested.

2 a i The dependent variable is the one that is measured, so it is the force needed to start movement down the slope.

ii The independent variable is the variable the experimenter controls, so it is the height of the slope.

b



© Peter D Riley Ltd and Judith Amery 2021

c 15 cm and 23 N.
d The higher the slope, the less force needed to start the movement.

3 a For Shazia's investigation she needs to know the conditions used by Ben, Oliver and Max.
b As Ben and Max are very competitive, they might not have taken accurate measurements, though their data is very similar.
c Go back to their experiments and measure the bean plants herself.

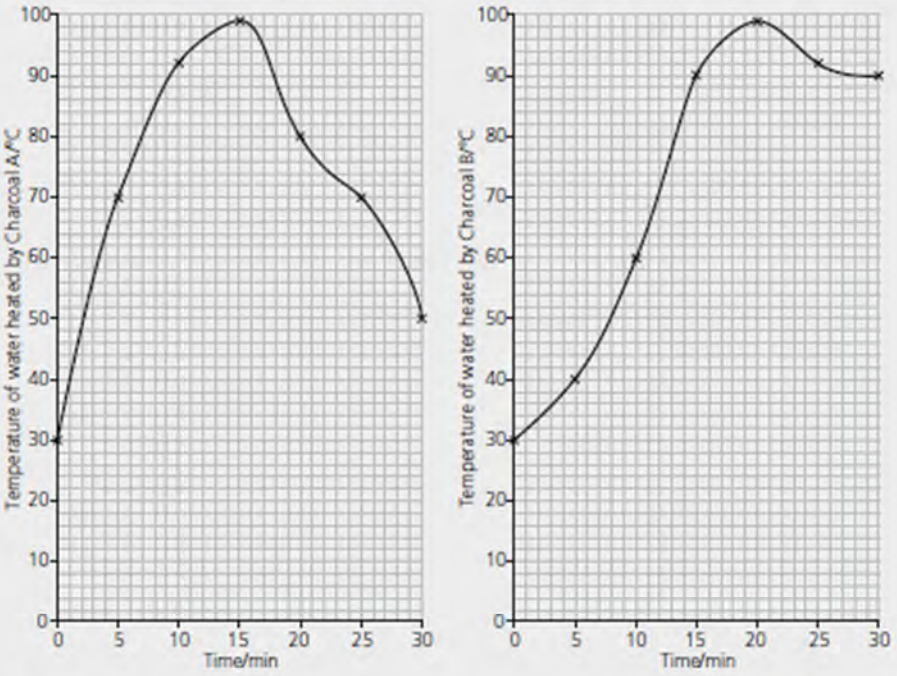
Accuracy of measurements

4 a i The dependent variable is the one that is measured, so it is the height of the bamboo shoots.
ii The independent variable is the variable the experimenter controls, so it is the age of the bamboo shoot (young or old).
b Both need to measure the heights of the bamboo shoots accurately. Larisa is more precise because she has measured her shoots in millimetres.
c Accurate measurements are important to compare to the data collected. Precise measurements are important to see small differences in the measurements.

Heat and temperature

5 a Use the same mass of each fuel, the same mass of water, have the pans the same distance above the fuels, make sure the air is still around both barbeques, and hold the thermometer in the same position in both pans when taking the temperature.

b



c i Brand A charcoal: The temperature rises quickly, stays high for a short time then falls quickly.
ii Brand B charcoal: The temperature rises slowly and remains high for longer then starts to cool down more slowly.

d Charcoal A releases its energy as heat faster than Charcoal B and releases less energy than Charcoal B later in the investigation.

© Peter D Riley Ltd and Judith Amery 2021

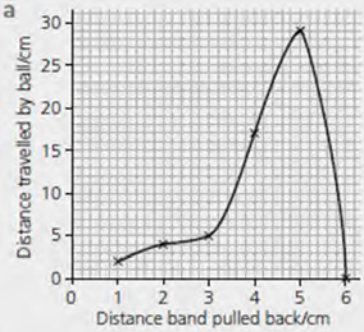
12 Energy

Workbook answers

Stores of energy

1 a Chemical energy.
b Potential energy.
c Strain energy.

2 a



b The further the band was pulled back, the further the ball travelled.
c The greater the stored energy in the band, the further the ball travelled. Pulling back the band further increases its stored energy.
d i 3 cm.
ii The elastic band could have been pulled back more than 3 cm before it was released. The cotton wool ball was not secure in the elastic band and fell out as the band was released.
e She could repeat them, taking more care over her measurements.
f The elastic band broke (or snapped).

3 It moves.

4 Any two from:
– Chemical energy can be seen as movement (kinetic) energy.
– Chemical energy can be seen as light energy.
– Chemical energy can be heard as sound energy.

5 Useful form of energy: Internal energy.
Less useful form of energy: Thermal energy.

Energy transfers

6 Place the metal tray on its end against a wall, put the dried bean in the pouch of the catapult (the place where the missile is stored), set up the catapult at a distance from the tray. (The catapult can be a simple Y-frame catapult.)
Pull back the elastic material in the catapult to increase the strain energy, then release the catapult.
The energy in the elastic material is transferred to the bean, which uses kinetic energy to move towards the metal tray and hit it.
This causes the tray to vibrate and produce sound energy.

7 Make sure the two samples have equal mass by weighing and cutting until they both have the same weight.
Measure out a certain volume of water with the measuring cylinder (for example, 50 cm^3) and pour it into the beaker.
Set up the beaker on the gauze and tripod.

© Peter D Riley Ltd and Judith Amery 2021

Take the temperature of the water.
Set fire to material A and let it burn away completely.
Record the temperature of the water again.
Subtract the first temperature from the second.
Repeat the steps above with material B.
Compare the rise in the temperature of the water when A and B have each been burnt.

a The independent variable is the variable the experimenter controls, so it is the materials A and B.

b The dependent variable is the one that is measured, so it is the amount of heat transferred to the beaker of water when they are burnt.

c The chemical energy stored in each material is released when the material burns and increases the internal energy of the water in the beaker. This is measured by the thermometer. The material that raises the temperature of the water higher has the greater stored chemical energy.

8 Because some energy always escapes/transfers/is lost to the environment as heat.

Wasted energy or energy we cannot use

9 The spreading out of energy into different forms.

10 It becomes less useful.

© Peter D Riley Ltd and Judith Amery 2021

13 Sound

Workbook answers

From vibration to sound wave

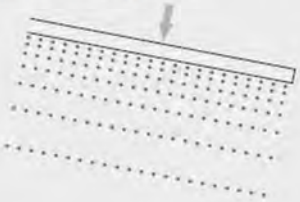
1 It is a to-and-fro or backwards-and-forwards movement about a fixed point.

2 Accept any ten, but must have a variety, from people, animals, vehicles, machines, musical instruments, weather conditions.

3 The sound goes lower as the vibrating length increases.
The sound goes higher as the vibrating length decreases.

4 a If there is no sound, Box A should have no particles (a vacuum) or just one or two particles.

b The vibrating object pushes the particles together.



c The vibrating object pulls the particles apart.



5 The different positions that particles occupy as they move to and from their resting position form the shape of a wave.

6 a Plans will vary but need to include the tennis ball suspended by the string so that it can move freely. The ruler should be on a flat surface, close to the tennis ball but not touching it. When the ruler is made to vibrate, the tennis ball should start to move.

b Particles.

c **Strength:** It shows how the movement of the vibrating object is transferred to a 'particle' in the air.

© Peter D Riley Ltd and Judith Amery 2021

Limitation: Only one particle is shown, and it is very large compared to the vibrating surface (although it could be said to represent a microscopic view). More table tennis balls on strings close to the one in the model could represent the movement in air better.

7 B A foot approaches the ground.
F A foot touches the ground and makes it vibrate.
C The vibrations pass across the ground.
E The lower jawbone of the snake starts to vibrate.
A The snake's ears receive the vibrations.
D The snake prepares to attack.

8 No, particles are needed to transmit the vibrations and there are no particles in a vacuum.

Reflection of sound

9 When sound is travelling in one direction, strikes a surface and bounces back in a different direction.

Echoes

10 a The echo.
b More than a tenth of a second apart.
c i The heat of the lightning makes the air expand, which causes a noise.
ii The noise is reflected off the clouds.

© Peter D Riley Ltd and Judith Amery 2021

14 Electricity

Workbook answers

Introducing the electron

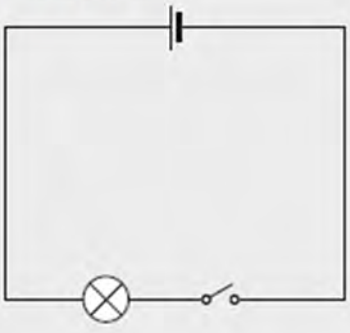
1 a i The water pump: The cells or battery.
ii The pipes: The wires.
iii The water: The electrons moving round the circuit.
b i The water in the dam: Electrons not moving because, for example, the switch has not been closed.
ii The water: The electrons that are able to move in a current.
iii The stream: The moving electrons.
c i **Strength:** Ahmed's model shows the particles moving round a circuit and the pump is a better model of the battery.
Limitation: The model doesn't show how the current could be stopped by breaking the circuit.
ii **Strength:** Lily can use the dam to stop and start the flow of the water, which represents the electrons.
Limitation: The model is not a circuit.

2 An electrical conductor is a material that allows an electric current to pass through it easily.
An electrical insulator is a material that does not allow electric current to pass through it.

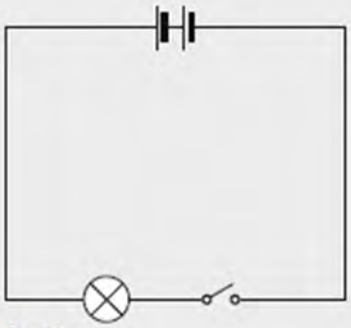
Simple circuits

3 a i The switch.
ii It is not a complete circuit.
b i The lamp shines more brightly.
ii Both lamps are dimmer than in the first circuit.

4 a



b



5 a Aruni.
b Aluminium is a metal and a conductor; wood is an insulator.

6 Suggested plan:
Set up a circuit with one cell, a switch and the lamp.
Set up the light meter at a certain measured distance from the lamp.
Close the switch so that the lamp lights and record the light level produced with the light meter.
Repeat the steps above with a circuit that has two and then three cells in it.
Compare the readings of the light meter to see if there is a difference.
a The independent variable is the variable the experimenter controls, so it is the number of cells.
b The dependent variable is the one that is measured, so it is the brightness of the lamp.
c There should be a difference in the readings and they should follow a pattern of increasing light intensity when extra cells are used.

Amperes

7 a The flow of current in a circuit.
b Connect the red terminal to the positive terminal of the cell.

8 The reading at A is the same as at B.

© Peter D Riley Ltd and Judith Amery 2021

9 a A comprises one cell, one lamp, an ammeter and a switch.
B comprises two cells, one buzzer, an ammeter and a switch.

b The buzzer would be quieter than in circuit B.

c The ammeter reading in circuit B would be higher than in circuit A, because the two cells in circuit B produce a larger current than the single cell in circuit A. The smaller current in circuit A provides less energy for the buzzer to make a sound and it will be quieter.

© Peter D Riley Ltd and Judith Amery 2021

15 The Earth in space

Workbook answers

Gravity and planet formation

1 Gravity is the force that pulls objects together. Objects with a greater mass have a stronger pulling power on those with a smaller mass.

2 The mass of the pebble is too small compared to the planet.

3 a The dust particles joined to form larger particles, then rocks, then planets.
b It was gravitational forces which caused them to join together.

4 It exerts a pulling force on any two objects in the universe which can bring them together.

5 a Air resistance is the force of friction between a moving object and the particles in the air.
b No, because there are no gas particles for the planets to push against. They are in a vacuum.

6 a i The table tennis ball.
ii Your hand.
b Whizz the ball around the hand.
c Let go of the string; the ball would fly away.
d **Strength:** It shows how a planet moves in an orbit around the planet.
Limitation: The planet is held in orbit by the string and the model doesn't show the force of gravity. The planet remains the same distance from the star and this is not always the case.

© Peter D Riley Ltd and Judith Amery 2021

The formation of the solar system

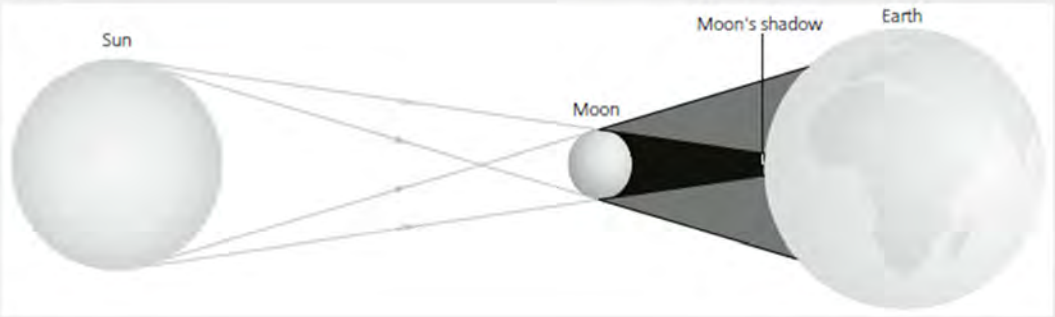
7 a The Earth.
b The Sun was at the centre.
c The planets moved in ellipses, not circular orbits around the Sun.
d Sir Isaac Newton.

The Moon, the Sun and the tides

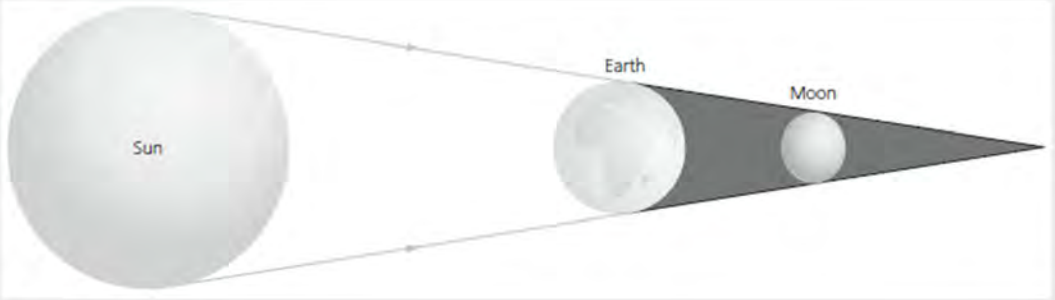
8 a E, C, B, D, A
b If the Sun, Moon and Earth were in a line, you would not be able to see the Moon.
c The difference between high and low tide is the greatest.

9 A spring tide occurs when the when the Sun and the Moon are in line.
A neap tide occurs when the Moon is furthest out of line with the Sun.

10 a



b



© Peter D Riley Ltd and Judith Amery 2021

16 A closer look at the Earth

Workbook answers

The structure of the Earth

1 The crust and the mantle.
2 Parts of the Earth's crust which move over the Earth's mantle.

The tectonic plates

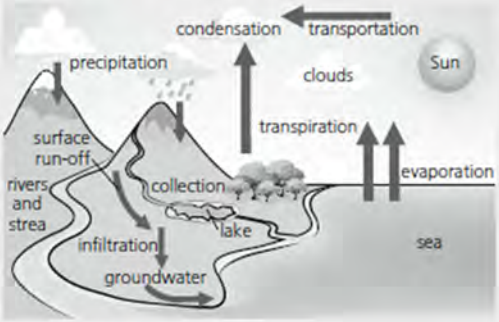
3 a The biscuits.
b The syrup.
c **Strength:** It shows how a solid plate can float on the liquid.
Limitation: It doesn't show how the tectonic plates fit together.
d The biscuits might move over the liquid.
e **Strength:** It shows why the tectonic plates move.
Limitation: It does not show what happens when tectonic plates meet.
4 a A convergent boundary.
b They push together and are forced upwards.
5 a When two plates meet and they form a crack.
b At the boundaries.
6 Volcanoes occur at the boundaries between tectonic plates.

The Earth's atmosphere

7 a 78% nitrogen and 21% oxygen.
b Carbon dioxide.
c Living things produce certain gases and these include oxygen and carbon dioxide.
d Nitrous oxides, ozone.

Water in the atmosphere and the water cycle

8 Accept diagrams with labels A, B, C and D correctly positioned.
Or:
Accept diagrams with the words evaporation, condensation, precipitation and run-off correctly placed.



9 a Possible plan:
Fill the watering can with a specified measured volume of water. The same amount of water needs to be used on each of the four surfaces.
Hold the watering can a specified height above each surface, begin to water and start the clock.
Let the watering can empty and time how long it takes for the water to flow out into the large bowl.
Repeat the steps above with each tray.
Compare the run-off rates to find the surface with the fastest run-off.
b Students should be able to predict that tarmac will have the fastest run-off.

© Peter D Riley Ltd and Judith Amery 2021