Skills Builder Workbook 9 Answers

All sample answers to the Cambridge Secondary 1 Checkpoint-style questions have been written by the authors of this work.

Unit 1 Plants

1.1 What do plants need for photosynthesis?

1 A and C

2 C and D

3 All four tubes

4 Only the tubes that had light – tubes A and C – gave off bubbles.

5 The tube that had extra carbon dioxide and light – tube C – gave off more bubbles than the tube that had light but no extra carbon dioxide – tube A.

6 All of the tubes had water, so we cannot tell whether or not the plants need water for photosynthesis.

7 Amal needs to have a fifth tube, with light, extra carbon dioxide and **no** water, in order to tell whether water is needed.

8 carbon dioxide + water ➔ glucose + oxygen

1.2 Duckweed experiment

1 A 0, B 1, C 2, D 3, E 4.

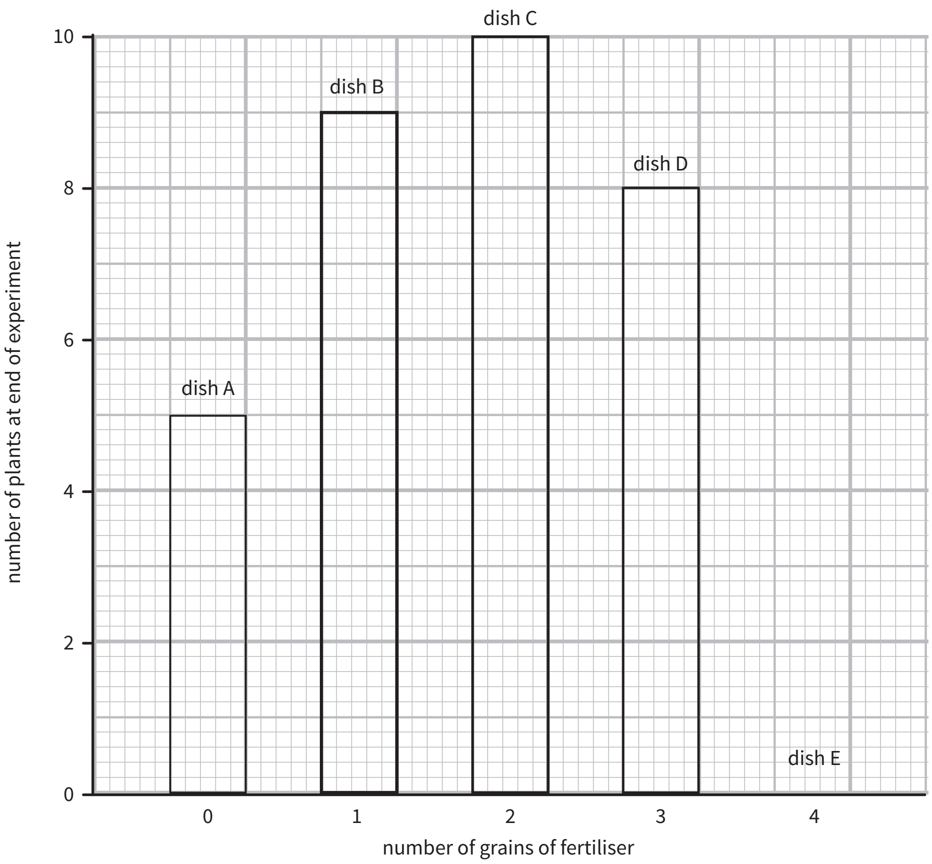
2 quantity of fertiliser

3 number of duckweed plants, volume of water, temperature, light intensity

4

Dish	Number of grains of fertiliser	Number of plants at end of experiment
A	0	5
B	1	9
C	2	10
D	3	8
E	4	0

5



6 More duckweed plants grew in the dishes with 1 or 2 grains of fertiliser than with no fertiliser. This shows that adding fertiliser causes the duckweed plants to grow more.

However, fewer plants grew when 3 grains of fertiliser were added than when 2 were added, and all the plants died when 4 grains were added.

7 Use three sets of dishes for each quantity of fertiliser.

(The other two choices would be different experiments and would not test Anna's original idea, which was that giving **duckweed plants extra nitrate fertiliser** helps them to grow faster.)

1.3 Saguaro cactus pollination

1 Any two of: the smell of the flowers; their shining white petals; their nectar.

2 It is easier for bats to reach them, because bats fly. If the flowers were lower down, then the bats might have to negotiate prickly cactus stems in order to reach the flowers. Also, the flowers may be able to spread their scent further, or be seen from a greater distance, when high up.

3 The petals form a long tube with nectar at the bottom. The anthers are in a ring around the top of the tube. The bats have to push their heads into the tube to allow their tongues to reach the nectar.

4 Each flower only opens on one night. If they all opened on the same night, there might not be enough bats to pollinate all of them. Also, if the weather was very bad on that night, then perhaps no bats would be able to fly to the flowers.

5 For example: The bats **pollinate** the flowers. This means that they transfer pollen from the anthers of one flower to the stigma of another flower. The **male gametes** in the pollen grains can then **fertilise** the **female gametes** inside the ovary. This is how plants undergo **sexual reproduction**.

1.4 Adaptations of fruits for dispersal

Answers should contain clear and detailed **explanations** of how the dispersal takes place.

1 By wind. The fruit has two long wings. These will help it to stay in the air for a long time, so it has time to float far away from the parent plant. (Fruits shaped like this come from trees. They behave like little helicopters, spinning as they fall to the ground.)

2 By animals. The seeds are embedded in the flesh of the fruit. We can assume that the flesh is juicy and sweet, and so would attract animals to eat the fruit. The animals might pick up the fruit and carry it away from the parent plant to eat it. They might spit the seeds out. Or they might eat the seeds, which pass through their digestive system and then are passed out in the animal's faeces in a place far away from the parent plant.

3 By animals (probably mammals). The hooks get caught in the animal's fur. The animal moves away, and later on grooms its fur and drops the seeds to the ground.

4 This allows the plant to colonise new places. It also makes sure that the new young plants that grow from the seeds won't have too much competition with their parent, or with each other – for example for light or water.

Unit 2 Living things in their environment

2.1 Woodlouse experiment

1

time / minutes	2	4	6	8	10	12	14	16	18	20
number of woodlice in uncovered side	6	10	7	4	3	3	2	0	0	0

Note: Also allow the time to begin at 0 minutes, as it is not clear from Jon's results whether the first one was collected at 0 minutes or after 2 minutes.

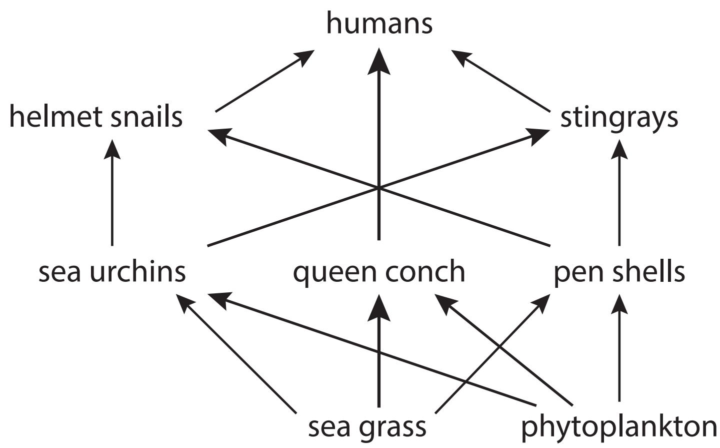
2 10

3 The woodlice tend to move into dark places.

4 Being in dark places will make the woodlice less visible to predators. It also helps them to keep cool and moist; woodlice can easily dry out if they are in the hot sun.

2.2 Building up a food web

1, 2, 3, 4 and **5**



6 sea grass and phytoplankton

7 any two of: sea urchins, pen shells, queen conch

8 any two of: helmet snails, stingrays, humans

2.3 Decomposers in a compost heap

1 Circles drawn around glass, metal and plastic

2 Students may suggest putting the material onto a microscope slide, and looking at it through a microscope. This should be credited, but in practice it would be impossible to pick out micro-organisms from among the non-living parts of the material. It would be better to mix the material with some water, and then spread a little of the mixture onto sterile agar jelly in a Petri dish. After some days, micro-organisms in the material will have formed little colonies on the agar. It would also be good to have another dish where just water was added to the jelly, so that the number of colonies could be compared.

3 Micro-organisms need water and oxygen to survive. Micro-organisms do much of the decomposing.

4 53.7 (allow between 53.5 and 54.0) °C

5 80(.0) °C

6 This happens just after the heap is turned, so that is probably the cause. The mixing would let more air into the heap, so the micro-organisms would have more oxygen for respiration. It could also mix the micro-organisms into some new areas of nutrients that they haven't had access to before. They would be more active, and release more heat.

7 Perhaps the micro-organisms are running out of nutrients to feed on. Perhaps the heap is running out of air and needs mixing again. Perhaps it is getting too dry.

Unit 3 Variation and inheritance

3.1 Using a key to identify fish

Most students find keys easy to use, once they have understood how to work through them. A common error is to try to identify everything at once. The questions here are intended to encourage them to look at one organism at a time, and work steadily through the key, step by step.

1 **a** 1a

b basking shark (its eye is above the front end of its mouth)

2 **a** 1b

b sea bream (it has short spines on its top fin)

3 Greenland shark

4 John Dory

3.2 Growing rice in Indonesia

1 1.5 tonnes per hectare (Watch out for students who miss the 'per hectare'.)

2 4.6 tonnes per hectare

3 3.1 tonnes per hectare

4 Fertiliser contains mineral ions that plants need to grow well, such as nitrate and magnesium. Nitrate helps the plant to make proteins. Magnesium helps the plant to make chlorophyll.

5 (4.8 – 2.1) tonnes per hectare = 2.7 tonnes per hectare

6 C, D, B, F, A, E

3.3 Blue-tailed lizards

1 nucleus

2 inheritance

3 When the lizard sheds its tail, the snake is more likely to be attracted to a blue tail than to a brown tail. So the blue tails are more likely to distract the snake from eating the lizard itself.

4 More parent lizards with blue tails survive, so they are the ones that reproduce. They pass on their genes for blue tails to their offspring.

3.4 Camouflaged caterpillars

1 How many green caterpillars and how many yellow caterpillars Jon picks up.

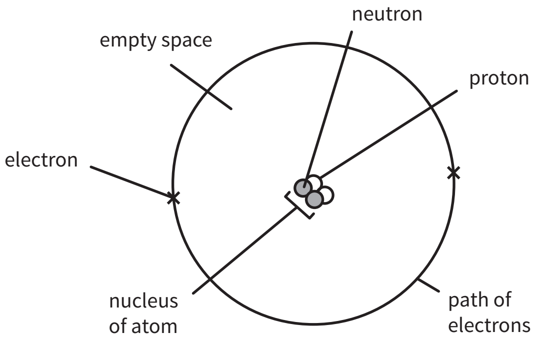
2 Repeat the experiment five times with the same caterpillars, using five different students to collect them.

3 D, B, A, E, C

Unit 4 Material properties

4.1 What is an atom made of?

1, 2 Allow labels for neutrons and protons to be reversed.



3 The following statements should be ticked:

Electrons have less mass than protons.

Electrons have a negative electrical charge.

Neutrons have more mass than electrons.

4.2 How many protons and neutrons are in an atom?

1 12

2 14

3 Aluminium

4 Neon

5 Carbon atom:

Atomic number = 6

Mass number = 12

Number of protons = 6

Number of neutrons = 6

Number of electrons = 6

6 Boron atom:

Atomic number = 5

Mass number = 11

Number of protons = 5

Number of neutrons = 6

Number of electrons = 5

4.3 Elements in the same group

1 The number of protons increases.

2 The mass number increases.

3 Sodium atom:

Atomic number = 11

Mass number = 23

Number of protons = 11

Number of neutrons = 12

Number of electrons = 11

4 2, 8, 1

5 They both have the same number of electrons (one) in the outer shell

6 Potassium atom:

Atomic number = 19

Mass number = 39

Number of protons = 19

Number of neutrons = 20

Number of electrons = 19

7 2, 8, 8, 1

8 All three have the same number of electrons (one) in the outer shell.

9 The atoms get larger / there are more electron shells as you go down the group.

The atoms have a larger mass / more protons and neutrons as you go down the group.

Unit 5 Energy changes

5.1 What happens when things burn?

1 Heat energy and light energy (and sound energy).

2 Circles labelled C should be grey; circles labelled O should be red.

3 Carbon dioxide

4 magnesium + oxygen ➔ magnesium oxide

5 Credit any other exothermic reaction, such as burning gas, a named chemical burning in air, or an alkali metal reacting in water.

5.2 Investigating an exothermic reaction

1 The length of magnesium ribbon.

2 The change in temperature.

3 The type of acid used; the volume of acid used; credit any other sensible control variables.

4

Length of ribbon / cm	Start temperature / °C	End temperature / °C	Temperature change / °C
0.5	19	36	**17**
1.0	19	36	**17**
1.5	19	36.5	**17.5**

5 The results show that the length of magnesium used makes very little difference to the temperature produced.

6 No. They have only used a very small range of lengths of magnesium.

7 0.5 cm

8 A larger interval in length, so that any difference in the temperature rise will be more obvious.

9 Accept any sensible number from 5 upwards.

10 Credit any sensible suggestion to reduce heat loss to the room. Ideas such as wrapping the test tube in some sort of jacket are the most likely.

11 They can repeat the investigation with each length of magnesium ribbon at least twice.

5.4 Energy changes

1

Reaction	Start temperature / °C	Final temperature / °C	Exothermic or endothermic?
A	21	45	**exothermic**
B	18	22	**exothermic**
C	19	16	**endothermic**
D	18	20	**exothermic**

2 Endothermic reaction

3 Exothermic reaction

4 It is called an endothermic process not an endothermic reaction because there is **no chemical reaction**. The ice changes state from a solid to liquid water / melts, by using heat energy from the environment.

5 In solid ice, the particles are lined up in rows and can only vibrate in fixed positions; they cannot move around inside the ice. The forces between the particles are strong. As the particles **gain heat energy** from the surroundings, they vibrate more and more. When the particles **have enough energy,** they can move and overcome the forces holding them in place. They can slide past each other. The ice begins to melt.

Unit 6 Reactivity

6.1 Investigating reactivity

1 The test tube with metal C has less acid than the others so it is not a fair test. All the tubes should have the same volume of acid. The volume of acid needs to be a controlled variable.

2 They have put on safety glasses.

3 Because the tube with metal A contains a different acid, nitric acid; the others have hydrochloric acid. The type of acid needs to be a controlled variable.

4 No, because the piece of metal B is larger than the pieces of the other metals. The size of the pieces of metal needs to be a controlled variable.

5 **a** How reactive different metals are with dilute acids.

b The type of metal used.

c The amount of bubbling / number of bubbles there are when the metal reacts with the acid.

d The volume of acid used, the type of acid used, the mass of metal used. Credit also 'the same temperature', and any mention of the form the metal is in, i.e. powder, lump or ribbon, which would show a high degree of understanding.

e Put on safety glasses. Measure out the same volume of acid in a measuring cylinder and place in four test tubes. Check the mass of the pieces of metal to make sure that they are the same. Place a piece of metal A in the first test tube, metal B in the second, metal C in the third and metal E in the fourth. Observe the reactions and compare the amount of bubbling. Record the observations. Give credit for naming a suitable acid and safety precautions when using acids.

f Some metals will produce more bubbles than others.

g This will show which are the more reactive metals. The ones that produce the most bubbles are the most reactive.

6 magnesium + hydrochloric acid ➔ **magnesium chloride** + hydrogen

7 zinc chloride

6.2 Using the reactivity series

1 Less vigorously.

2 It does not react at all. But give credit for 'silver reacts less / is less reactive than copper'.

3 Iron will react more quickly than lead with dilute acid.

6.3 Metals and metal salts

1 No. There will not be a displacement reaction because copper is less reactive than iron.

2 Silver or gold. Give credit if there is mention of another unreactive metal such as platinum.

3 Iron. Accept zinc.

4 **a** yes
   b no
   c no
   d yes
   e yes

5 magnesium + zinc chloride ➔ magnesium chloride + zinc

Unit 7 Salts

7.1 Which acid is used to make which salt?

1 Hydrochloric acid — HCl — chlorides
   Sulfuric acid — H_2SO_4 — sulfates
   Nitric acid — HNO_3 — nitrates

2 Sodium chloride: hydrochloric acid
   Sodium nitrate: nitric acid
   Sodium sulfate: sulfuric acid

3 NaCl: sodium chloride
   $CuSO_4$: copper sulfate
   $CuCl_2$: copper chloride
   KNO_3: potassium nitrate

4 Citrates

7.2 Preparing copper chloride

1 The copper carbonate reacts with the acid, and carbon dioxide gas is given off. Credit any mention of the formation of copper chloride or water.

2 (Unreacted) copper carbonate

3 A solution of copper chloride. Credit 'a mixture of water and copper chloride'. (The important thing here is that they recognise there is water present in addition to the salt.)

4 Place the filtrate in an evaporating basin and heat it to evaporate off the water and leave the crystals.

5 When the solution is being heated it tends to spit, and this can burn.

6 They should wear safety glasses to prevent damage to their eyes. They should take special care when near to the evaporating dish. They should turn off the heat when the solution begins to spit, then leave the water to evaporate in the air.

7 copper carbonate + hydrochloric acid ➔ copper chloride + water + carbon dioxide

7.3 Preparing potassium chloride

1 The list should include: measuring cylinder; beaker (credit conical flask); hydrochloric acid; burette; stand; universal indicator solution; safety glasses.

2 Put on safety glasses. First add a drop of universal indicator solution to the potassium hydroxide in the beaker, which turns blue. Set up the burette and fill with acid. Add acid, a little at a time, to the potassium hydroxide, and swirl the beaker to mix the acid.

3 When they see the universal indicator solution turn from blue to green.

4 Add charcoal to the neutral solution. This will remove the colour. Then the solution should be filtered to remove the pieces of charcoal.

5 potassium hydroxide + hydrochloric acid ➔ potassium chloride + water

6 A solution of a metal oxide in water. Give credit for saying it is a solution that contains hydroxide particles / is the opposite of an acid / has a pH above 7.

7 Credit any hydroxide that they may have come across, e.g. sodium hydroxide.

8 A base is a metal oxide.

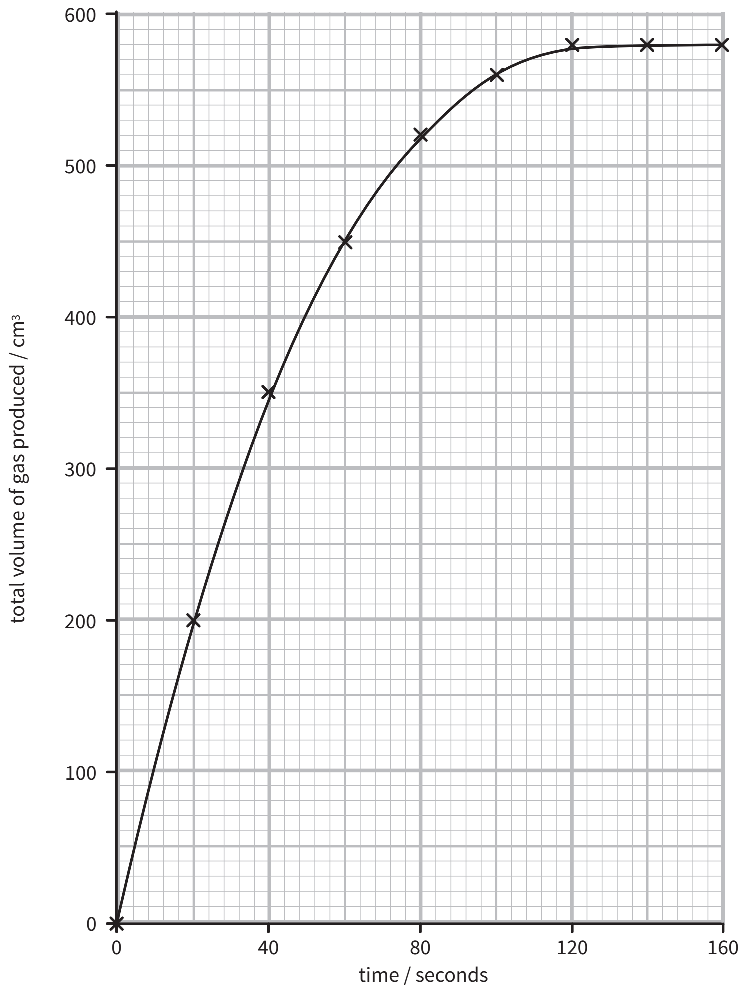
9 Credit any metal oxide that they may have come across, e.g. copper oxide.

Unit 8 Rates of reaction

8.1 Investigating the reaction of calcium carbonate with an acid

1 Carbon dioxide

2



Credit the use of pencil and ruler, correct axes (time on the *x*-axis), suitable scales (filling most of the graph grid), scales correctly labelled, points plotted accurately, suitable curve of best fit through the points.

3 As time progresses more gas is produced, up until 120 seconds. Then no more gas is given off. If students make a comment about the steeper the line the faster the gas is given off, this would show a greater level of understanding.

4 All the calcium carbonate has reacted so no more carbon dioxide can be produced.

8.2 Showing the change in rate of reaction on a graph

1 Between 0 seconds and 100 seconds.

2 Between 250 seconds and 350 seconds.

3 35 (allow 36) cm^3

4 $(66 - 53)\,cm^3 = 13\,cm^3$

8.3 Explaining changes in the rate of reaction

1 a At the start of the reaction, there are a lot of particles of the reactants. They move about. A large number of them are likely to collide with one another with enough energy to react.

b As the reaction continues, some of the particles have reacted so there are fewer particles of the reactants left. There are fewer available particles to collide and react so the rate of reaction slows down.

2 When the temperature increases, some of the heat energy is transferred to the particles. The particles with more energy move more quickly. This means that there will be more collisions in a period of time, so the rate of reaction will increase.

Unit 9 Forces in action

9.1 Density and mass

1 lead

2 stone

3 sponge

4 brick

5 sponge

6 gas

9.2 Measuring volumes

1 ruler; or measuring tape / tape measure; or metre rule(r) / metre stick

2 105 (cm^3)

working shown as:

5 × 7 × 3

(numbers can be in any order)

3 In each, credit the working as the three numbers multiplied together (in any order).

a 200 (cm^3)

b 44(.1) (cm^3)

4

work out the increase in volume	4
put 50 cm^3 of water in a 100 cm^3 measuring cylinder	1
put the modelling clay into the water in the measuring cylinder	2
record the new volume in the measuring cylinder	3

5 **a** 10 (cm^3)

b 28 (cm^3)

c 2 (cm^3)

9.3 Calculating the density

1 In each, credit the working as the mass divided by the volume.

a 10 (g/cm^3)

b 5 (g/cm^3)

c 0.25 (g/cm^3)

9.4 Force and pressure

1 a prediction

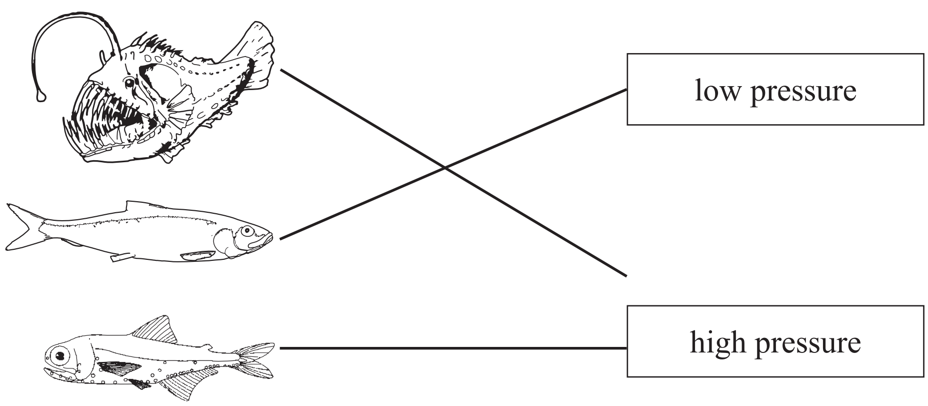
2 C

3 B

9.5 Pressure in air and water

1 The aeroplane

2



(no credit for a fish if more than one line from that fish)

3 Pressure increases with depth in water.

4 The pressure decreases with height / pressure gets lower as you get higher / negative correlation between pressure and height. (Or words to that effect; must mention a trend or relationship.)

5 20 000 (Pa)

6 0 (m) / ground level

9.6 Moments

1 C

2 further / more

3 Any two ideas from: same ruler; same point X / weights hung same distance from end; same length of ruler extending off bench / clamp at same distance / end of bench at same distance (**not** height from the floor).

4 The ruler won't bend as far / results (for bend) are smaller. (Accept any numerical examples of results that are smaller than those in the results table.)

Unit 10 Electricity

10.1 Predicting effects of static electricity

1 One gains a positive charge. The other gains a **negative** charge.

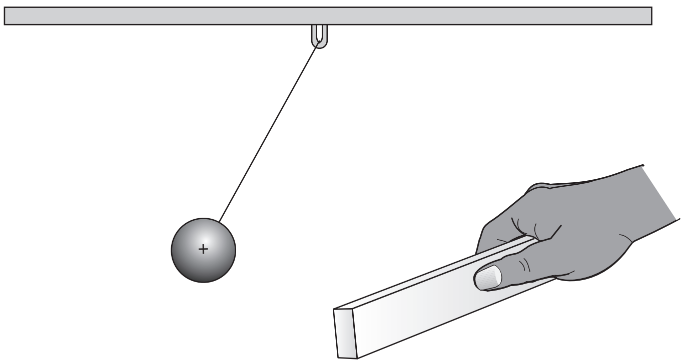
A negative charge will attract a **positive** charge.

2 lightning

3 positive

4 non-contact

5



The question is assessing the understanding that the ball will go further from the rod. Therefore, accept drawing errors, e.g. the ball further to the left on the same level as the rod with a longer string. Ignore the size of the ball or the shape of the string.

6 The ball has lost its charge.

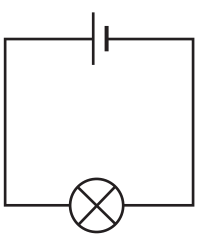
10.2 Conductors in circuits

1 Any one idea from: to check the lamp works; to check the cell / battery works; to check the circuit is complete / wires are not broken / contacts are good. Accept 'to check it all works'.

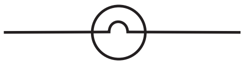
2

Material	Does the lamp light?
copper wire	✓
plastic comb	✗
iron nail	✓
aluminium foil	✓
wooden ruler	✗
glass beaker	✗

3



Accept lamp drawn as



Do not accept lines drawn through, or into, components or gaps in circuit. Ignore curved lines for wires.

4 cell

5 The pins on the plugs are made from **metal** which is a **conductor**.

The body of each plug is made from **plastic** which is an **insulator**.

The wires that come from the plug are covered with **plastic**. (Allow insulator.)

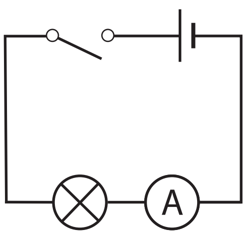
10.3 Measuring current

1 From left to right: 5 (A), 7.5 (A), 1200 (A)

2 1.0A

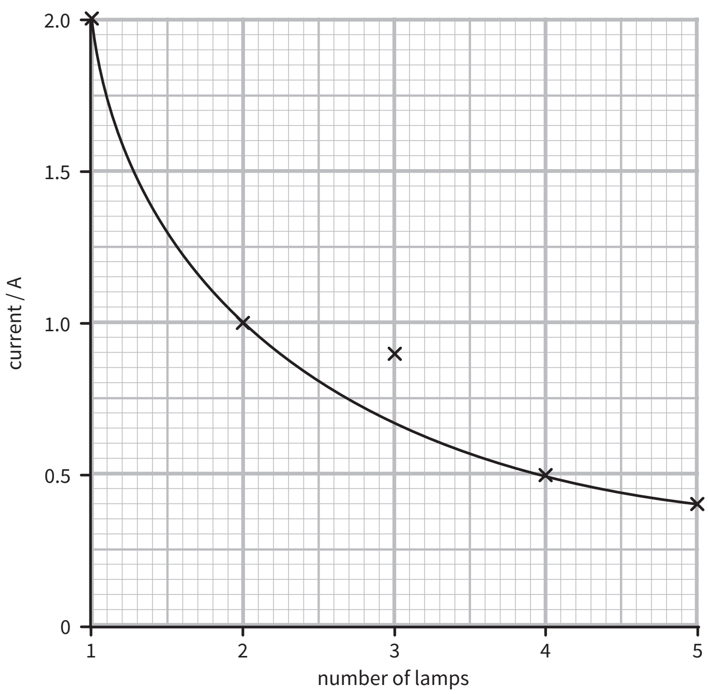
3 Both lamps go off at the same time.

4



Components can be in any order; switch can be open or closed; do not accept lines for wires drawn into or through components; do not accept gaps in circuit except for the switch.

5



All points plotted to within half a small square; smooth curve drawn though all points except (3, 0.9). Accept curve drawn though points even if incorrectly plotted.

6 As the number of lamps increases, the current decreases / negative correlation between number of lamps and current.

7 Point (3, 0.9) circled.

She should repeat the reading.

Unit 11 Energy

11.1 Displaying energy information

1 Pie chart; idea that the data consist of percentages totalling 100%.

2 Cold weather; more energy is spent heating than cooling / most energy is spent on heating / more energy used heating than anything else (answer must be comparative).

3 Accept any two other uses or named household appliances that are not already included, e.g. TV / radio / cooker / microwave / vacuum cleaner / computer / games console / washing machine.

4 Bar chart

5 One idea from: to make people aware how much energy they will use / so people can see how much it will cost to operate / people can see what their electric bill will be like / help people decide which item is best value overall / not just the purchase price that affects the cost.

6 Line graph; it needs to show a continuous trend / time is a continuous variable (ignore 'time is on the x-axis' without qualification).

7 Any one idea from: increasing population / more cars / more industry / mechanisation.

11.2 Looking at different energy sources

1 **a** Will (eventually) run out / cannot be replaced (ignore 'cannot be used again').

b Will not run out / can be replaced (do not accept 'can be used again').

2 Chemical

3 **a** China

b 11%

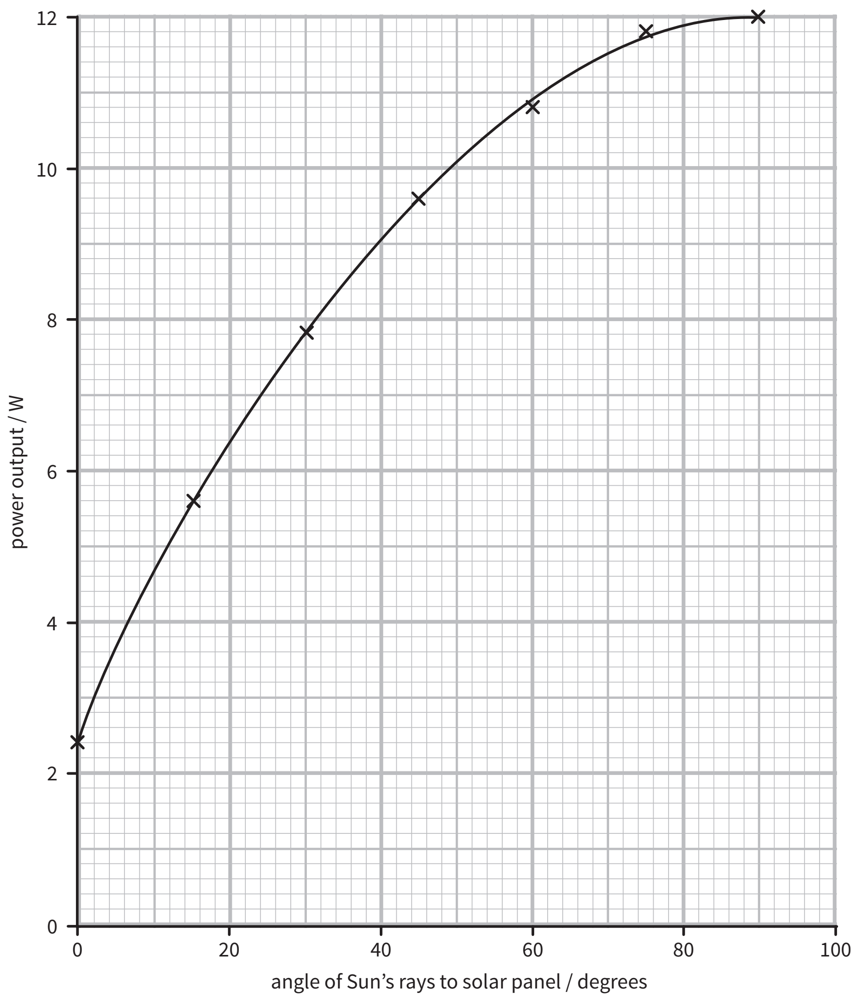
c 9%; working shown as:

100 – totals that are given (49 + 25 + 11 + 3 + 3) = 100 – 91

4 Renewable

5 12:00 / 12pm / midday / noon

6



Axes scaled correctly, *x*-axis with linear scale 0 – 90, *y*-axis with linear scale 0 – 12.0; zero at the start of both axes; all points plotted correctly; smooth curve through points.

7 As the angle gets larger, the power output gets larger. Maximum power output is at 90º.

Accept positive correlation between angle and power (but ignore positive correlation unqualified). Do not accept any reference to 'proportional'.

8 zero / 0

11.3 Investigating heat conduction

1 Circle around the paper clip closest to the Bunsen.

2 The paper clips fall off because the wax **melts**.

3 Any three from: same heat source / same Bunsen / same heat setting; same distance from flame to rod; same length of rod; same diameter / width of rod; same type of wax; same amount of wax; same (weight of) paper clips.

4 It will be longer.

5 Plastic will melt.