Year 7 Science Workbook.

To be completed at home on Monday 5\textsuperscript{th} and Tuesday 6\textsuperscript{th} June.

In order to reach your target grade, you need to complete the relevant number of marks according to your pathway.

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Target number of marks to achieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>120</td>
</tr>
<tr>
<td>7</td>
<td>140</td>
</tr>
<tr>
<td>8</td>
<td>160</td>
</tr>
</tbody>
</table>
**Year 7 Biology**

**Cells**

**Q1.** Nadine mixed grass seeds with sand. She put the mixture into three mesh bags to make three model heads. She soaked two of the bags in water.

(a) The drawings below show the model heads after one week.

![Diagram showing three model heads: A, B, C.]

(i) Which **two** model heads did Nadine soak in water? Give the letters.

............... and .............

How can you tell this from the drawings?

..............................................................................................................
..............................................................................................................
..............................................................................................................

1 mark

(ii) Nadine watered both of these models for two weeks. She watered one more often than the other.

How would the model that was watered more often look different from the other one?

..............................................................................................................
..............................................................................................................
..............................................................................................................

1 mark
(b) Nadine put one of the watered models near a window.

Why did the grass grow towards the window?

....................................................................................................................... 1 mark

(c) (i) Grass plants have root hairs. Which diagram shows a root hair cell?
Tick the correct box.

A

B

C

D

1 mark

(ii) Fill the gaps in the sentence below.

Root hairs take in ......................... and

......................... from the soil.

1 mark

maximum 6 marks
Q2. The diagram below shows an organism called Euglena. It is made of only one cell. It lives in ponds and streams. Euglena have features of both plants and animals.

(a) Look at the diagram of Euglena.

Give two pieces of evidence which suggest it is an animal cell and not a plant cell.

1. ................................................................................................................... 1 mark
2. ................................................................................................................... 1 mark

(b) Plant cells can carry out photosynthesis.
How can you tell from the diagram that Euglena can carry out photosynthesis?

....................................................................................................................... 1 mark

(c) Complete the word equation for photosynthesis.

\[ \text{carbon dioxide + } \text{molecule} \rightarrow \text{glucose + molecule} \] 2 marks
maximum 5 marks
Variation and inheritance

Q3. The drawings below show pigs from two different breeds.

Tamworth

Gloucester Old Spot

(a) (i) From the drawings above, give two ways in which the pigs are different.

1. ........................................................................................................... 1 mark

2. ........................................................................................................... 1 mark

(ii) What are these differences called?
Tick the correct box.

adaptations classification

fertilisation variations

1 mark

(b) The drawing below shows a piglet bred from a Tamworth and a Gloucester Old Spot.

Give one way you can tell that one of its parents is a Tamworth.

.......................................................................................................................

1 mark
(c)  (i) When pigs reproduce, which two types of cell pass information from the pigs to their piglets?

Tick the two correct boxes.

- blood cell
- nerve cell
- cheek cell
- egg cell
- muscle cell
- sperm cell

2 marks

(ii) When pigs reproduce, two cells join together.

What is this process called?

Tick the correct box.

- adaptation
- classification
- fertilisation
- variation

1 mark

maximum 7 marks
Selective breeding

Q4. (a) The drawings below show an old and a modern variety of wheat plant.

<table>
<thead>
<tr>
<th></th>
<th>Old Variety</th>
<th>Modern Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average mass of grain produced per m² (kg)</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Average length of stalk (cm)</td>
<td>145</td>
<td>78</td>
</tr>
</tbody>
</table>

Glucose produced by the wheat plants is used:

- to provide energy for growth
- to make cell walls
- to make starch which is stored in the grain.

Give one reason why modern wheat plants with short stalks can store more starch in the grain. Use the drawings and information.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

1 mark
(b) A plant breeder wants to use selective breeding to produce corn with short stalks and a high mass of grain. He could use the following varieties of corn:

<table>
<thead>
<tr>
<th>variety A</th>
<th>variety B</th>
<th>variety C</th>
</tr>
</thead>
<tbody>
<tr>
<td>long stalks</td>
<td>short stalks</td>
<td>long stalks</td>
</tr>
<tr>
<td>high mass of grain</td>
<td>low mass of grain</td>
<td>low mass of grain</td>
</tr>
</tbody>
</table>

(i) What would the plant breeder need to do to make sure he always produced corn with short stalks and a high mass of grain? Describe the three steps the breeder would use.

..............................................................................................................
..............................................................................................................
..............................................................................................................
..............................................................................................................
..............................................................................................................
..............................................................................................................

3 marks

(ii) Suggest one other characteristic that farmers might like corn plants to have to increase the amount of corn produced.

..............................................................................................................
..............................................................................................................

1 mark

maximum 5 marks
Adaptation

Q5. (a) The photograph below shows a team of dogs called huskies pulling a sledge across the ice.

Huskies need to survive in a cold climate. They must be able to pull a heavy sledge for a long time each day.

Which **two** features would a dog breeder look for when choosing huskies to breed from?
Choose from the list of features below and give the reason for each choice.

<table>
<thead>
<tr>
<th>blue eyes</th>
<th>fierce nature</th>
<th>long tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>thick fur</td>
<td>short legs</td>
<td>strong muscles</td>
</tr>
</tbody>
</table>

1. feature .......................................................................................................................... 1 mark
   reason ..............................................................................................................................
   ........................................................................................................................................... 1 mark

2. feature .......................................................................................................................... 1 mark
   reason ..............................................................................................................................
   ........................................................................................................................................... 1 mark
(b) The drawings below show three dogs. They all look different.

(i) Which word describes the differences between these dogs? Tick the correct box.

| adaptation | reproduction |
| vaccination | variation |

1 mark

(ii) The drawing below shows a puppy. Dog C is the puppy's mother.

Why does the puppy look like his mother? Tick the correct box.

- Information passed from the mother in an egg.
- Information passed from the mother in a sperm.
- Information passed from the mother in milk.
- Information passed from the mother in blood.

1 mark

Maximum 6 marks
Reproduction

Q6. (a) The diagram below shows the female reproductive system and a ciliated cell.

Ciliated cells move an ovum along part of the reproductive system.

(i) In which part of the reproductive system are ciliated cells found?

..............................................................................................................

..............................................................................................................

1 mark

(ii) Describe how ciliated cells move an ovum along.

..............................................................................................................

..............................................................................................................

..............................................................................................................

1 mark

(b) The diagrams below represent what happens at fertilisation and after fertilisation has taken place.
(i) Some women find it difficult to become pregnant. Doctors have developed a technique in which an ovum is fertilised in a test-tube. An embryo is then implanted into the woman’s reproductive system.

Which stage in part (b) shows an embryo and which stage shows a foetus?

embryo ..............................................................

foetus .............................................................

1 mark

(ii) Into which part of the woman’s reproductive system is the embryo implanted?

...................................................................................

1 mark

(c) (i) Explain why a child can look like both parents but is not identical to either of the parents.

........................................................................................

........................................................................................

........................................................................................

........................................................................................

........................................................................................

2 marks

(ii) In the table below, tick one box by each human characteristic to show whether it is:

• inherited only

• inherited and affected by environmental conditions.

<table>
<thead>
<tr>
<th>human characteristic</th>
<th>inherited only</th>
<th>inherited and affected by environmental conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>eye colour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>skin colour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>weight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 mark

maximum 7 marks
Breathing

Q7. The drawing below shows the human rib cage.

(a) The rib cage protects organs in the chest. Give the names of two organs in the chest.

1. ................................................................

2. ................................................................

2 marks

(b) The ribs are attached to the breast bone by cartilage which bends easily. This lets the space in the chest get bigger.

Why is it important that the space can get bigger?

.......................................................................................................................

.......................................................................................................................

1 mark

(c) The drawings below show parts of three different organ systems. Draw a line from each organ system to its function. Draw only three lines.
organ system

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>digestion of food</td>
</tr>
<tr>
<td>reproduction</td>
</tr>
<tr>
<td>control of the body</td>
</tr>
<tr>
<td>taking in oxygen from the air</td>
</tr>
<tr>
<td>movement of the body</td>
</tr>
</tbody>
</table>

3 marks
maximum 6 marks
Q8. When people exercise, the volume of blood per minute needed to supply different parts of the body changes.

This is shown in the bar chart below.

(a) Explain why muscles need more blood during exercise. Give three reasons.

......................................................................................................................
......................................................................................................................
......................................................................................................................
......................................................................................................................
......................................................................................................................

3 marks

(b) Look at the bar chart.
Suggest why you should not go for a long run just after eating a meal.

......................................................................................................................
......................................................................................................................
......................................................................................................................

1 mark

(c) Why is it important that the blood supply to the brain stays constant?

......................................................................................................................

1 mark

maximum 5 marks
Q9. Choose words from the box below to answer all the questions.

<table>
<thead>
<tr>
<th>cell division</th>
<th>digestion</th>
<th>fertilisation</th>
<th>foetus</th>
<th>genes</th>
<th>intestine</th>
<th>ovary</th>
<th>ovum (egg)</th>
<th>sperm</th>
<th>testis</th>
<th>uterus</th>
</tr>
</thead>
</table>

(a)

![Cell A](image)

(i) What is the name of cell A?

.............................................................

1 mark

(ii) Where is cell A produced?

.............................................................

1 mark

(b)

![Cell B](image)

(i) What is the name of cell B?

.............................................................

1 mark

(ii) Where is cell B produced?

.............................................................

1 mark
What process is shown in C? Choose your answer from the box above.

........................................................................................................... 1 mark

(d) The diagram shows a baby developing inside its mother.

(i) Which word means an unborn baby? Choose your answer from the box above.

........................................................................................................... 1 mark

(ii) Where does the unborn baby develop? Choose your answer from the box above.

........................................................................................................... 1 mark

maximum 7 marks
Q10. The diagram shows a baby developing inside its mother's body.

(a) Eggs are produced in organ X. What is the name of organ X?

....................................................................................................................

1 mark

(b) The baby grows in a bag of amniotic fluid which is inside organ Y. What is the name of organ Y?

....................................................................................................................

1 mark

(c) (i) Through which part, labelled in the diagram, is food passed from the mother to the baby?

.............................................................................................................

1 mark

(ii) Name one useful substance, other than food, which passes from the mother to the unborn baby.

.............................................................................................................

1 mark

(d) The diagram shows an organ system of the mother’s body. What is the name of this organ system?

....................................................................................................................

1 mark

Maximum 5 marks
Q1. Sharna boiled some red cabbage in water. The cabbage-water turned purple.

(a) (i) Sharna separated pieces of cabbage from the cabbage-water.

Which method did she use?
Tick the correct box.

- chromatography
- filtration
- condensation
- freezing

1 mark

(ii) Sharna wanted to find out if the purple cabbage-water contained more than one coloured substance.

Which method did she use?
Tick the correct box.

- chromatography
- filtration
- condensation
- freezing

1 mark
(b) Sharna mixed the purple cabbage-water with some other liquids. She wrote the colours of the mixtures in a table as shown below.

<table>
<thead>
<tr>
<th>colour of cabbage-water mixed with liquid</th>
<th>Is the liquid acidic, alkaline or neutral?</th>
</tr>
</thead>
<tbody>
<tr>
<td>liquid 1</td>
<td>red</td>
</tr>
<tr>
<td>liquid 2</td>
<td>blue</td>
</tr>
<tr>
<td>liquid 3</td>
<td>purple</td>
</tr>
</tbody>
</table>

Use the information in the table to answer parts (i) and (ii) below.

(i) Sharna mixed cabbage-water with colourless washing-up liquid. The mixture turned blue.

What does this tell you about the washing-up liquid?

..............................................................................................................................................................................

1 mark

(ii) Sharna then mixed cabbage-water with lemon juice. Lemon juice is acidic.

What colour was the mixture?

..............................................................................................................................................................................

1 mark

(c) What is the name of a chemical which changes colour when it is mixed with acids or alkalis? Tick the correct box.

- filtrate
- indicator
- non-metal
- solution

1 mark maximum 5 marks
Q2. Russell put ground-up coffee beans in a coffee maker and added hot water.

He pushed the plunger down. This separated the coffee drink from the ground-up coffee beans.

(a) How could Russell see that some coffee had dissolved in the water?

(b) The end of the plunger is a circle of wire mesh.

(i) Which mesh would be best to separate the coffee drink from all the ground-up coffee beans? Write the letter.

(ii) This method of making coffee uses a type of filter. The apparatus used for filtration in a school laboratory is drawn below.
Which part of the apparatus above works in the same way as the wire mesh? Write the letter.

....................... 1 mark

(c) Russell wanted to separate the water from the coffee drink. He set up the apparatus shown below.

(i) Why did Russell put ice cubes around the glass tube?

........................... 1 mark
(ii) Choose words from the box below to fill the gaps in the following sentences.

<table>
<thead>
<tr>
<th>an acid</th>
<th>a gas</th>
<th>a liquid</th>
<th>a solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>condensation</td>
<td>crystallisation</td>
<td>evaporation</td>
<td>filtration</td>
</tr>
</tbody>
</table>

Russell heats the water. Water in the drink changes from

............................................ into ............................................ .

This change of state is called ............................................ .

Water vapour changes into liquid. This change of state is called

............................................ .

Metals and non-metals

Q3. The list below shows properties that different elements can have.

- magnetic
- can be compressed
- very high melting point
- very low melting point
- good conductor of heat
- poor conductor of heat
- good conductor of electricity
- poor conductor of electricity

(a) Which two properties from the list above make aluminium suitable for saucepans?

1. .................................................................................................................
2. .................................................................................................................

2 marks
(b) Which property in the list above explains why:

(i) copper is used in the cable of a television?

............................................................................................................. 1 mark

(ii) a lot of oxygen gas can be pumped into a very small container?

............................................................................................................. 1 mark

Total Maximum 4 marks

Q4. Leanne had four rods, each made from a different metal. She wanted to find out which metal was the best conductor of heat. The diagram shows some of Leanne’s equipment.

(a) Leanne’s results are shown in the table.

<table>
<thead>
<tr>
<th>metal rod</th>
<th>time for metal ball to drop off (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>brass</td>
<td>36</td>
</tr>
<tr>
<td>copper</td>
<td>24</td>
</tr>
<tr>
<td>lead</td>
<td>246</td>
</tr>
<tr>
<td>iron</td>
<td>132</td>
</tr>
</tbody>
</table>

What measuring equipment did Leanne use to get her results?

............................................................................................................. 1 mark
(b) Give two things Leanne must do to carry out a fair test.

1 ...................................................................................................................................................

2 ...................................................................................................................................................

2 marks

(c) Which metal in the table was the best conductor of heat?
Tick the correct box.

<table>
<thead>
<tr>
<th>brass</th>
<th>copper</th>
<th>iron</th>
<th>lead</th>
</tr>
</thead>
</table>

1 mark

(d) Leanne left the rods in the water for a week.
One of the metal rods went rusty.

Which metal rod went rusty?
Tick the correct box.

<table>
<thead>
<tr>
<th>brass</th>
<th>copper</th>
<th>iron</th>
<th>lead</th>
</tr>
</thead>
</table>

1 mark

maximum 5 marks
Q5. Michelle added some universal indicator solution to four liquids.

Michelle uses the pH chart to fill in her table of results.

**pH chart**

<table>
<thead>
<tr>
<th>pH</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>colour</td>
<td>red</td>
<td>orange</td>
<td>green</td>
<td>blue</td>
<td>purple</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) The table below shows some of Michelle’s results.

Complete Michelle’s table of results below.
Use the pH chart to help you.

<table>
<thead>
<tr>
<th>liquid</th>
<th>colour of universal indicator solution</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>milk</td>
<td>green</td>
<td></td>
</tr>
<tr>
<td>rain water</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>hydrochloric acid</td>
<td>red</td>
<td></td>
</tr>
<tr>
<td>bleach</td>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

2 marks

(b) Explain why using acids can be dangerous.

.......................................................................................................................
.......................................................................................................................
.......................................................................................................................

1 mark

(c) Michelle measured the pH of some milk stored at room temperature for five days.

The graph of Michelle’s results is shown below.
One of the axes has been labelled.
(i) Write the axis label for the graph at X.

(ii) Use the graph. How does the pH of the milk change over the five days?

.................................................................

1 mark
maximum 5 marks
Q6. The drawing shows a cylinder of butane. The butane is under pressure in the cylinder. Most of the butane in the cylinder is liquid, but some is a gas.

(a) Tick the two correct statements about the molecules of butane gas in the cylinder.

The molecules of gas are:

- closer together than those in the liquid; □
- further apart than those in the liquid; □
- the same distance apart as those in the liquid; □
- bigger than those in the liquid; □
- smaller than those in the liquid; □
- the same size as those in the liquid; □

(b) The gas molecules exert a pressure on the inside of the cylinder. How do the moving molecules cause this pressure?

.......................................................................................................................
.......................................................................................................................

2 marks

1 mark
(c)  (i) Explain why the pressure inside the cylinder falls when the temperature falls.
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
2 marks

(ii) Butane from the cylinder was used in a camping stove. If there was a large fall in the air temperature around the cylinder, what effect would this have on the flame of the camping stove?
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................
1 mark
Maximum 6 marks

Metals and alloys

Q7. An alloy is a mixture of elements. The table shows the mass of each element present in 100 g of five different alloys, bronze, solder, steel, stainless steel and brass.

<table>
<thead>
<tr>
<th>alloy</th>
<th>lead (g)</th>
<th>tin (g)</th>
<th>copper (g)</th>
<th>zinc (g)</th>
<th>carbon (g)</th>
<th>iron (g)</th>
<th>chromium (g)</th>
<th>nickel (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bronze</td>
<td></td>
<td>4</td>
<td>95</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>solder</td>
<td>62</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>steel</td>
<td></td>
<td></td>
<td>1</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stainless steel</td>
<td></td>
<td></td>
<td>70</td>
<td>20</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>brass</td>
<td>67</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(a) Which **alloy** in the table above contains an element which is a non-metal?

......................................................................................................................... 1 mark

(b) Which **two alloys** in the table contain only **two metals**?

.........................................................................................................................

and ......................................................................................................................... 1 mark

(c) Another alloy called nichrome contains only the elements chromium and nickel.

100 g of nichrome contains 20 g of chromium.

How much nickel does it contain?

........... g 1 mark

(d) Before 1992, two-pence coins were made of bronze. Steel rusts but bronze does **not** rust.

(i) Why does bronze **not** rust?

Use information in the table above to help you.

...............................................................................................................................

.................................................................................................................................

................................................................................................................................. 1 mark

(ii) Rusting requires water and a gas from the air.

Give the name of this gas.

................................................................................................................................. 1 mark

maximum 5 marks
(a) The table shows some of the properties of three different substances, X, Y and Z. Complete the last column by stating whether each substance is a metal, a non-metal or a compound.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Melting Point</th>
<th>Electrical Conductivity</th>
<th>Solubility in Water</th>
<th>Effect of Heating in Air</th>
<th>Metal or Non-metal or Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>113 °C</td>
<td>very poor</td>
<td>insoluble</td>
<td>burns to form one product which is an acidic gas</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>962 °C</td>
<td>very good</td>
<td>insoluble</td>
<td>loses shiny surface</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>–102 °C</td>
<td>very poor</td>
<td>almost insoluble</td>
<td>burns to form two new substances</td>
<td></td>
</tr>
</tbody>
</table>

(b) Complete the following using one of the phrases.

Closer together

Further apart

In contact with more particles

Substance Z has a boiling point of –161°C. At room temperature the particles of Z are ..................................... than the particles of substance X.

1 mark

(c) Substance Z burns in air. What must be present in air for substance Z to burn?

......................................................................................................................

1 mark

Maximum 5 marks
Earth structure

Q9. The diagram shows rocks in a mountain range.

(a) Choose the correct letter from the diagram to best match the descriptions below. You may write each letter more than once.

(i) rock changed by heat and pressure

(ii) rock formed by magma cooling and solidifying

(iii) the oldest rock shown in the diagram

(iv) region where eroded materials are deposited

(v) region not being affected by erosion

(b) Rainwater can damage rocks by physical and chemical weathering.

(i) Give one way rainwater causes physical weathering. Give the name and describe the process in the table below.

(ii) Give one way rainwater causes chemical weathering. Give the name and describe the process in the table below.
Q10. (a) The diagram gives information about some of the layers that make up the Earth.

(i) What name is given to the outer layer of the Earth labelled X?
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................

(1)

(ii) What is the difference between the inner core and the outer core?
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................

(2)
(b) Which of the following is used to detect the waves produced by an earthquake?

Draw a ring around your answer.

barograph  seismograph  tachograph

(Total 4 marks)

**The earth and beyond**

**Q11.** The diagram shows the Earth’s orbit. The Earth is shown in two positions six months apart. In one of the positions it is midsummer in Britain, and in the other positions it is midwinter.

(a) Estimate what time of the day it is in Britain when the Earth is in position B, and explain your answer.

........................................................................................................................................
........................................................................................................................................

1 mark

(b) The Earth has rotated exactly 183 times on its axis as it moved between the two positions shown.

(i) Explain how you can tell from the diagram that the Earth has rotated a whole number of times.

........................................................................................................................................
........................................................................................................................................

1 mark
(ii) Explain how you can tell from the diagram that the time of day in Britain is different in the two positions.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
1 mark

(iii) While the Earth has rotated exactly 183 times, only 182.5 days have passed. Calculate the exact time taken for each rotation of the Earth on its axis.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
1 mark

(c) The Moon orbits the Earth approximately once each month. However, only one face of the Moon is ever visible from the Earth.

(i) Explain why we always see the same face of the Moon.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
1 mark

(ii) Suggest how long in Earth days the period from sunrise to sunrise will be at a point on the Moon’s surface.

........................................................................................................................................
1 mark
Maximum 6 marks
Physics

Forces

Q1. The drawing shows Amy water-skiing.

(a) (i) The rope is pulling Amy. Draw an arrow on the rope to show the direction of this force. Label the arrow A. 1 mark

(ii) Draw an arrow to show the direction of Amy’s weight. Label the arrow B. 1 mark

(b) Give the names of two other forces which act on Amy or on her skis.

1. ..................................................................................................................

2. ..................................................................................................................

2 marks

The drawing below shows the speed boat which is pulling Amy along.

(c) The rope which pulls Amy also exerts a force on the boat. Draw an arrow on the rope to show the direction of this force. Label the arrow C. 1 mark

(d) The force of the engine on the boat is increased. What effect will this have on the speed of the boat? 1 mark

Maximum 6 marks
Q2. The diagram shows four forces acting on a plane in flight.

(a) Which arrow represents air resistance?
   Give the letter.

(b) (i) When the plane is flying at a constant height, which two forces must be balanced?
   Give the letters.

(ii) When the plane is flying at a constant speed in the direction shown, which two forces must be balanced?
   Give the letters.

(c) (i) Just before take-off, the plane is speeding up along the ground.

Which statement is true?
Tick the correct box.

- Force B is zero.
- Force B is greater than force D.
- Force D is equal to force B.
- Force D is greater than force B.

1 mark
(ii) Which statement is true about the plane just as it leaves the ground? Tick the correct box.

- Force C is zero.
- Force C is greater than force A.
- Force A is equal to force C.
- Force A is greater than force C.

1 mark
maximum 5 marks

Sound

Q3. The diagram shows a firework rocket.

(a) Three forces act as the rocket flies through the air. Which arrows show the directions of these three forces?

..............................            ..............................               ..............................

3 marks

(b) When there is no fuel left, the rocket falls to the ground.

(i) Give the name of the force which pulls it down.

.........................................................................................................

1 mark

(ii) Give the name of the force which acts against the motion of the rocket.

.........................................................................................................

1 mark
(c) Another rocket was sent high into the air. It exploded with a loud bang and a bright flash of light.

Put a tick in the box by the correct statement.

- the bright flash of light was seen first
- the loud bang was heard first
- the flash of light was seen and the bang was heard at the same time

1 mark

Give a reason for your answer.

........................................................................................................................................
........................................................................................................................................
1 mark

Q4. Thunder and lightning happen at the same time.

(a) We see the flash of lightning before we hear the thunder.
    Give the reason for this.

........................................................................................................................................
1 mark
(b) Omar investigated the movement of a storm. He measured the time between seeing a flash of lightning and hearing the thunder. He did this six times. Omar put his results in a table.

<table>
<thead>
<tr>
<th>flash of lightning</th>
<th>time between seeing the lightning and hearing the thunder, in seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8.0</td>
</tr>
<tr>
<td>B</td>
<td>5.0</td>
</tr>
<tr>
<td>C</td>
<td>3.0</td>
</tr>
<tr>
<td>D</td>
<td>9.0</td>
</tr>
<tr>
<td>E</td>
<td>13.0</td>
</tr>
<tr>
<td>F</td>
<td>16.5</td>
</tr>
</tbody>
</table>

Omar drew a bar chart of his results as shown below.

(i) On the bar chart, draw a bar for flash D. Use a ruler.

(ii) Which flash of lightning was closest to Omar? Give the correct letter.

.................................................................................................................... 1 mark
(iii) Describe how the distance between the storm and Omar changed as the storm moved between flash A and flash F.

................................................................................................................................................

................................................................................................................................................

1 mark
Maximum 4 marks

Q5. Jasmine is deaf. She blows up a balloon and holds it near to John’s mouth. She cannot hear John’s voice, but she can tell that he is speaking, by feeling the balloon.

(a) How can Jasmine tell when John is speaking, by feeling the balloon?
................................................................................................................................................
................................................................................................................................................

1 mark

(b) John shouts loudly. How will the balloon feel different to Jasmine now?
................................................................................................................................................
................................................................................................................................................

1 mark
(c) Loudness is measured in decibels. The table below shows the loudness of some sounds.

<table>
<thead>
<tr>
<th>sound</th>
<th>loudness, in decibels</th>
</tr>
</thead>
<tbody>
<tr>
<td>whispering</td>
<td>20</td>
</tr>
<tr>
<td>normal talking</td>
<td>60</td>
</tr>
<tr>
<td>disco</td>
<td>100</td>
</tr>
<tr>
<td>road drill</td>
<td>120</td>
</tr>
<tr>
<td>space rocket taking off</td>
<td>190</td>
</tr>
</tbody>
</table>

Jasmine’s balloon bursts. What would be the most likely range of loudness of the sound produced when the balloon bursts? Tick the correct box.

- below 60 decibels
- 60–120 decibels
- 120–190 decibels
- above 190 decibels

1 mark

(d) (i) Very loud sounds can damage a person’s ears. In what way can the ears be damaged?

.............................................................................................................................................
.............................................................................................................................................

1 mark
Some people work in very noisy places. How can they protect their ears?

1 mark

Maximum 5 marks

Q6. The dotar is a musical instrument with two strings.

(a) Aftal plays the dotar very quietly.
   What must he do to the strings to make a louder sound?
   1 mark

(b) Aftal makes the strings tighter so they vibrate more quickly.
   How does this affect the sound produced by the strings?
   Tick the correct box.
   The sound has a lower pitch. 
   The sound is louder.
   The sound has a higher pitch.
   The sound is quieter.
   1 mark
(c) One of the strings is thicker than the other, so it vibrates more slowly.

In what way is the sound made by the thicker string different from the sound made by the thinner string?

........................................................................................................................................................................

1 mark

(d) Aftal played the dotar near a microphone connected to an oscilloscope. The diagrams below show the patterns made by four sounds.

![Graph A](image1.png)

![Graph B](image2.png)

![Graph C](image3.png)

![Graph D](image4.png)

(i) How does the sound shown in trace A differ from the sound in trace B?

........................................................................................................................................................................

........................................................................................................................................................................

........................................................................................................................................................................

1 mark

(ii) How does the sound shown in trace A differ from the sound in trace C?

........................................................................................................................................................................

........................................................................................................................................................................

........................................................................................................................................................................

1 mark

maximum 5 marks
### Electricity

**Q7.** (a) Draw a line from each circuit symbol below to the correct name. Draw only four lines.

<table>
<thead>
<tr>
<th>circuit symbol</th>
<th>name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ammeter</td>
</tr>
<tr>
<td></td>
<td>switch</td>
</tr>
<tr>
<td></td>
<td>motor</td>
</tr>
<tr>
<td></td>
<td>battery</td>
</tr>
<tr>
<td></td>
<td>bulb</td>
</tr>
</tbody>
</table>

3 marks
(b) Fred made circuit 1 as shown below.

![Circuit 1 Diagram]

Give the name of the part that is the energy source for the circuit.

........................................................................................................................................

1 mark

(c) Fred then made circuit 2 as shown below.

![Circuit 2 Diagram]

In the table below, tick a box to show whether circuit 1 and circuit 2 are series or parallel circuits. Tick only two boxes.

<table>
<thead>
<tr>
<th></th>
<th>series</th>
<th>parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>circuit 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>circuit 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 mark

(d) What metal is usually used for wires in electric circuits?

........................................................................................................................................

1 mark

maximum 6 marks
Q8. Peter measured the current through each of three similar bulbs in a parallel circuit.

He had only one ammeter and he placed it first at A1, then A2, then A3, in order to measure the currents.

The table shows his results.

<table>
<thead>
<tr>
<th>position of ammeter</th>
<th>current, in amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.14</td>
</tr>
<tr>
<td>A2</td>
<td>0.16</td>
</tr>
<tr>
<td>A3</td>
<td>0.15</td>
</tr>
</tbody>
</table>

(a) He expected the current readings to be the same for each bulb but found they were different.

Suggest two reasons why the readings were different.

1. ........................................................................................................................................
2. ........................................................................................................................................

(b) Peter then measured the current at A4 and recorded it as 0.45 A. He concluded that the current at A4 could be calculated by adding together the currents through each of the bulbs at positions A1, A2 and A3.
He added two more similar bulbs to his circuit, in parallel. The current through each bulb was 0.15 A.
Use Peter's conclusion to predict the current at A4 with the 5 bulbs in the circuit.

............... A

(c) Peter left the circuit connected overnight. He used a datalogger to measure the current at position A4 at regular intervals of time. The next morning the bulbs were dim.

Using the axes below, sketch (do not plot) how the current at position A4 might change with time.

Indicate on the graph:

(i) The correct labels for each axis, including the correct units.

(ii) The shape of the graph you would expect to obtain.
Energy

Q9. (a) The diagrams below show how much heat is lost from different parts of a house every second.

Through which part of the house above is most heat lost?

................................................................................................................. 1 mark

(b) Part of the house is insulated to reduce the loss of heat. This is shown below.
(i) Which part of the house has been insulated?
.............................................................................................................. 1 mark

(ii) Explain your answer.
..............................................................................................................
.............................................................................................................. 1 mark

(c) The table below gives information about three fossil fuels that can be used to heat a house.

<table>
<thead>
<tr>
<th>fuel</th>
<th>physical state</th>
<th>energy released when 1g is burned (J)</th>
<th>Does the fuel produce these substances when burned?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>water</td>
</tr>
<tr>
<td>coal</td>
<td>solid</td>
<td>25000</td>
<td>yes</td>
</tr>
<tr>
<td>oil</td>
<td>liquid</td>
<td>42000</td>
<td>yes</td>
</tr>
<tr>
<td>methane</td>
<td>gas</td>
<td>55000</td>
<td>yes</td>
</tr>
</tbody>
</table>

(i) Which fuel in the table releases the **least** energy when 1 g is burned?
.............................................................................................................. 1 mark

(ii) Methane **can** be compressed.
Which information in the table shows that methane can be compressed?
.............................................................................................................. 1 mark
(iii) Sulphur dioxide causes acid rain.
Use the table to explain why burning methane does \textbf{not} produce acid rain.

..............................................................................................................

..............................................................................................................

1 mark
maximum 6 marks

Q10. A company has made a new material called ‘Wellwarm’. They want to use ‘Wellwarm’ to make coats.

(a) A scientist tested ‘Wellwarm’ to see how well it insulated a beaker of hot water.
She tested ‘Wellwarm’ and three other materials as shown below.

![Diagram of four beakers: material A, material B, material C, material D]

material A  material B  material C  material D

She wrapped each beaker in a different material. She recorded the temperature at the start and 20 minutes later.

(i) What was the independent variable that the scientist \underline{changed}?

..............................................................................................................

1 mark

(ii) What was the dependent variable that the scientist \underline{measured} during the investigation?

..............................................................................................................

1 mark
(b) The results of the investigation are shown below.

<table>
<thead>
<tr>
<th>time (minutes)</th>
<th>temperature of water (°C) wrapped in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>material A</td>
</tr>
<tr>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>20</td>
<td>34</td>
</tr>
</tbody>
</table>

(i) The scientist said that the ‘Wellwarm’ material is the best insulator. Which material was ‘Wellwarm’? Use the results to help you. Tick the correct box.

A □ B □ C □ D □  

(ii) Use the evidence in the results table to explain your choice.

..............................................................................................................
..............................................................................................................

1 mark

(c) The company made a coat from each of the four materials they tested.

A person tested the different coats by wearing each one in a cold room. He measured the temperature inside each coat for 30 minutes.

Write down two other variables that should be controlled to make this a fair test.

1. ................................................................................................................... 1 mark

2. ................................................................................................................... 1 mark

(d) Write down one thing the scientists should do to make sure the person testing the coats is safe.

............................................................................................................... 1 mark
Q11. A pupil has two well-insulated containers of water at 20° C. She takes two identical blocks of aluminium, both at 100° C, and puts one into container A and the other into container B. The temperature of the water rises in each container until it reaches a steady value. Her results are shown in the table.

<table>
<thead>
<tr>
<th>container</th>
<th>temperature of water in °C at the start</th>
<th>temperature of block in °C at the start</th>
<th>volume of water in cm³</th>
<th>final temperature of water in °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>100</td>
<td>500</td>
<td>44</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>100</td>
<td>1000</td>
<td>34</td>
</tr>
</tbody>
</table>

(a) Explain why the final temperature of the water is lower in container B.
.........................................................................................................................................................
.........................................................................................................................................................
.........................................................................................................................................................
1 mark

(b) What is the final temperature of each aluminium block?

The block in container A is at ................................ °C.

The block in container B is at ................................ °C.
1 mark

(c) Which of the identical aluminium blocks transferred more energy to the water?

Explain your reasoning.
.........................................................................................................................................................
.........................................................................................................................................................
.........................................................................................................................................................
1 mark

Maximum 3 marks