Year 9 science test

Paper 2

First name __________________________________________

Last name __________________________________________

Class ____________________________________________

Date ____________________________________________

Please read this page, but do not open your booklet until your teacher tells you to start. Write your name, your class and the date in the spaces above.

Remember:
■ The test is 1 hour long.
■ You will need a pen, pencil, rubber and ruler. You may find a protractor and a calculator useful.
■ The test starts with easier questions.
■ Try to answer all of the questions.
■ The number of marks available for each question is given below the mark boxes in the margin. You should not write in this margin.
■ Show any rough working on this paper.
■ Check your work carefully.
■ Ask your teacher if you are not sure what to do.

__________________________________________________

TOTAL MARKS ____________________________
1. (a) Tom watched birds feeding in his garden. He spotted the birds shown below.

Tom recorded what the birds in his garden ate. His results are shown below.

<table>
<thead>
<tr>
<th>bird</th>
<th>type of food</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fruit</td>
</tr>
<tr>
<td>blackbird</td>
<td>✓</td>
</tr>
<tr>
<td>blue tit</td>
<td>✓</td>
</tr>
<tr>
<td>bullfinch</td>
<td>✓</td>
</tr>
<tr>
<td>dove</td>
<td>✓</td>
</tr>
<tr>
<td>sparrow</td>
<td>✓</td>
</tr>
<tr>
<td>robin</td>
<td>✓</td>
</tr>
</tbody>
</table>

Use the information in the table to answer the following questions.

(i) Tom put some pieces of fruit in his garden. Which **two** birds will eat this food?

____________________ and __________________

(ii) How many types of bird eat nuts?

____________________
(iii) Which food from the table opposite will attract the most types of bird?

__________________________

(iv) Which bird from the table eats the most types of food?

__________________________

(b) What are birds covered with to keep them warm?

__________________________

(c) Many birds reproduce in the spring.

Suggest why birds need extra food in the spring.

__________________________

maximum 6 marks
2. Ellie has a set of scales and some weights as shown below.

[Diagram of scales with weights 5N, 4N, 2N, 1N, 1N in pan X and 1N in pan Y]

Ellie puts two weights in pan X and one weight in pan Y. The scales balance.

(a) Which weights could be in pans X and Y?

pan X: _______ and _______

pan Y: _______

(b) Ellie removes all the weights from the scales. She then puts a cup on pan X. In which direction will pan Y move?

__________________________
(c) She puts weights into pan Y so the scales balance.

How much does the cup weigh?

__________N

(d) Ellie puts some water in the cup.
She then adds some more weights to pan Y to make the scales balance.

(i) How much do the cup and water weigh?

_______N

(ii) How much does the water weigh?

_______N

maximum 5 marks
3. The drawing below shows Rebekah **pulling** a turnip out of the ground.

(a) Which arrow, A, B, C or D, shows the direction of force of Rebekah’s hand on the turnip?

(b) The drawing below shows root maggots eating a turnip. The maggots damage the roots.
Damaged roots do **not** grow very well.

Complete the sentence below.

Damaged roots **cannot** take up as much ________________ and ________________ from the soil.

(c) The drawing below shows a food chain including a rove beetle.

![Food chain diagram](image)

Which word describes a rove beetle? Tick the correct box.

- herbivore
- predator
- prey
- producer

(d) Turnip plants make food by photosynthesis.

(i) Which part of a plant makes food?

________________________

(ii) What will the turnip plant use stored food for?

________________________

*maximum 6 marks*
4. David put two bars of iron close to each other. There was no magnetic force between them. David recorded the result as shown below.

\[
\begin{array}{c|c}
\text{bar of iron} & \text{result} \\
\hline
\text{attract} & \ \\
\text{repel} & \ \\
\text{no magnetic force} & \checkmark \\
\end{array}
\]

(a) David did three other tests. Tick the correct box to show the result for each test.

(i) \[
\begin{array}{c|c}
\text{bar of copper} & \text{result} \\
\hline
\text{attract} & \ \\
\text{repel} & \ \\
\text{no magnetic force} & \ \\
\end{array}
\]

(ii) \[
\begin{array}{c|c}
\text{bar of iron} & \text{result} \\
\hline
\text{attract} & \ \\
\text{repel} & \ \\
\text{no magnetic force} & \ \\
\end{array}
\]
(iii) David then did two experiments with magnets. The tick in each box shows David's results in each experiment. Label the missing poles on each magnet to match David's results.

(i) bar magnet

<table>
<thead>
<tr>
<th>bar of steel</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>attract</td>
</tr>
<tr>
<td></td>
<td>repel</td>
</tr>
<tr>
<td></td>
<td>no magnetic force</td>
</tr>
</tbody>
</table>

(ii) bar magnet

<table>
<thead>
<tr>
<th>bar of steel</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>attract</td>
</tr>
<tr>
<td></td>
<td>repel</td>
</tr>
<tr>
<td></td>
<td>no magnetic force</td>
</tr>
</tbody>
</table>

(b) David then did two experiments with magnets. The tick in each box shows David's results in each experiment. Label the missing poles on each magnet to match David's results.

(i) bar magnet

<table>
<thead>
<tr>
<th>bar magnet</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>attract</td>
</tr>
<tr>
<td></td>
<td>repel</td>
</tr>
<tr>
<td></td>
<td>no magnetic force</td>
</tr>
</tbody>
</table>

(ii) bar magnet

<table>
<thead>
<tr>
<th>bar magnet</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>attract</td>
</tr>
<tr>
<td></td>
<td>repel</td>
</tr>
<tr>
<td></td>
<td>no magnetic force</td>
</tr>
</tbody>
</table>

maximum 5 marks
5. 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?

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

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

- brass ☐
- copper ☐
- iron ☐
- lead ☐

(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.

- brass ☐
- copper ☐
- iron ☐
- lead ☐
6. Paula made a pendulum from a ball attached to a piece of string.

She counted the number of swings the ball made in 10 seconds. She repeated the experiment with different lengths of string.

The table below shows Paula's results.

<table>
<thead>
<tr>
<th>length of string (cm)</th>
<th>number of swings in 10 seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>30</td>
<td>9</td>
</tr>
<tr>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>50</td>
<td>7</td>
</tr>
</tbody>
</table>

(a) What happens to the number of swings when the string gets longer?
(b) Paula drew a graph of her results.

(i) Write the labels on **both axes** of the graph below. Use the table to help you.

(ii) Paula made a pendulum from a piece of string that was 15 cm long. How many times would this pendulum swing in 10 seconds? Use the graph to help you.

(iii) Paula made a pendulum from a piece of string that was 60 cm long. Estimate the number of swings the pendulum makes in 10 seconds. Use the graph. Tick the best answer.

(c) After some time the pendulum stops moving. What force makes the pendulum stop moving?

**maximum 6 marks**

(a) Smoking can be very harmful. Which three problems can be caused by smoking?

Tick the three correct boxes.

- being out of breath easily
- being overweight
- heart disease
- lung cancer
- food poisoning

(b) Some scientists investigate ‘passive smoking’. Passive smoking is when people breathe in smoke from other people’s cigarettes. They checked the health of three groups of people.

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>non-smokers who spend no time in smoky places</td>
</tr>
<tr>
<td>B</td>
<td>non-smokers who spend time in smoky places</td>
</tr>
<tr>
<td>C</td>
<td>smokers who spend time in smoky places</td>
</tr>
</tbody>
</table>

(i) Which group of people breathe in the least cigarette smoke? Tick the correct box.

- group A
- group B
- group C

(ii) Which two groups will help scientists find out the effects of passive smoking? Tick the two correct boxes.

- group A
- group B
- group C
(c) People in group B are likely to have similar health problems to people in group C. Explain why.

(d) Four scientists investigated passive smoking. The table below shows the number of people each scientist studied from each group.

<table>
<thead>
<tr>
<th>scientist</th>
<th>group A</th>
<th>group B</th>
<th>group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>David</td>
<td>289</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Olga</td>
<td>8</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Peter</td>
<td>402</td>
<td>399</td>
<td>403</td>
</tr>
<tr>
<td>Mary</td>
<td>15</td>
<td>210</td>
<td>511</td>
</tr>
</tbody>
</table>

Which scientist is likely to get the most reliable results? Tick the correct box.

David [ ] Olga [ ]

Peter [ ] Mary [ ]

maximum 6 marks
8. (a) The drawing below shows a fish.

![Fish drawing]

Look at the drawing of a fish.

**Describe two ways in which a fish is suited to swimming.**

1. 

2. 

(b) The drawing below shows a blue whale.

![Blue whale drawing]

A long time ago people thought that the blue whale was a fish. Now we know that the blue whale is a mammal.

**Give one way mammals are different from fish.**

(c) A hundred years ago there were 350,000 blue whales. Now there are only about 10,000 blue whales. Suggest why the blue whale population has decreased.


(d) The blue whale is now a protected species. Scientists catch and tag the whales with a transmitter. Satellites can be used to track the tagged whales.

(i) What information about whales can scientists be certain to get from a satellite tracking system? Tick the correct box.

- what food they eat
- how often they give birth
- where they travel
- the sex of the whale

(ii) Give one advantage of using a satellite tracking system to track whales.
9. The diagram below shows the path of a meteor as it gets closer to the Earth. The meteor is shown in three positions: A, B and C.

(a) The path of the meteor is affected by the Earth’s gravity. The arrow shows the direction of the force due to gravity acting on the meteor at B.

(i) **On the diagram** draw an arrow to show the direction of the force of gravity on the meteor at A. Use a ruler.

(ii) **On the diagram** draw an arrow to show the direction of the force of gravity on the meteor at C. Use a ruler.

(iii) How does the force of gravity on the meteor change as it travels from A to C?
(b) What happens to the speed of the meteor as it travels from A to B?

(c) When the meteor enters the Earth's atmosphere, three forces act on the meteor. Gravity and upthrust are two of these forces.

Give the name of the other force.
10. Kiran lit a candle. 
She placed a 100 cm³ glass jar over the candle. 
The candle flame went out after 2 seconds.

(a) Why did the flame go out?

(b) Kiran put different sized jars over a lit candle. 
She measured the time it took for the flame to go out each time. 
She recorded her results in a table.

<table>
<thead>
<tr>
<th>Size of Jar (cm³)</th>
<th>Time for Candle to Go Out (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>250</td>
<td>5</td>
</tr>
<tr>
<td>500</td>
<td>9</td>
</tr>
<tr>
<td>1000</td>
<td>22</td>
</tr>
<tr>
<td>2000</td>
<td>37</td>
</tr>
<tr>
<td>3000</td>
<td>60</td>
</tr>
</tbody>
</table>
(i) **Plot Kiran’s results** on the graph paper below. The first one has been done for you.

(ii) **Draw a line of best fit.**

(iii) What conclusion can you make from her results?

(c) What should Kiran keep the same in this experiment to make it a fair test?

(d) Suggest one way for Kiran to make her results more reliable.

*maximum 6 marks*
11. (a) The table below shows information about five elements.

<table>
<thead>
<tr>
<th>element</th>
<th>melting point (°C)</th>
<th>boiling point (°C)</th>
<th>conducts electricity</th>
<th>colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>–7</td>
<td>59</td>
<td>no</td>
<td>brown</td>
</tr>
<tr>
<td>B</td>
<td>–218</td>
<td>–183</td>
<td>no</td>
<td>colourless</td>
</tr>
<tr>
<td>C</td>
<td>1535</td>
<td>2750</td>
<td>yes</td>
<td>silvery</td>
</tr>
<tr>
<td>D</td>
<td>113</td>
<td>445</td>
<td>no</td>
<td>yellow</td>
</tr>
<tr>
<td>E</td>
<td>1083</td>
<td>2567</td>
<td>yes</td>
<td>orange</td>
</tr>
</tbody>
</table>

(i) Which two of these elements are likely to be metals? Write the letters.

_____________ and _____________

(ii) Which element in the table is liquid at room temperature? Write the letter.

_______

(b) What is the chemical symbol for copper? Tick the correct box.

Cr   Cu   C   Co   Ca

1 mark
(c) How many atoms of iron and oxygen are there shown in the formulas for FeO and Fe_2O_3?

Complete the table below.

<table>
<thead>
<tr>
<th>compound</th>
<th>number of atoms of iron</th>
<th>number of atoms of oxygen</th>
</tr>
</thead>
<tbody>
<tr>
<td>FeO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe_2O_3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

maximum 5 marks
12. In a power station, coal can be used to generate electricity.

(a) Use words from the box to answer the questions below.

- chemical  electrical  gravitational potential
- kinetic  light  sound  thermal

(i) What is the useful energy transfer when coal is burnt?

__________________ energy is transferred to _____________ energy

(ii) Some of the energy stored in coal is wasted when it is burnt.
Give the name of one type of energy released that is not useful.

__________________
(b) Wind turbines are also used to generate electricity. The wind turns the turbine blades and the turbine blades turn a generator.

Use words from the box opposite. Complete the sentence to show the useful energy transfer in a wind turbine and generator.

_________________ energy is transferred to ________________ energy

(c) Suggest one disadvantage of using wind to generate electricity.

__________________________________________________________________

(d) Sugar cane is a plant.

The sugar from the cane is used to make alcohol. Alcohol is a fuel.

(i) Which energy source do plants use to produce sugar?

__________________________________________________________________

(ii) Is sugar cane a renewable or non-renewable source of energy? Tick one box.

renewable source [ ] non-renewable source [ ]

Give a reason for your answer.

__________________________________________________________________
13. The diagram below shows the two different forms of the same moth. All these moths are either speckled or black.

(a) The graph below shows how the percentage of speckled moths changed between 1950 and 2000 in one city.

(b) Complete the table below with the missing year and percentage. Use the graph.

<table>
<thead>
<tr>
<th>year</th>
<th>percentage of speckled moths (%)</th>
<th>percentage of black moths (%)</th>
<th>total percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>10</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>1990</td>
<td>78</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

(ii) The percentage of black moths from 1950 to 1980 is also shown on the graph. Continue the line on the graph above to show how the percentage of black moths changed between 1980 and 2000.
(b) The maps below show the percentage of speckled moths and black moths at different places in Britain in 1956 and 1996.

Key

- 100% black moths
- 100% speckled moths

How did the percentage of black moths change at place A between 1956 and 1996?

(c) (i) Describe one way in which the data shown in the graph is better than the data shown in the maps.

(ii) Describe one way in which the data shown in the maps is better than the data shown in the graph.

*maximum 7 marks*
14. Sally investigated how the human body digests and absorbs starch.

She used saliva to digest the starch.

To model digestion she used special bags made from a semi-permeable membrane. These bags have lots of very small holes.

Sally sets up the equipment as shown below. There is one special bag in each beaker.

She keeps the water in the beakers at 37°C. After 20 minutes, Sally tested the contents of each beaker and bag for starch and sugar. The table below shows Sally’s results.

<table>
<thead>
<tr>
<th></th>
<th>Was starch found in the bag?</th>
<th>Was sugar found in the bag?</th>
<th>Was starch found in the water?</th>
<th>Was sugar found in the water?</th>
</tr>
</thead>
<tbody>
<tr>
<td>beaker A</td>
<td>✓</td>
<td>✓</td>
<td>✘</td>
<td>✓</td>
</tr>
<tr>
<td>beaker B</td>
<td>✓</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>beaker C</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
</tbody>
</table>

(a) Suggest why Sally kept the water at 37°C.

(b) (i) Explain why sugar was found in the bag in beaker A.

(ii) Starch was not found in the water outside the bag in any beaker. Suggest why.
(c) Why did Sally set up beaker C? Tick the correct box.

- for a fair test
- for accuracy
- for reliability
- for a control

(d) Sally used diagrams to show what happened in her investigation.

<table>
<thead>
<tr>
<th>Key:</th>
<th>starch</th>
<th>sugar</th>
<th>wall of bag</th>
</tr>
</thead>
</table>

Use the diagrams above to answer the following questions.

(i) Which diagram shows the results of beaker B? Write the letter.  
_____

(ii) Which diagram shows the results of beaker A? Write the letter.  
_____

(e) What does saliva contain that causes starch to change in beaker A?  

(f) Sally chewed a piece of bread for 5 minutes without swallowing.  
What would she notice about the taste of the bread after chewing for 5 minutes?  
Use Sally’s results to help you.  

maximum 8 marks
15. A long time ago sulphuric acid was made by heating a substance called **blue vitriol**. The equations below show how sulphuric acid is produced by this method.

\[
\text{blue vitriol} \rightarrow \text{copper oxide + sulphur trioxide + water} \\
\text{sulphur trioxide + water} \rightarrow \text{sulphuric acid}
\]

(a) Name **three** elements contained in blue vitriol.

1. __________________________
2. __________________________
3. __________________________

(b) (i) Anton Lavoisier was a scientist. He made acids by dissolving oxides like sulphur oxide and nitric oxide in water. They formed two acids; sulphuric acid and nitric acid. From this, he concluded:

> All acids contain oxygen.

![Anton Lavoisier](image)

The formulas for these two acids are $\text{H}_2\text{SO}_4$ and $\text{HNO}_3$. How do these formulas support Lavoisier’s conclusion about acids?
(ii) Some time after Lavoisier’s death, hydrochloric acid was identified. The formula for hydrochloric acid is HCl.

Explain why scientists no longer supported Lavoisier’s conclusion about acids.

________________________________________________________________________
________________________________________________________________________

(c) Scientists now agree that **all** acids contain hydrogen. Look at the two word equations below.

\[
\text{zinc + sulphuric acid} \rightarrow \text{zinc sulphate + hydrogen}
\]

\[
\text{magnesium + nitric acid} \rightarrow \text{magnesium nitrate + hydrogen}
\]

(i) Explain how these equations support the suggestion that acids contain hydrogen.

________________________________________________________________________
________________________________________________________________________

(ii) Complete the equation below for the reaction between iron and hydrochloric acid.

\[
\text{iron + hydrochloric acid} \rightarrow \underline{\hspace{2cm}} + \underline{\hspace{2cm}}
\]