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

First name ____________________________________________
Last name ____________________________________________
School _______________________________________________

Remember
- The test is 1 hour long.
- You will need: pen, pencil, rubber, ruler, protractor and calculator.
- 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.
- If you are asked to plan an investigation, there will be space for you to write down your thoughts and ideas.
- Do not use any rough paper.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

For marker’s use only

<table>
<thead>
<tr>
<th>Total marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borderline check</td>
</tr>
</tbody>
</table>

270048_KS3ScT3_6P2.qxp  22/12/05  8:58 pm  Page 1
1. (a) The diagram below shows a circuit with a two-way switch, S.

Rosie puts the switch in the position shown below.

Complete the table below to show if the bulbs are on or off. Write on or off for each bulb.

<table>
<thead>
<tr>
<th>bulb</th>
<th>on or off</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
</tr>
</tbody>
</table>

(b) Give the name of the part that provides energy for the circuit.

__________________________
(c) The diagrams below show a light-bulb over a staircase of a model house.

There is a two-way switch at the bottom of the stairs and another two-way switch at the top.

Under each diagram, tick one box to show if the bulb is on or off. The first one has been done for you.

maximum 4 marks

KS3/06/Sc/Tier 3–6/P2
2. John investigated which material would be best for sound-proofing. He put a bell inside a box. He covered the bell with each material in turn. He put a sound sensor outside the box to record the sound level.

He tested different materials and got the following results.

<table>
<thead>
<tr>
<th>material</th>
<th>sound level (decibels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>no material added</td>
<td>65</td>
</tr>
<tr>
<td>A</td>
<td>40</td>
</tr>
<tr>
<td>B</td>
<td>58</td>
</tr>
<tr>
<td>C</td>
<td>50</td>
</tr>
<tr>
<td>D</td>
<td>35</td>
</tr>
</tbody>
</table>

(a) On the chart below, draw the bar for **material A**.
(b) How many types of material did John test? 

________

(c) Which material was best at stopping the sound going through? Give the correct letter. 

________

(d) Which two things should John have done to make his test fair? Tick the two correct boxes.

- Use the same box each time.  
- Make sure a different person recorded the results each time.  
- Use the same material each time.  
- Keep the distance between the sound sensor and the bell the same each time.  
- Test each material in a different room. 

maximum 5 marks

Total 5
3. The drawings in parts (a), (b) and (c) show two teams of pupils in a tug-of-war. There is a ribbon tied to the middle of the rope.

(a) The sizes and directions of the forces of each team are shown.

The ribbon stays above point X on the ground. Give the reason for this.

(b) The teams then pull with the forces shown below.

Draw an arrow on the rope to show the direction in which the ribbon will move.
(c) Later, the ribbon was to the left of point X as shown below.

Why did the ribbon move towards the left?

(d) Team A practises by pulling a rope tied to a tree.

The team pulls with a force of 1200 N but the tree does not move.

What is the force of the tree on the rope?
Tick the correct box.

- zero
- less than 1200 N
- 1200 N
- more than 1200 N

(e) The pupils do not slip because there is a force between their shoes and the ground. What is the name of this force?

maximum 5 marks
4. A statue outside a zoo was made from two types of rock.

The panda was made of granite.
The base was made of limestone.

The drawings show the statue as it was in 1936 and in 2006.

(a) The surface of the limestone base has changed over the years.

(i) Which process caused this change?
    Tick the correct box.

- evaporating
- melting
- reflecting
- weathering

(ii) The surface of the panda made of granite has not changed.

Suggest why granite does not change in the same way as limestone.
(b) Acid rain can be formed when fossil fuels burn.

(i) Give the name of one fossil fuel.

_________________________________

(ii) What is true about all fossil fuels?
Tick the correct box.

<table>
<thead>
<tr>
<th>All fossil fuels are a source of energy.</th>
<th>All fossil fuels are black.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(iii) Acid rain has changed the surface of the metal letters on the statue.

Which word describes the effect of acid rain on a metal?
Tick the correct box.

<table>
<thead>
<tr>
<th>corrosion</th>
<th>friction</th>
<th>magnetism</th>
<th>vibration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(iv) What could the zoo owner put on the metal letters to protect them from acid rain?

__________________________________________

*maximum 6 marks*
5. 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

(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
(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?
__________________________________________________________________________

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

What colour was the mixture?
_________________________________

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

filtre  indicator  non-metal  solution

maximum 5 marks
6. The drawing shows some people in a balloon ride. The basket of the balloon is fixed to the end of a steel cable.

(a) A man brings the balloon down by winding the steel cable around a winch. Six properties of steel are given below.

(i) Which **two** properties of steel make it suitable for the **cable**? Tick the **two** correct boxes.

- It conducts electricity. [ ]
- It conducts heat. [ ]
- It is flexible. [ ]
- It is magnetic. [ ]
- It becomes rusty. [ ]
- It is strong. [ ]

(ii) From these six properties of steel, give **one** property that is **never** useful.

__________________________________________________________________________
(b) The table below shows the mass of 1 m$^3$ of five different gases at 20°C.

<table>
<thead>
<tr>
<th>gas</th>
<th>mass of 1 m$^3$ of gas (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hydrogen</td>
<td>0.1</td>
</tr>
<tr>
<td>helium</td>
<td>0.2</td>
</tr>
<tr>
<td>air</td>
<td>1.2</td>
</tr>
<tr>
<td>oxygen</td>
<td>1.3</td>
</tr>
<tr>
<td>carbon dioxide</td>
<td>1.8</td>
</tr>
</tbody>
</table>

(i) Many years ago hydrogen was used in balloons that carried people. Hydrogen is **no** longer used because it is dangerous.

Why is it dangerous to use hydrogen?

(ii) Which other gas in the table can be used in a balloon so that it can go up in the air?

maximum 5 marks
7. In 2004, a man fishing on the River Thames in London told scientists that a strange fish had dropped from the sky onto his boat.

(a) What is the length of this fish?

cm

(b) A scientist looked at the fish and wrote the notes shown below.

Scientist’s notes

- Its shape and teeth suggest it is a piranha.
- It is fresh, so it died recently.
- It might have been a pet that was put in the river by its owner.
- Maybe a bird picked it out of the river. The cut on its body could have been made by a bird’s beak.

Read the scientist’s notes.

What two features of the fish made the scientist think it was a piranha?

1. ____________________________________________________________

2. ____________________________________________________________
(c) What made the scientist think a bird had picked it out of the river?
_________________________________________________________________
_________________________________________________________________

(d) How could you find out the name of a fish you had **not** seen before?
_________________________________________________________________
_________________________________________________________________

(e) Four of the scientist’s ideas are listed in the table below.

By each idea put one tick to show whether the idea is supported by evidence or **not** supported by evidence.

<table>
<thead>
<tr>
<th>idea</th>
<th>supported by evidence</th>
<th>not supported by evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is a piranha.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It died recently.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was put in the river by its owner.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was picked up by a bird.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*maximum 7 marks*
8. The drawings below show a stoat, a weasel and an American mink.

The stoat and weasel are British wild animals.
Mink are from America.

(a) They all hunt and eat rabbits.

1 000 American mink were set free into the British countryside in 1998.

(i) What happened to the numbers of rabbits in the countryside?

__________________________________________________________________________
Give a reason for your answer.
__________________________________________________________________________
__________________________________________________________________________

(ii) How did this affect the stoats and weasels that lived in the countryside?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
(b) Stoats, weasels and American mink all hunt and eat rabbits. Complete the sentence below.

The stoats, weasels and American mink are all predators and the rabbits are their ________________.

(c) (i) Give the name of one other wild animal in Britain that hunts for small animals such as rabbits.

__________________________________________________________________________

(ii) The American mink were not hunted by other animals in the British countryside, but many of the mink died.

Suggest two different reasons why the mink died.

1. _________________________________________________________

2. _________________________________________________________

(d) Stoats, weasels and mink are all mammals.

Give one way you tell from the drawings that they are mammals.

__________________________________________________________________________

maximum 8 marks
9. The drawing below shows a cardboard scale called an EasyWeigh. It can be used to estimate the mass of letters.

(a) Clare put a letter in the 20 g slot. The scale tipped as shown below.

She then put the same letter in the 40 g slot. The scale did not tip.

(i) What do these results tell you about the mass of Clare’s letter?

__________________________________________________________________________
__________________________________________________________________________

(ii) What could Clare do to this cardboard scale to weigh her letter more accurately?

__________________________________________________________________________
__________________________________________________________________________
(b) (i) Clare drew a short line to show where she thought she should cut a slot to weigh a 150 g letter. She labelled the slot Y.

Why could Clare **not** use a slot at Y to weigh a 150 g letter?

(ii) Clare wanted to cut a slot to weigh a 70 g letter.

On the diagram above, draw a short line to show where the slot should be cut.

*maximum 4 marks*
10. 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?

_________________________________________________________________
_________________________________________________________________

(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.
(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?

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

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

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

*maximum 5 marks*
11. Russell investigated the relationship between mass and weight. He weighed five different masses using a force meter.

His results are shown in the table.

<table>
<thead>
<tr>
<th>mass (g)</th>
<th>weight (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>1.5</td>
</tr>
<tr>
<td>250</td>
<td>2.5</td>
</tr>
<tr>
<td>300</td>
<td>3.8</td>
</tr>
<tr>
<td>400</td>
<td>4.0</td>
</tr>
<tr>
<td>580</td>
<td>5.8</td>
</tr>
</tbody>
</table>

(a) He plotted four of his results on a grid as shown below.

(i) Plot the point for the 150 g mass on the graph.

(ii) Draw a line of best fit.
(b) One of the points Russell plotted does not fit the pattern. Circle this point on the graph.

(c) Use your graph to predict:

(i) the mass of an object weighing 6.5 N;

   ______ g

(ii) the weight of an object of mass 50 g.

   ______ N

(d) Give one reason why it is more useful to present the results as a line graph rather than a table.

   __________________________________________

   __________________________________________

   __________________________________________

maximum 6 marks
12. A science teacher showed her class three experiments, A, B and C. The experiments and the word equations for the reactions that took place are shown below. All the experiments were done in a fume cupboard.

**experiment A**

Calcium carbonate is heated

**word equation**  calcium carbonate $\rightarrow$ calcium oxide + carbon dioxide

**experiment B**

Iron filings and sulphur are heated together

**word equation**  iron + sulphur $\rightarrow$ iron sulphide

**experiment C**

Hot copper is added to chlorine

**word equation**  copper + chlorine $\rightarrow$ piece of copper covered with brownish solid
(a) From the substances in experiments A, B and C, opposite, give the name of:

(i) one metallic element; 
________________________________________

(ii) one non-metallic element; 
________________________________________

(iii) two compounds. 
________________________ and ________________________

(b) In experiment B, the iron filings weighed 2.0 g at the beginning of the experiment and the iron sulphide produced weighed 2.8 g.

Explain this increase in mass. 
________________________________________

________________________________________

(c) Complete the word equation for the chemical reaction in experiment C.

copper + chlorine → ______________________

maximum 5 marks
13. (a) Air is a mixture of gases. The pie chart represents the percentages of different gases in air. **On the line** by each section of the pie chart, write the name of the correct gas. Two have been done for you.

- 0.04% carbon dioxide
- 1.96% water vapour and other gases

(b) On a cold day, droplets of water form on a cold window. Explain how these droplets form.
(c) The word equation below represents a process taking place in the cells of the human body.

\[ \text{glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water} \]

(i) What process does this word equation represent?

(ii) As a result of this process, the proportions of oxygen and carbon dioxide in air breathed in and air breathed out change.

Which one of the statements below is true?

Tick the correct box.

- Air breathed out has less carbon dioxide and more oxygen than air breathed in. [ ]
- Air breathed out has less carbon dioxide and less oxygen than air breathed in. [ ]
- Air breathed out has more carbon dioxide and less oxygen than air breathed in. [ ]
- Air breathed out has more carbon dioxide and more oxygen than air breathed in. [ ]
14. Joe bought a potted plant. He kept it well watered but some of the leaves turned yellow.

Joe thought that the plant did not have enough light for photosynthesis. He moved the plant closer to the window but more leaves turned yellow.

(a) He then thought that the plant did not have enough minerals.

The table below gives information about minerals.

<table>
<thead>
<tr>
<th>mineral</th>
<th>why the mineral is needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>magnesium</td>
<td>to make chlorophyll</td>
</tr>
<tr>
<td>nitrogen</td>
<td>to make protein</td>
</tr>
<tr>
<td>phosphorus</td>
<td>to grow and transfer energy</td>
</tr>
<tr>
<td>potassium</td>
<td>to make fruit</td>
</tr>
</tbody>
</table>

(i) Joe's plant did not have enough of one of the minerals in the table. Use the information in the table to suggest which mineral this was.

__________________________________________________________________________

(ii) A plant growing in a pot is more likely to be affected by a shortage of minerals than a plant growing in a garden. Give the reason for this.

__________________________________________________________________________
(b) Joe bought some fertiliser for his plant.
The names and formulae of four different fertilisers are shown below.

<table>
<thead>
<tr>
<th>Easy Grow</th>
<th>Epsom Salts</th>
<th>Saltpetre</th>
<th>Superphosphate</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH₄NO₃</td>
<td>MgSO₄</td>
<td>KNO₃</td>
<td>Ca(H₂PO₄)₂</td>
</tr>
</tbody>
</table>

A   B   C   D

(i) Give the letter of one box of fertiliser, A, B, C or D, that would provide each of the minerals in the table below. Write the letters in the table.

<table>
<thead>
<tr>
<th>mineral</th>
<th>letter of fertiliser</th>
</tr>
</thead>
<tbody>
<tr>
<td>magnesium</td>
<td></td>
</tr>
<tr>
<td>nitrogen</td>
<td></td>
</tr>
<tr>
<td>phosphorus</td>
<td></td>
</tr>
<tr>
<td>potassium</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Easy Grow is ammonium nitrate, NH₄NO₃.

How many different elements are present in ammonium nitrate?

(iii) How many atoms are present in the formula of ammonium nitrate?

maximum 7 marks
15. The drawing below shows an alligator.

(a) Alligators are carnivores.
What does the word carnivore mean?
_________________________________________________________________

(b) Alligators lay eggs in nests made from plant material.
The eggs have tough shells containing calcium carbonate.

(i) How does the eggshell help the developing alligator to survive before it hatches?
________________________________________________________________________
________________________________________________________________________

(ii) Rotting plant material in the nest is acidic.
When the acid comes into contact with calcium carbonate in the eggshell it makes the shell weaker.

Why does the acid weaken the eggshell?
________________________________________________________________________
________________________________________________________________________

(iii) Suggest one reason why it is helpful to the developing alligator in the egg if the eggshell becomes weaker.
________________________________________________________________________
________________________________________________________________________
(c) The table below shows the percentage of female and male alligators that hatch from the eggs when the eggs are kept at different temperatures.

<table>
<thead>
<tr>
<th>temperature (°C)</th>
<th>% eggs hatching as females</th>
<th>% eggs hatching as males</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>28</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>32</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>34</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>36</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

(i) Use the table to suggest how a zookeeper could make sure only females hatch from the eggs.

__________________________________________________________________________

(ii) Between which two temperatures are 50% of the eggs likely to hatch as females?

Tick the correct box.

- between 26°C and 30°C
- between 30°C and 32°C
- between 32°C and 34°C
- between 34°C and 36°C

*maximum 6 marks*
16. Jack compared the reaction times of ten different pupils in his class. He dropped a metre ruler between each pupil’s finger and thumb. As soon as they saw the ruler begin to move, they had to catch it as quickly as possible.

(a) Jack did not measure time to compare pupils’ reactions. What did Jack measure to compare pupils’ reaction times?

_________________________________________________________________

_________________________________________________________________

1 mark

(b) Why was it more accurate to use the ruler rather than a stopwatch in this investigation?

_________________________________________________________________

_________________________________________________________________

1 mark
(c) What factor did Jack change as he carried out his investigation (the independent variable)?

______________________________

(d) Give two factors he should have kept the same to make his test fair.

1. ________________________________
2. ________________________________

(e) What could he do to make his results more reliable?

_________________________________________________________________
_________________________________________________________________

maximum 6 marks
END OF TEST