Science test

Paper 1

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.
1. 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. _______________________________

(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?

___________________________________________________________________________

___________________________________________________________________________
(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.

<table>
<thead>
<tr>
<th>organ system</th>
<th>function</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c)</td>
<td>digestion of food</td>
</tr>
<tr>
<td>(c)</td>
<td>reproduction</td>
</tr>
<tr>
<td>(c)</td>
<td>control of the body</td>
</tr>
<tr>
<td>(c)</td>
<td>taking in oxygen from the air</td>
</tr>
<tr>
<td>(c)</td>
<td>movement of the body</td>
</tr>
</tbody>
</table>

maximum 6 marks
2. Jay collected pond snails from the school pond. He measured the lengths of all their shells.

(a) What is the length of the shell above?

______ mm

(b) Jay made a tally chart of the lengths of all the shells he found.

<table>
<thead>
<tr>
<th>range of lengths of shells (mm)</th>
<th>0-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>26-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of shells</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

What was the most common range of lengths of shells Jay collected?

_________________ mm
(c) Jay recorded his results in a bar chart.

(i) Add the missing numbers to the side of the bar chart labelled ‘number of shells’.

(ii) On the chart above, draw the bar for the number of shells measuring 16–20 mm.

(d) Look at Jay’s results and decide if each conclusion below is **true** or **false** or if you **cannot tell**.
Tick the correct box for each conclusion.

<table>
<thead>
<tr>
<th>conclusions</th>
<th>true</th>
<th>false</th>
<th>cannot tell</th>
</tr>
</thead>
<tbody>
<tr>
<td>The oldest snails have the darkest shells.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>He did <strong>not</strong> find any shells longer than 30 mm.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>He found a total of eight snails.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All the snails he found are the same type.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*maximum 6 marks*
3. The drawings show the amounts of different substances in 100 g of full-cream milk and 100 g of skimmed milk.

(a) Use the information in the drawings to complete the sentence.

When skimmed milk is made from full-cream milk, most of the __________ is taken out.

(b) (i) Look at the drawings. Which substance in milk do we need for strong bones and teeth?

________________________

(ii) How are substances carried around the body?

________________________
(c) (i) Which animals produce milk to feed their young?
Tick the correct box.

- amphibians
- birds
- mammals
- reptiles

(ii) A baby fed on its mother’s milk gets fewer infections.
What is the reason for this?
Tick the correct box.

- The milk contains antibodies.
- The milk contains water.
- The milk is at body temperature.
- The milk is a liquid.

*maximum 5 marks*
4. Gary wanted to find out if some food colourings contained a banned food dye. He put a drop of each food colouring and the banned food dye onto some special paper. He hung the paper in a beaker of water.

After 10 minutes, the banned food dye and some of the dyes from the food colourings had moved up the paper. Gary's results are shown below.
(a) Gary wrote the labels on the paper in pencil. Why should he not write them in ink?

(b) Look at Gary's results. The different dyes in some of the food colourings had moved up the paper.
   (i) Which food colouring contained the banned food dye?
   ________________
   (ii) Which food colouring contained the most dyes?
   ________________

(c) Which food colouring did not dissolve in the water?
   ________________

(d) Which method did Gary use to separate the dyes? Tick the correct box.

   - chromatography
   - distillation
   - evaporation
   - filtration

   4a 1 mark
   4bi 1 mark
   4c 1 mark
   4d 1 mark

   maximum 5 marks

KS3/07/Sc/Tier 3–6/P1
5. Some pupils investigated different materials used to make rucksacks. Here are some of the questions they asked.

(a) Which pupil asked a question that cannot be investigated? Tick the correct box.

- Aysha
- Phillip
- Zoe
- Shaun

Give a reason for your answer.

(b) Zara took four different rucksack materials and investigated how waterproof they were.

She poured 100 cm$^3$ of water through each material in turn. She measured the volume of water passing through each material in 30 minutes.
(i) Give one way of making Zara’s test fair.

(ii) Look at the photograph of the investigation.

   Name one measuring instrument Zara used.

(c) The table below shows Zara’s results.

<table>
<thead>
<tr>
<th>material</th>
<th>volume of water passing through each material (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
</tr>
<tr>
<td>C</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>15</td>
</tr>
</tbody>
</table>

Which material was the most waterproof? Tick the correct box.

A [ ] B [ ] C [ ] D [ ]

Explain your answer.

maximum 6 marks
6. Fran has a balancing game. On each side of the pivot there are nine steel balls. The tray is balanced.

(a) Fran removes one of the steel balls as shown below.

What will happen to end A?

(b) There are three balls on side A as shown below.

Draw three other balls in the correct positions to balance the tray.
(c) Fran puts two steel balls on one side and one brass ball on the other side. The tray is balanced.

![Image of a balance with steel and brass balls]

The mass of each steel ball is 50 g.

What is the mass of the brass ball?

______ g

(d) The table below gives information about the brass and steel balls.

<table>
<thead>
<tr>
<th>Is it attracted to a magnet?</th>
<th>elements in the ball</th>
</tr>
</thead>
<tbody>
<tr>
<td>brass</td>
<td>no</td>
</tr>
<tr>
<td>steel</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>copper and zinc</td>
</tr>
<tr>
<td></td>
<td>iron and carbon</td>
</tr>
</tbody>
</table>

(i) Which element is **not** a metal?

Tick the correct box.

- carbon
- copper
- iron
- zinc

(ii) Look at the elements in the brass ball and the steel ball.

Why is steel attracted to a magnet but brass is **not**?
7. The drawings below show six ways of providing energy.

A. Coal fire
   burns coal to provide heat

B. Turbine
   turns a generator to provide electricity

C. Petrol generator
   burns petrol to provide electricity

D. Gas boiler
   burns gas to provide heat

E. Solar panel
   uses solar energy to provide heat

F. Wave turbine
   uses wave energy to provide electricity
(a) From the opposite page, give the names of two fossil fuels.
1. _______________________________
2. _______________________________

(b) (i) What is the source of energy for a solar panel?
_______________________________

(ii) Why can the solar panel not work at night?
_______________________________

(c) What makes the blades of the turbine in drawing B go round?
_______________________________

(d) Renewable energy resources will not run out.
   From the opposite page, give one energy source that will not run out.
_______________________________

maximum 6 marks
8. Susan has a small fan to keep herself cool. When she switches it on, a motor turns the blades to blow air.

(a) The diagrams below show the symbols for a battery, a motor and a switch.

In the space below, draw a series circuit diagram for the fan using these symbols.
(b) (i) Which part provides energy for the circuit?

(ii) Some of this energy is used to turn the blades. The rest of the energy is wasted.

Complete the sentence below. Choose words from the list.

chemical          heat          light          sound

When the blades are turning, energy is wasted as

________________________ energy and ____________________ energy.

(c) Susan built a circuit using a battery, a motor and a switch. She closed the switch to turn the motor on.

(i) Susan added a bulb to the circuit. The current in the circuit decreased.

How did this affect the motor?

(ii) Susan removed the motor from the circuit. The current in the circuit increased.

How did this affect the bulb?

maximum 6 marks
9. **Diagram 1** shows a baby in its mother's uterus.

(a) What is the normal length of pregnancy in humans?

______ months

(b) (i) What is the function of the amniotic fluid around the baby?

(ii) As a baby is born, it is pushed out of the mother's body.

Look at the diagram above.
What happens in the wall of the uterus to push the baby out?
(c) How does a baby get oxygen from its mother while it is inside its mother's uterus?

________________________________________

(d) **Diagram 2** shows a section through the mother's lungs.

Look at **diagram 2**.

From which labelled part is oxygen absorbed into the blood?

________________________________________

*maximum 5 marks*
10. The drawings show part of a farmland food chain.

(a) A pyramid of numbers represents the number of organisms at each stage in a food chain.

On each line by the pyramid of numbers below, write the name of the correct organism from the food chain above.

(b) Partridges feed mainly on insects and wild plants (weeds).

Some farmers spray their crops with chemicals to kill insects and weeds.

How would this affect the number of foxes?

Explain your answer.
(c) Partridges build their nests on the ground among plants. They lay up to 18 eggs in the nest.

Suggest why partridges need to lay so many eggs.

_____________________________________________________________________________________

_____________________________________________________________________________________

(d) Some farmers leave a strip of land around the edge of each field which they do not spray with chemicals.

Suggest two reasons why this will lead to an increase in the number of partridges on these farms.

1. ____________________________________________________________
   ____________________________________________________________

2. ____________________________________________________________
   ____________________________________________________________

maximum 5 marks
11. Amy and Tom investigated how sugar affects the growth of pollen grains. They looked at pollen grains under a microscope.

**Amy’s Plan**
- Add some pollen grains to one drop of very concentrated sugar solution.
- Add some pollen grains to one drop of dilute sugar solution.
- Count how many pollen grains have started to grow.

**Tom’s Plan**
- Add one drop of different concentrations (0%, 5%, 10%, 15%, 20% and 25%) of sugar solution to each slide.
- Add the same amount of pollen to each drop.
- One hour later count how many pollen grains have started to grow. Work out the percentage.

(a) Give two ways in which Tom’s plan is better than Amy’s plan.

1. ____________________________________________________________
2. ____________________________________________________________

(b) In Tom’s investigation, what factor did he change (the independent variable)?

______________________________________________________________

(c) Look at Tom’s results in the table below.

<table>
<thead>
<tr>
<th>concentration of sugar solution (%)</th>
<th>percentage of pollen grains that had started to grow (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>
He plotted five of his results on graph paper.

Plot the result for 20% sugar solution.

(d) Tom’s conclusion was, ‘The greater the concentration of sugar solution, the greater the percentage of pollen grains that had grown.’

Do his results support his conclusion?  
Tick one box.

<table>
<thead>
<tr>
<th>yes</th>
<th>no</th>
</tr>
</thead>
</table>

Use the results in the graph to explain your answer.

maximum 5 marks
12. Jill bought a can of Wax Seal to spray the parts underneath her car.

Wax Seal helps to prevent these parts rusting.
It is a mixture of wax and a liquid called white spirit.

(a) (i) The body of Jill’s car is made from steel. Steel contains iron.

Give two substances that are needed for iron to rust.

1. _______________________________
2. _______________________________

(ii) How does Wax Seal help to protect the car from rusting?

________________________________________________________________________

________________________________________________________________________

(iii) Wax Seal can also be used on the upper parts of a car.

What else protects parts such as the doors from rusting?

________________________________________________________________________

(b) The metal parts of a car may corrode.

What type of air pollution could cause corrosion?

________________________________________________________________________
(c) The diagram below shows the mixture of particles of wax and white spirit in Wax Seal.

After Jill sprays the car, the white spirit evaporates leaving a layer of solid wax on the surface.

(i) In the box below, draw eight circles, $\bigcirc$, to show the arrangement of particles in a gas.

(ii) In the box below, draw eight circles, $\bullet$, to show the arrangement of particles in a solid.

Maximum 7 marks
13. (a) Helen weighed three pieces of rock and soaked them in water. The next day, she weighed them again. Her results are shown below.

<table>
<thead>
<tr>
<th>rock</th>
<th>mass before soaking in water (g)</th>
<th>mass after soaking in water (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>granite</td>
<td>26.3</td>
<td>26.3</td>
</tr>
<tr>
<td>marble</td>
<td>20.4</td>
<td>20.4</td>
</tr>
<tr>
<td>sandstone</td>
<td>25.5</td>
<td>27.6</td>
</tr>
</tbody>
</table>

Rocks that have lots of small spaces are described as **porous**.

What evidence is there in the table that sandstone is porous, but granite and marble are **not** porous?

(b) Helen put the soaked sandstone into a freezer for 24 hours.

Water in the spaces in the sandstone froze and expanded.

(i) What would happen to the sandstone as the water froze and expanded?

(ii) In the winter this process happens in rocks in the countryside. What is the name of this process?
(c) Helen placed fresh pieces of granite, marble and sandstone in beakers of dilute sulphuric acid. Only the marble reacted with the acid.

Use Helen's results to explain why granite is more suitable than marble for a statue in a city centre.

(d) (i) Draw a line from the name of each rock below to the group of rocks it belongs to.

(ii) Draw a line from each group of rocks below to the way the group of rocks was formed.

<table>
<thead>
<tr>
<th>name of rock</th>
<th>group of rocks</th>
<th>way the group of rocks was formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>granite</td>
<td>sedimentary</td>
<td>the effect of high temperature and pressure on limestone</td>
</tr>
<tr>
<td>marble</td>
<td>igneous</td>
<td>formed when magma cools</td>
</tr>
<tr>
<td>sandstone</td>
<td>metamorphic</td>
<td>particles are deposited in layers</td>
</tr>
</tbody>
</table>

*maximum 8 marks*
14. James shone a ray of light at a mirror as shown below.

He measured the angle of reflection for different angles of incidence. His results are shown below.

<table>
<thead>
<tr>
<th>angle of incidence (°)</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle of reflection (°)</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>65</td>
<td>70</td>
</tr>
</tbody>
</table>

(a) Which angle of reflection was not measured accurately?

How can you tell this from the table?

(b) James set up a different experiment as shown below.

Diagram 2
He measured the angle of **refraction** for different angles of incidence. His results are shown in the graph.

Use the graph to answer the questions below.

(i) When the angle of **refraction** is 20°, what is the angle of **incidence**?


°

(ii) What conclusion could James draw from his graph?

Complete the sentence below.

When light passes from air into glass, the angle of **incidence** is always ______________________ the angle of **refraction**.

(c) **On diagram 2, on the opposite page**, draw a line to continue the refracted ray as it leaves the glass block.

*maximum 4 marks*
15. The diagram below shows part of the solar system.

(a) Look at the diagram. Give the names of X and Y.

X _______________________________

Y _______________________________

(b) It takes Jupiter much longer than Mars to complete one orbit. Give two reasons for this.

1. ____________________________________________________________
   ______________________________________________________________

2. ____________________________________________________________
   ______________________________________________________________
(c) The diagram opposite also shows the orbit of a comet.

In 1531, 1607 and 1683 scientists recorded that they had seen a comet in the sky.

(i) Edmund Halley looked at these dates and suggested the scientists had all seen the same comet.

Explain how he worked out that it was the same comet each time.

(ii) The comet was last seen in 1986.

Predict when it will be seen next.
16. David made two electromagnets as shown below. He used paper-clips to test the strength of each electromagnet. He switched on the power supply in both circuits.

(a) How can you tell that the strength of both electromagnets is the same?

(b) David switched off the power supply in both circuits. The paper-clips fell off the iron core, but not off the steel core.

Why is iron used, rather than steel, for the core of an electromagnet? Use the diagrams above to help you.
(c) David used a sensor to measure the strength of an electromagnet. He placed the sensor 25 mm from the electromagnet and increased the current in the coil. He repeated the experiment with the sensor 50 mm from the electromagnet. The graph below shows his results.

(i) How did the distance of the sensor from the electromagnet affect the reading on the sensor?

(ii) How did the size of the current in the coil affect the strength of the electromagnet?

(iii) What else could David do to an electromagnet to change its strength?

maximum 5 marks