GCSE BIOLOGY
AQA - COMBINED SCIENCE

Materials
For this paper you must have:
• Ruler
• Pencil, Rubber, Protractor and Compass
• Scientific calculator, which you are expected to use when appropriate

Instructions
• Answer all questions
• Answer questions in the space provided
• All working must be shown
• Do all rough work in this book. Cross out any rough work you don't want to be marked

Information
• The marks for the questions are shown in brackets
Muscle cells divide to form new muscle cells.

(a) Which two cell components are copied before the muscle cells start to divide?

Tick two boxes.

- Cytoplasm
- Mitochondria
- Plasmids
- Ribosomes
- Vacuole

(b) Why do muscle cells need to divide by mitosis more often than most other cells?

Tick one box.

- To contract the muscles
- To repair the muscles
- To supply more oxygen to the muscles
- To transmit nerve impulses
Mitosis is part of the cell cycle.

The diagram below shows the percentage of time taken by each stage of a cell cycle.

(c) The cell cycle shown in the diagram above takes 21 hours in total.

Cell division takes 5% of the total time.

Calculate how many hours cell division takes.

___________________________________________________________________
___________________________________________________________________

Time taken = _______________ hours

(2)

(d) What percentage of time is spent copying DNA in the cell cycle shown in the diagram above?

___________________________________________________________________
___________________________________________________________________

Percentage = _______________

(2)
(e) A sperm cell from a dog contains 39 chromosomes.

How many chromosomes are there in each dog muscle cell?

Tick one box.

39
78
156
312

(f) A sperm cell fuses with an egg cell.

What is this process called?

Tick one box.

Fertilisation
Meiosis
Ovulation
Respiration

(Total 9 marks)
Figure 1 shows an animal cell.

(a) What is structure A?

Tick one box.

- Cell membrane
- Cell wall
- Chromosome
- Cytoplasm
(b) What is structure B?

Tick one box.

- Chloroplast
- Mitochondria
- Nucleus
- Vacuole

(c) Figure 2 shows a sperm cell.

Describe how a sperm cell is adapted to carry out its function.

___________________________________________________________________
___________________________________________________________________

(1)
Substances can move into and out of cells by three processes.

The diagrams show the concentration of different substances inside and outside a root hair cell.

How would each substance move into the root hair cell?

Draw one line from each root hair cell to the correct process.

<table>
<thead>
<tr>
<th>Root hair cell</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water molecule</td>
<td>Active transport</td>
</tr>
<tr>
<td>Nitrate ion</td>
<td>Diffusion</td>
</tr>
<tr>
<td>Magnesium ion</td>
<td>Osmosis</td>
</tr>
</tbody>
</table>

(2)
(Total 5 marks)
The figure below shows a scale drawing of one type of cell in blood.

(a) Use the scale to determine the width of the cell.

Give your answer to the nearest micrometre.

___________________________________________________________________
___________________________________________________________________

Width of cell = _________________ micrometres

(1)

(b) Complete the table below.

<table>
<thead>
<tr>
<th>Part of the blood</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carries oxygen around the body</td>
</tr>
<tr>
<td></td>
<td>Protects the body against infection</td>
</tr>
<tr>
<td>Plasma</td>
<td></td>
</tr>
</tbody>
</table>

(3)
Platelets are fragments of cells.
Platelets help the blood to clot.
Suggest what might happen if the blood did not clot.

___________________________________________________________________
___________________________________________________________________

(1) (Total 5 marks)

The figure below shows four different types of cell.

4

(a) Which cell is a plant cell?
Give one reason for your answer.
Cell _________
Reason ____________________________________________________________

(2)

(b) Which cell is an animal cell?
Give one reason for your answer.
Cell _________
Reason ____________________________________________________________

(2)

(c) Which cell is a prokaryotic cell?
Give one reason for your answer.
Cell _________
Reason ____________________________________________________________

(2)
(d) A scientist observed a cell using an electron microscope.

The size of the image was 25 mm.

The magnification was \( \times 100\,000 \)

Calculate the real size of the cell.

Use the equation:

\[
\text{magnification} = \frac{\text{image size}}{\text{real size}}
\]

Give your answer in micrometres.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Real size = __________________ micrometres

(Total 9 marks)

Living organisms are made of cells.

(a) Animal and plant cells have several parts. Each part has a different function.

Draw one line from each cell part to the correct function of that part.

<table>
<thead>
<tr>
<th>Cell part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell membrane</td>
<td>Where most energy is released in respiration</td>
</tr>
<tr>
<td>Mitochondria</td>
<td>Controls the movement of substances into and out of the cell</td>
</tr>
<tr>
<td>Nucleus</td>
<td>Controls the activities of the cell</td>
</tr>
<tr>
<td></td>
<td>Where proteins are made</td>
</tr>
</tbody>
</table>

(3)
(b) The diagram below shows a cell from a plant leaf.

Which two parts in the diagram above are not found in an animal cell?

1. _________________________________________________________________
2. _________________________________________________________________

(Total 5 marks)

Cells, tissues and organs are adapted to take in different substances and get rid of different substances.

The table shows the concentration of four ions outside cells and inside cells.

<table>
<thead>
<tr>
<th>Ion</th>
<th>Concentration outside cells in mmol per dm$^3$</th>
<th>Concentration inside cells in mmol per dm$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>140</td>
<td>9</td>
</tr>
<tr>
<td>Potassium</td>
<td>7</td>
<td>138</td>
</tr>
<tr>
<td>Calcium</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>Chloride</td>
<td>118</td>
<td>3</td>
</tr>
</tbody>
</table>

(a) Use information from the table above to complete the following sentences.

Sodium ions will move into cells by the process

of ________________________________ .

Potassium ions will move into cells by the process

of ________________________________ .

(2)
(b) Some students investigated the effect of the different concentrations of sugar in four drinks, A, B, C and D, on the movement of water across a partially permeable membrane.

The students:

• made four bags from artificial partially permeable membrane
• put equal volumes of 5% sugar solution in each bag
• weighed each bag containing the sugar solution
• placed one bag in each of the drinks, A, B, C and D
• after 20 minutes removed the bags containing the sugar solution and weighed them again.

The diagram below shows how they set up the investigation.

(i) The bag in drink A got heavier after 20 minutes.

Explain why.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(3)
(ii) In which drink, A, B, C or D, would you expect the bag to show the smallest change in mass?

Tick (✔) one box.

A   B   C   D

(1)

(iii) Explain why you think the bag you chose in part (b)(ii) would show the smallest change.

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

(2) (Total 8 marks)

The image below shows an epithelial cell from the lining of the small intestine.

Direction in which food is absorbed

Highly folded surface

Mitochondria

A

(a) (i) In the image above, the part of the cell labelled A contains chromosomes.

What is the name of part A?

________________________________________________________________________________________

(1)
(ii) How are most soluble food molecules absorbed into the epithelial cells of the small intestine?

Draw a ring around the correct answer.

\[
\begin{array}{ccc}
\text{diffusion} & \text{osmosis} & \text{respiration} \\
\end{array}
\]

(1)

(b) Suggest how the highly folded cell surface helps the epithelial cell to absorb soluble food.

___________________________________________________________________
___________________________________________________________________

(1)

(c) Epithelial cells also carry out active transport.

(i) Name one food molecule absorbed into epithelial cells by active transport.

___________________________________________________________________

(1)

(ii) Why is it necessary to absorb some food molecules by active transport?

___________________________________________________________________
___________________________________________________________________

(1)

(ii) Suggest why epithelial cells have many mitochondria.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)

(d) Some plants also carry out active transport.

Give one substance that plants absorb by active transport.

___________________________________________________________________

(1)

(Total 8 marks)