GCSE BIOLOGY
AQA - COMBINED SCIENCE

B1 CELL BIOLOGY TEST 2

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
The image below shows some muscle cells from the wall of the stomach, as seen through a light microscope.

(a) Describe the function of muscle cells in the wall of the stomach.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(b) The figure above is highly magnified.

The scale bar in the figure above represents 0.1 mm.

Use a ruler to measure the length of the scale bar and then calculate the magnification of the figure above.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Magnification = _______________ times

(c) The muscle cells in Figure above contain many mitochondria.

What is the function of mitochondria?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)
(d) The muscle cells also contain many ribosomes. The ribosomes cannot be seen in the figure above.

(i) What is the function of a ribosome?

_________________________________________________________________________

_________________________________________________________________________

(1)

(ii) Suggest why the ribosomes cannot be seen through a light microscope.

_________________________________________________________________________

_________________________________________________________________________

(1)

(Total 8 marks)

Figure 1 shows one type of white blood cell.

Figure 1

(a) What is structure A?

Tick one box.

- Cell membrane
- Cell wall
- Cytoplasm
- Nucleus

(1)
(b) White blood cells help to defend the body against pathogens.

How do the white blood cells do this?

Tick **three** boxes.

- Clone pathogens
- Engulf pathogens
- Produce antibiotics
- Produce antibodies
- Produce antitoxins
- Produce toxins

(3)
Measles is a serious disease. A person can die from measles.

Figure 2 shows the number of cases of measles in England and Wales between 2012 and 2015.

(c) Use Figure 2 to calculate the decrease in the number of cases of measles between 2012 and 2015.

___________________________________________________________________
___________________________________________________________________

Answer = ______________________ cases

(2)

(d) Suggest one reason for the decrease in the number of cases of measles between 2012 and 2015.

___________________________________________________________________
___________________________________________________________________

(1)
(e) Antibiotics cannot be used to treat measles.
Suggest why.

___________________________________________________________________

___________________________________________________________________

(1)

(f) Gonorrhoea is a disease caused by a bacterium.

Gonorrhoea can be treated with antibiotics.

Give one other way to control the spread of gonorrhoea.

___________________________________________________________________

___________________________________________________________________

(1)

A scientist investigated how effective different antibiotics were at killing gonorrhoea bacteria.

This is the method used.

1. Grow gonorrhoea bacteria on agar in a Petri dish.
2. Place one paper disc soaked in water onto the agar.
3. Place four other paper discs, each soaked in a different antibiotic, A, B, C, and D, onto the agar.
4. Use the same sized paper discs and the same concentration of each antibiotic.
5. Incubate the Petri dish for 3 days.

Figure 3 shows the scientist's results.

A clear area around the disc means the antibiotic has killed the bacteria.

Figure 3

![Diagram showing the results of the antibiotic test.](image-url)
A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

1. Cut three pieces of potato to the same length.
2. Dry each piece on a paper towel.
3. Weigh each piece.
4. Place each piece in a different concentration of sugar solution.
5. Leave all three pieces for 2 hours.
6. Remove the three pieces of potato from the solutions.
7. Dry each piece on a paper towel.
8. Measure the length and mass of each piece of potato.

**Figure 1** shows how the investigation was set up.

**Figure 1**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Antibiotic Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Water 0.0 mol/dm³</td>
</tr>
<tr>
<td>B</td>
<td>Sugar solution 0.4 mol/dm³</td>
</tr>
<tr>
<td>C</td>
<td>Sugar solution 0.8 mol/dm³</td>
</tr>
</tbody>
</table>
(a) Why did the student dry each piece of potato before weighing it?

___________________________________________________________________

___________________________________________________________________

(1)

(b) What two changes would you expect in the potato in tube A after 2 hours?

Tick two boxes.

Breaks into pieces

Decrease in hardness

Decrease in size

Increase in mass

Increase in length

(2)

(c) Complete the sentences.

Water moves into and out of cells by a process called ________________.

Water would move ________________ the potato cells in tube A.

The solution outside the potato in tube A is at a ________________ concentration than the solution inside the potato cells.

(3)

(d) The potato in tube B did not change.

Give one conclusion that can be made from this observation.

___________________________________________________________________

___________________________________________________________________

(1)
(e) **Figure 2** shows the root of a germinating seed.

Figure 2

Describe **two** ways the root is adapted to absorb water efficiently.

1. _________________________________________________________________
   ___________________________________________________________________
2. _________________________________________________________________
   ___________________________________________________________________

(2)
(Total 9 marks)

A student investigated the effect of different concentrations of sugar solution on pieces of carrot.

This is the method used.

1. Weigh five pieces of carrot.
2. Place each piece into a different tube.
3. Into each tube add 20 cm³ of water or one of the sugar solutions as shown in **Figure 1**
4. Leave the apparatus for 2 hours.
5. Remove the carrot and dry each piece on paper towel.
6. Reweigh each piece.
7. Calculate the percentage (%) change in mass of each piece.
Figure 1 shows how the investigation was set up.

The table below shows the results.

<table>
<thead>
<tr>
<th>Concentration of sugar solution in mol/dm³</th>
<th>Percentage (%) change in mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>+24</td>
</tr>
<tr>
<td>0.2</td>
<td>+12</td>
</tr>
<tr>
<td>0.4</td>
<td>+1</td>
</tr>
<tr>
<td>0.6</td>
<td>−8</td>
</tr>
<tr>
<td>0.8</td>
<td>−15</td>
</tr>
</tbody>
</table>

(a) Suggest why the student calculated the percentage (%) change in mass of each piece of carrot.

___________________________________________________________________
___________________________________________________________________

(1)
(b) Complete Figure 2 using the results in the table above

- Choose a suitable scale and label for the y-axis.
- Plot the results.
- Draw a line of best fit.

Figure 2

(c) Estimate the concentration of sugar solution inside the carrot cells.

Use your completed graph on Figure 2

Concentration = _________________ mol/dm$^3$
(d) Explain why the mass of the carrot in the 0.6 mol/dm$^3$ sugar solution changed.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(e) The student repeated the investigation using boiled pieces of carrot.

The pieces of carrot did not change in mass.

Suggest why.
___________________________________________________________________
___________________________________________________________________

(Total 11 marks)

This question is about stem cells.

(a) Give one place in a plant where stem cells are found.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(1)
(b) What is one economic use of plant stem cells?

Tick one box.

To create genetically modified crops

To create new species of plants

To increase variation in plants

To produce large numbers of identical plants

Embryonic stem cells divide by mitosis.

**Figure 1** represents a cell cycle for a human embryonic stem cell.
(c) The mass of DNA in the cell at the start of the cycle is 6 picograms.

A picogram is $10^{-3}$ nanograms.

Convert 6 picograms to grams.

Give your answer in standard form.

___________________________________________________________________
___________________________________________________________________
Mass = _____________________ g

(1)

(d) The time taken for this complete cell cycle is 15 hours.

Calculate how many hours the cell spent in mitosis.

Give your answer to 3 significant figures.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Time spent in mitosis = _____________________ hours

(2)
(e) Describe what happens in each of the three stages of the cell cycle.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(f) Figure 2 shows how embryonic stem cells are produced in therapeutic cloning for use in patients.

![Diagram of cell cycle with labels: Donated egg cell, Body cell from patient, Embryo, Some stem cells cultured, Some cells not used.]

Figure 2
Give two advantages and two disadvantages of therapeutic cloning in medical treatments. Use Figure 2 to help you.

Advantage 1

___________________________________________________________________

Advantage 2

___________________________________________________________________

Disadvantage 1

___________________________________________________________________

Disadvantage 2

___________________________________________________________________

This question is about cell structures.

(a) Draw one line from each cell structure to the type of cell where the structure is found.

<table>
<thead>
<tr>
<th>Cell Structure</th>
<th>Type of cell where the structure is found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nucleus</td>
<td>Prokaryotic cells</td>
</tr>
<tr>
<td>Permanent vacuole</td>
<td>Plant cells only</td>
</tr>
<tr>
<td>Plasmid</td>
<td>Eukaryotic cells</td>
</tr>
</tbody>
</table>

(2)

(4)

(Total 14 marks)
(b) **Figure 1** shows a plant cell.

![Figure 1](image)

What are the names of structures A, B and C?

Tick one box.

<table>
<thead>
<tr>
<th>Structure A</th>
<th>Structure B</th>
<th>Structure C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroplast</td>
<td>Vacuole</td>
<td>Cell wall</td>
</tr>
<tr>
<td>Nucleus</td>
<td>Chloroplast</td>
<td>Cell membrane</td>
</tr>
<tr>
<td>Vacuole</td>
<td>Mitochondrion</td>
<td>Cell membrane</td>
</tr>
<tr>
<td>Vacuole</td>
<td>Ribosome</td>
<td>Cell wall</td>
</tr>
</tbody>
</table>

A student observed slides of onion cells using a microscope.

**Figure 2** shows two of the slides the student observed.

![Figure 2](image)

The cells on the slides are **not** clear to see.
(c) Describe how the student should adjust the microscope to see the cells on Slide A more clearly.

___________________________________________________________________

___________________________________________________________________

(1)

(d) Describe how the student should adjust the microscope to see the cells on Slide B more clearly.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

(2)

(e) The student made the necessary adjustments to get a clear image.

**Figure 3** shows the student’s drawing of one of the cells.

*Figure 3*

![Figure 3](image)

The real length of the cell was 280 micrometres (µm).

Calculate the magnification of the drawing.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

Magnification = × _________________________

(3) (Total 9 marks)
Cells divide in a series of stages called the cell cycle.

Stage 2 of the cycle is mitosis.

The diagram below shows a simplified cell cycle for a human body cell.

(a) Draw one line from each stage in the cell cycle to what happens during that stage.

<table>
<thead>
<tr>
<th>Stage in the cell cycle</th>
<th>What happens during that stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Nucleus divides</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Cell divides into two</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Copies of the DNA are made</td>
</tr>
</tbody>
</table>
(b) The mass of DNA in a human body cell at the start of the cell cycle is 6 picograms.

What mass of DNA will be in each of the new cells produced by this cell division?

Tick one box.

- 3 picograms
- 6 picograms
- 9 picograms
- 12 picograms

(c) Stem cells are undifferentiated cells.

Which statement about stem cells is correct?

Tick one box.

- Animal stem cells are found in meristems
- Animal stem cells divide by meiosis
- Meristem cells in plants can differentiate throughout the life of the plant
- Meristem cells in plants can only differentiate into one type of cell
Stem cells from human embryos can differentiate into most types of human cell.

Research is being done into the use of embryonic stem cells in medical treatments.

The long-term effects of using embryonic stem cells in patients are not well understood.

In therapeutic cloning, human embryos are produced using a donated human egg cell and a cell from the patient.

- The embryo produced contains the same genetic information as the patient.
- Stem cells are taken from the embryo and stimulated to divide to form cells the patient needs.
- The embryo is then destroyed.

(d) Suggest two advantages of therapeutic cloning.

1. _________________________________________________________________
   ___________________________________________________________________

2. _________________________________________________________________
   ___________________________________________________________________

(2)

(e) Suggest two disadvantages of therapeutic cloning.

1. _________________________________________________________________
   ___________________________________________________________________

2. _________________________________________________________________
   ___________________________________________________________________

(2)

(Total 8 marks)