Sixth Form Entrance Examination

Specimen Paper

BIOLOGY

Time allowed: 60 minutes
SECTION A

Use the attached ‘Multiple Choice Answer Sheet’ at the back of this booklet to give your answer to the following 20 multiple questions. You may detach the sheet but remember to write your name and school in the space provided.

Indicate your answer by joining the dots under your chosen letter using a dark (HB) pencil. Ensure you have only one clear answer for each question.

Q1 The diagrams show four different cells (not drawn to scale).

1 2 3 4

blood cell  sperm cell  root hair cell  muscle cell

Which cells provide a large surface area for absorption?

A 1 & 2  B 1 & 3  C 2 & 4  D 3 & 4

Q2 The table shows features that may be found in living cells.

Which features are found in a liver cell?

<table>
<thead>
<tr>
<th></th>
<th>large central vacuole</th>
<th>chloroplasts</th>
<th>cellulose cell wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>C</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>D</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
Q3  Use the diagram of a section through a leaf to answer the question.

Which can perform the most photosynthesis?

A  P  
B  Q  
C  R  
D  S

Q4  In the pancreas, there are groups of cells that make insulin.

What describes these cells?

A  an organ in an organism  
B  an organ system in an organism  
C  cells within a cell wall  
D  tissue in an organ

Q5  Which of these is digested by protease?

A  ■  
B  ●  
C  ■■■■■  
D  ●●●●●  

key
■ amino acid  
● glucose  
— chemical bond
The diagram shows a half-flower.

Use the following key to identify the type of flower.

1. petals attached above the ovary go to 2
   petals attached below the ovary go to 3

2. stamens less than ten type A
   stamens more than ten type B

3. sepals absent type C
   sepals present type D
Q7  The apparatus shown in the diagram is used to investigate the effect of a green plant on carbon dioxide in the air.

Limewater goes cloudy if carbon dioxide is bubbled through it.
What happens to the limewater in X and in Y?

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>goes cloudy</td>
<td>goes cloudy</td>
</tr>
<tr>
<td>B</td>
<td>goes cloudy</td>
<td>stays clear</td>
</tr>
<tr>
<td>C</td>
<td>stays clear</td>
<td>goes cloudy</td>
</tr>
<tr>
<td>D</td>
<td>stays clear</td>
<td>stays clear</td>
</tr>
</tbody>
</table>

Q8  What crosses the placenta from fetal blood to maternal blood in larger quantities than from maternal blood to fetal blood?

A  amino acids
B  carbon dioxide
C  glucose
D  oxygen
Q9  The diagram shows reproductive organs of a human male.

Which tube carries both sperms and urine?

Q10  Which features of an animal’s skin make it suitable as a gaseous exchange surface?

<table>
<thead>
<tr>
<th>features of skin</th>
<th>large area compared with body size</th>
<th>well supplied with blood vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>C</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>D</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

key
✓ = suitable
x = not suitable
Q11  The diagram shows a plant cell.

Which structure controls the passage of substances into and out of the cell?

A  Nucleus
B  Cell wall
C  Cell membrane
D  Cytoplasm

Q12  The arrows represent the movement of salts into a root hair cell.

low salt concentration in soil water

What describes the movement of the salts?

A  active transport against the concentration gradient
B  active transport down the concentration gradient
C  diffusion against the concentration gradient
D  diffusion down the concentration gradient
Q13 What is the function of each type of plant cell?

<table>
<thead>
<tr>
<th>PALLISADE CELLS</th>
<th>PHLOEM CELLS</th>
<th>ROOT HAIR CELLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A photosynthesis</td>
<td>sugar transport</td>
<td>ion uptake</td>
</tr>
<tr>
<td>B photosynthesis</td>
<td>sugar transport</td>
<td>transpiration</td>
</tr>
<tr>
<td>C transpiration</td>
<td>Photosynthesis</td>
<td>ion uptake</td>
</tr>
<tr>
<td>D transpiration</td>
<td>Photosynthesis</td>
<td>sugar transport</td>
</tr>
</tbody>
</table>

Q14 Five pieces are cut from a potato, all of equal size and shape. The pieces are then placed in sugar solutions of different concentrations. After four hours, the change in length of each potato piece is measured.

The results are shown in the graph.

Which concentration of sugar solution has approximately the same water concentration as the potato?

A 0.00 mol dm\(^{-3}\)
B 0.15 mol dm\(^{-3}\)
C 0.30 mol dm\(^{-3}\)
D 0.40 mol dm\(^{-3}\)
Q15  In which order do these events occur in human nutrition?

A  digestion → ingestion → absorption → assimilation

B  digestion → ingestion → assimilation → absorption

C  ingestion → digestion → absorption → assimilation

D  ingestion → digestion → assimilation → absorption

Q16  Which chemical test shows the presence of an enzyme in a biological washing powder?

A  Benedict’s

B  Biuret

C  ethanol emulsion

D  iodine solution

Q17  The graph shows the rate of photosynthesis in a pea plant at different light intensities. At which point is carbon dioxide concentration a limiting factor?

[Diagram showing the rate of photosynthesis and carbon dioxide concentration at different light intensities]
Q18  The diagram shows an experiment to investigate the volume of gas produced by an aquatic plant under different conditions of light intensity and temperature.

Which conditions result in the greatest production of gas by the plant?

<table>
<thead>
<tr>
<th></th>
<th>light intensity</th>
<th>temperature / °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>high</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>low</td>
<td>5</td>
</tr>
<tr>
<td>C</td>
<td>high</td>
<td>25</td>
</tr>
<tr>
<td>D</td>
<td>low</td>
<td>25</td>
</tr>
</tbody>
</table>

Q19  The diagram shows the human gut.

Which numbered structures secrete digestive enzymes?

A  1, 2, 3 & 4
B  1, 2, 3 & 6
C  2, 3, 4 & 5
D  2, 3, 5 & 6
Q20 The table shows some of the nutrients present in four foods.

<table>
<thead>
<tr>
<th>food</th>
<th>iron / mg per 100 g of food</th>
<th>calcium / mg per 100 g of food</th>
<th>vitamin C / mg per 100 g of food</th>
<th>vitamin D / μg per 100 g of food</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 bananas</td>
<td>0.4</td>
<td>7</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>2 fish</td>
<td>0.4</td>
<td>35</td>
<td>0</td>
<td>6.38</td>
</tr>
<tr>
<td>3 lentils</td>
<td>7.6</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4 milk</td>
<td>0.1</td>
<td>120</td>
<td>0.5</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Which two foods are best to help the healthy growth of bones and teeth of a child?

A 1 and 2  
B 1 and 3  
C 2 and 3  
D 2 and 4

The END of Section A
Q1 In an experiment to investigate starch production by a plant, three similar plants, each with variegated (green and white) leaves were set up as shown in Fig. 2.1.

Fig. 2.1

(a) Name the process that produces starch in the leaves.

.............................................................................................................................. [1]

(b) At the start of the experiment, each jar contained atmospheric air. Name a gas, other than oxygen and carbon dioxide, which was present in the air inside the jars.

.............................................................................................................................. [1]

(c) Explain how the conditions in Jar L make it a control.

.............................................................................................................................. [1]
(d) Name the solution used to test for the presence of starch.

........................................................................................................................................... [1]

(e) At the end of the experiment, a leaf was taken from each plant and tested for the presence of starch. On the outlines in the figure below, clearly label the colours of each leaf after the starch test. Do not colour in the leaves.

[Fig. 2.2]

leaf from L

leaf from M

leaf from N

(f) When the air was first trapped under the jars, it contained 0.04% carbon dioxide. For each of the jars, explain why this percentage has changed by the end of the experiment.

Jar L ........................................................................................................................................... 

........................................................................................................................................... 

Jar M ...........................................................................................................................................

...........................................................................................................................................

Jar N ...........................................................................................................................................

........................................................................................................................................... [6]

[Total: 13]
Q2  Fig. 3.1 shows an apparatus used to investigate the uptake of water by a cut stem of a fresh green plant.

(a)  Draw an arrow on Fig. 1.1 to show the direction in which the air bubble moves when the plant takes up water.

(b)  Explain why the air bubble moves along the tube.

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........................................................................................................................................

........................................................................................................................................ [2]
A student carried out an investigation using the apparatus shown in Fig. 3.1, on water uptake by the cut stem. The data collected is shown in Table 3.1.

Table 3.1

<table>
<thead>
<tr>
<th>time of day</th>
<th>distance moved by bubble / mm per min</th>
</tr>
</thead>
<tbody>
<tr>
<td>06.00</td>
<td>1</td>
</tr>
<tr>
<td>08.00</td>
<td>3</td>
</tr>
<tr>
<td>10.00</td>
<td>8</td>
</tr>
<tr>
<td>12.00 mid-day</td>
<td>16</td>
</tr>
<tr>
<td>14.00</td>
<td>14</td>
</tr>
<tr>
<td>15.00</td>
<td>11</td>
</tr>
<tr>
<td>18.00</td>
<td>2</td>
</tr>
</tbody>
</table>

Construct a line graph of the data on the grid below. [5]

[Total: 8]
SECTION B – Extended Writing Question

Write a structured essay on the topic listed below.

You will be assessed on the:

- scientific content, use of scientific terminology, relevant examples (15 marks)
- essay structure, style and coherence (3 marks)
- spelling, punctuation and grammar (1 marks)

You may include relevant labelled diagrams.

Essay Title:

1: **Homeostasis in humans**