Tuesday 15 May 2018  Afternoon  Time allowed: 1 hour 15 minutes

Materials
For this paper you must have:
• a ruler
• a scientific calculator.

Instructions
• Use black ink or black ball-point pen.
• Fill in the boxes at the top of this page.
• Answer all questions in the spaces provided.
• Do all rough work in this book. Cross through any work you do not want to be marked.
• In all calculations, show clearly how you work out your answer.

Information
• The maximum mark for this paper is 70.
• The marks for questions are shown in brackets.
• You are expected to use a calculator where appropriate.
• You are reminded of the need for good English and clear presentation in your answers.
Figure 1 shows one type of white blood cell.

What is structure A? [1 mark]

Tick one box.

- Cell membrane
- Cell wall
- Cytoplasm
- Nucleus

White blood cells help to defend the body against pathogens. [3 marks]

How do the white blood cells do this?

Tick three boxes.

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

![Figure 2](image)

**01.3** Use **Figure 2** to calculate the decrease in the number of cases of measles between 2012 and 2015.

[2 marks]

Answer = ______________ cases

**01.4** Suggest one reason for the decrease in the number of cases of measles between 2012 and 2015.

[1 mark]
01.5 Antibiotics **cannot** be used to treat measles.

Suggest why. [1 mark]

01.6 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 mark]

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](image-url)
Give one control variable the scientist used. [1 mark]

Suggest why one disc was soaked in water. [1 mark]

Which antibiotic in Figure 3 would be the best to treat gonorrhoea?

Give a reason for your answer. [2 marks]

Antibiotic

Reason

Turn over for the next question
This question is about photosynthesis.

What are the two products of photosynthesis?

Tick two boxes.

- Carbon dioxide
- Chlorophyll
- Glucose
- Oxygen
- Water

[2 marks]

A student investigated the effect of light intensity on the rate of photosynthesis. Figure 4 shows the apparatus.

**Figure 4**

This is the method used.

1. Place the pondweed at 5 cm from the light source.
2. Measure the rate of photosynthesis by counting the number of bubbles produced in 30 seconds.
3. Repeat the investigation with the pondweed at different distances from the light source.
How could the student measure the rate of photosynthesis more accurately? [2 marks]

Tick two boxes.

- Count the number of bubbles produced in 1 minute
- Measure the change in mass of the pondweed in 30 seconds
- Measure the volume of gas produced in 30 seconds
- Place the pondweed further from the light source
- Use water instead of sodium hydrogencarbonate solution

The LED light source does not get hot. Why is this important? [1 mark]

Table 1 shows the student’s results.

<table>
<thead>
<tr>
<th>Distance of light source from pondweed in cm</th>
<th>Number of bubbles produced in 30 seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>
02.4 Calculate the number of bubbles produced in 2 minutes when the light source was 10 cm from the pondweed.

Number of bubbles produced in 2 minutes = 

02.5 Plot the data from Table 1 on Figure 5

Draw a line of best fit.

Figure 5

02.6 Give one conclusion that can be made from these results.

Give one conclusion that can be made from these results.
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 6 shows how the investigation was set up.

Figure 6

Why did the student dry each piece of potato before weighing it?

[1 mark]
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

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.

The potato in **tube B** did not change.

Give **one** conclusion that can be made from this observation.

**Question 3 continues on the next page**
**Figure 7** shows the root of a germinating seed.

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

[2 marks]

1. 

2. 

---

[035]
Exercise can improve health.

A student measured her breathing rate at rest, when walking and when jogging.

**Figure 8** shows her results.

![Breathing rate graph]

**Question 4 continues on the next page**
04.2 Explain why the breathing rate changes when doing different activities. [3 marks]

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Figure 9 shows the heart in the circulatory system.

**Figure 9**

Lungs

Right ventricle

Body

Left ventricle

04.3 The heart is a double pump.

Describe what this means.

Use Figure 9 to help you. [2 marks]

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
0 4.4 The wall of the left ventricle is much thicker than the wall of the right ventricle.

Suggest one reason for this.

[1 mark]

0 4.5 People are encouraged to exercise after recovering from a heart attack.

Suggest one reason why.

[1 mark]
Cells divide in a series of stages called the cell cycle.

Stage 2 of the cycle is mitosis.

**Figure 10** shows a simplified cell cycle for a human body cell.

**Figure 10**

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>
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? [1 mark]

Tick one box.

3 picograms
6 picograms
9 picograms
12 picograms

Stem cells are undifferentiated cells.

Which statement about stem cells is correct? [1 mark]

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

Question 5 continues on the next page
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.

Suggest **two** advantages of therapeutic cloning. [2 marks]

1. 

2. 

Suggest **two** disadvantages of therapeutic cloning. [2 marks]

1. 

2. 
This question is about cell structures.

06.1 Draw one line from each cell structure to the type of cell where the structure is found. [2 marks]

<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>

Question 6 continues on the next page
**Figure 11** shows a plant cell.

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 12** shows two of the slides the student observed.

**Figure 12**

The cells on the slides are **not** clear to see.

0 6 3 Describe how the student should adjust the microscope to see the cells on **Slide A** more clearly.

[1 mark]

0 6 4 Describe how the student should adjust the microscope to see the cells on **Slide B** more clearly.

[2 marks]

**Question 6 continues on the next page**
The student made the necessary adjustments to get a clear image.

**Figure 13** shows the student’s drawing of one of the cells.

**Figure 13**

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

Calculate the magnification of the drawing.

[3 marks]

Magnification = \times 

___ 9 ___
Coronary heart disease (CHD) is a non-communicable disease. CHD is caused when fatty material builds up in the coronary arteries.

Explain what a non-communicable disease is. [2 marks]

Figure 14 shows a coronary artery of someone with CHD.

Explain how CHD can cause a heart attack. [3 marks]

Question 7 continues on the next page
Explain how lifestyle and medical risk factors increase the chance of developing CHD. [6 marks]