Cells and microbes

“I couldn’t do my homework because my computer has a virus and so do all my pencils and pens.”

Science Homework
1. A labelled diagram of a light microscope is shown below.

Copy the table below into your jotter and complete it using the diagram above.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Name</th>
<th>Function (job)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A and B</td>
<td>Adjustment knobs</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Objective lens</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td></td>
<td>Reflects light onto specimen</td>
</tr>
</tbody>
</table>

(b) If the magnification of the eye-piece lens is x10 and the objective lens is x20, what is the total magnification?
(c) Name the structure labelled X in the onion cell below.

(d) What is the job of this structure in the cell?

2. Why is the cell often referred to as the smallest unit of life?
Homework 2

1. The diagrams below show a plant cell.

   ![Diagram of a plant cell with labeled parts A and B]

   (a) Name structures A and B.
   (b) What is the function of the nucleus?
   (c) Other than the nucleus name one structure that is found in both plant and animal cells.

2. The field of view of a microscope with a number of plant cells positioned across it is shown below.

   ![Diagram of a field of view with labeled 1.4 millimetres]

   (a) Calculate the length of each plant cell if the diameter of the field of view of the microscope was 1.4mm.
   (b) How would the number of cells in the field of view change if the magnification of the microscope was increased?
   (c) Which part of a microscope would be used to increase the magnification?
   (d) Most cells are transparent and difficult to see under a microscope. What could be added to the cells to make them more visible under the microscope?
Homework 3

1. The diagram below shows 4 different types of human cell. Name one cell and state the job that it carries out in the body.

![Cell1](image1) ![Cell2](image2) ![Cell3](image3) ![Cell4](image4)

2. Name any plant cell and state how its structure is related to the job that it does in a plant.

3. What does the term specialised mean when describing a cell?

4. The table below shows the percentage of different types of cell found in a section of human tissue.

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White blood cell</td>
<td>15</td>
</tr>
<tr>
<td>Nerve cell</td>
<td>25</td>
</tr>
<tr>
<td>Muscle cell</td>
<td>45</td>
</tr>
<tr>
<td>Red blood cell</td>
<td>10</td>
</tr>
<tr>
<td>Fat cell</td>
<td>5</td>
</tr>
</tbody>
</table>

(a) Use the information in the table to construct a bar chart.
(b) If the tissue sample contained 500 cells how many would be nerve cells?
(c) If the percentage of cells present in the tissue were arranged from the lowest percentage present to the highest percentage present what cell type would be in the middle of the order?

5. A white blood cell is drawn below. Name structure X and state its function in a cell.

![Structure X](image5)
1. A bacterial cell is shown below.

![Bacterial Cell Diagram]

(a) Structure B is also found in a plant cell. Name this structure.
(b) Can you suggest a use for structure A?
(c) Bacteria are very difficult to remove from any surface. Can you suggest how the diagram above might help you to explain why.

2. State one way bacteria and yeast cells can be useful to humans.

3. Name two diseases that can be caused by microorganisms.

4. How can drinking water be treated to prevent the spread of disease?

5. Other than drinking contaminated water suggest another two ways in which microbes can be passed between humans.

6. Someone who cleans their teeth regularly may have as many as 100,000 bacteria living on each tooth. Some of these bacteria are useful and can help prevent disease in the mouth. What disadvantage might arise from the regular use of antiseptic mouthwash?
Homework 5

1. Name two natural barriers on our body that prevent microorganisms entering our internal body tissues.

2. How can microbes spread very quickly through our body once they penetrate the skin?

3. Edward Jenner is shown below vaccinating a boy against smallpox.

(a) Explain how a vaccine helps to protect the body from disease.
(b) Name two diseases that humans are vaccinated against.
(c) The graph below shows the number of cases of measles in the USA between 1950 and 2007.

**Measles - United States, 1950-2007**

(i) In which decade did the number of cases of measles reach its peak?
(ii) In which year was there a mass vaccination programme introduced across the USA?
Homework 6

1. The human female reproductive organs are shown below.

(a) In which structure does fertilisation take place?
(b) Name structure 2 and state its function.
(c) Name the structure that produces the egg cells in a female.

2. Copy and complete the table below which shows the function of the organs in the male reproductive system.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testis (pl. testes)</td>
<td></td>
</tr>
<tr>
<td>Sperm tube</td>
<td>Releases sperm cells into female</td>
</tr>
</tbody>
</table>

3. If a human sperm cell can swim at a rate of 4 millimetres per minute how long would it take a sperm cell to travel along a female uterus of length 7.6 centimetres to reach the egg cell?
Homework 7

1. In which part of the female reproductive system does fertilisation take place?

2. Describe what happens to the egg after it is fertilised.

3. The diagram below shows a baby developing in the uterus.

![Diagram of a baby in the uterus]

   A
   B
   C
   embryo

(a) Name structures A, B and C and state their function.

(b) The table below shows the size of the human embryo at different stages of development over the first 16 weeks of growth.

<table>
<thead>
<tr>
<th>Age (weeks)</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td>16</td>
<td>150</td>
</tr>
</tbody>
</table>

(i) Use the information to plot a bar graph.

(ii) In which 4 week period did the embryo increase most in length?
Read the paragraph below and then answer the questions that follow.

Women who smoke during pregnancy have a higher risk of miscarriage than non-smokers and tend to give birth to smaller babies. Nicotine in tobacco smoke causes the blood vessels in the placenta to collapse which prevents sufficient food and oxygen reaching the baby. The baby's brain development may also be affected resulting in babies with lower intelligence.

If excessive alcohol is consumed during pregnancy the baby may be born with foetal alcohol syndrome (FAS). These baby's mental development may be affected or it may have defects of the heart, face and other organs. Alcohol affects the developing baby much more than an adult because the alcohol stays in the baby's blood-stream for a longer time since it is unable to break it down as quickly as an adult.

Drugs are also able to cross the placenta. In the 1960's the drug thalidomide was given to women who suffered from 'morning sickness', a common condition during pregnancy. This drug affected the development of the baby's arms and legs resulting in babies being born with missing or poorly developed limbs. Even the commonly used drug aspirin can cause problems during pregnancy by delaying labour and causing heart and lung problems in the developing baby.

German measles is a virus that can cross the placenta from the mother to the baby and have serious affects on the baby's development. However, the MMR vaccine introduced in 1969 has drastically reduced the number of cases of German measles in the human population.

1. Why must a pregnant woman be careful of what she eats and drinks?
2(a) State one way in which smoking can affect the developing baby.
    (b) Which substance in tobacco causes the problems in the developing baby?
3. Foetal alcohol syndrome is caused by drinking too much alcohol during pregnancy.
    (a) Why is alcohol much more toxic (poisonous) to a baby than an adult?
    (b) State one way in which drinking alcohol during pregnancy might affect the baby.
4. Which part of the baby's body did the drug thalidomide affect?
5. Why were pregnant women given this drug?
6. Name a commonly used drug, mentioned in the passage, that women should not take during pregnancy.
7. How has the number of cases of German measles been reduced in the human population?
8. Use a dictionary or some other source to find the meaning of the following words or phrases.

   Miscarriage       MMR vaccine       Premature baby       German measles
Homework 9

1. What does the term variation mean?

2. State 3 examples of variation between yourself and a member of your class group.

3. Name the structure, shown below, that carries some of the instructions to make a new human being.

4. How many of these structures are found in a normal human body cell?

5. How many of these structures are found in a human sperm or egg cell?

6. Use your answers to questions 4 and 5 above to suggest why a baby has similar features to both of its parents.

7. In which structure inside the cell is the structure above found?

8. One human feature that is different in every individual is their fingerprints. There are 4 main groups of fingerprints, they are, loop, whorl, arch and compound. The fingerprints of a class of 40 first year pupils were examined and placed into one of the 4 groups above. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Fingerprint type</th>
<th>Number of pupils</th>
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<tbody>
<tr>
<td>Loop</td>
<td>18</td>
</tr>
<tr>
<td>Whorl</td>
<td>12</td>
</tr>
<tr>
<td>Arch</td>
<td>8</td>
</tr>
<tr>
<td>Compound</td>
<td>2</td>
</tr>
</tbody>
</table>

Place the information in the table above into a bar chart.
Homework 10

Importance of DNA and DNA profiling

Read the following passage and then answer the questions over-page.

The chromosomes, found in the nucleus of every body cell, are made up of a substance called DNA. The DNA carries a set of coded instructions to produce all of the different features in a human being. For example, the instructions to produce a person’s eye colour, height, heart rate and skin colour are contained in their DNA.

At fertilisation the baby receives DNA from its mother and DNA from its father on the 23 chromosomes that each parent passes on in their sperm and egg cells. So the baby’s DNA is completely unique and therefore the baby will be different from its parents and from every other human. These differences in a person’s DNA bring about variation in a population.

An individual’s DNA can be broken down by scientists into small fragments and a DNA profile produced. In the example below a suspect left a hair at a crime scene. The police forensic scientist produced the person’s DNA profile, using the hair and also produced the DNA profile of 4 people found leaving the scene of the crime. Each profile is shown as distinct banding patterns on the diagram below.

```
<table>
<thead>
<tr>
<th></th>
<th>HAIR DNA</th>
<th>Suspect 1</th>
<th>Suspect 2</th>
<th>Suspect 3</th>
<th>Suspect 4</th>
</tr>
</thead>
<tbody>
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</tbody>
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1. Where is DNA found in the nucleus of a body cell?

2. Why is DNA important for the development of a new human being?

3. How does a person's DNA bring about variation in the population?

4. What is a DNA profile (or fingerprint)?

5. In the example above a DNA profile was produced from a person's hair, left at a crime scene. The DNA profile of 4 suspects, seen leaving the scene of the crime, were also produced from swabs taken by the police from their cheek lining.

(a) Which suspect left the hair at the crime scene?

(b) One witness said that she was sure that two of the people she saw leaving the crime scene were identical twin sisters. Does the evidence support her statement or not? Give a reason for your answer.

6. State one benefit and one risk (or disadvantage) of DNA profiling.