Section:

1.1 Cell Structure

1.2 Genetic Engineering

1.3 Transport Across Cell Membranes
1. Name the parts labelled A, B and C on the diagram below of a microscope (2)

2. Copy and complete this sentence:

   The _______________ is the basic unit from which all living things are made (1)

3. The diagram below shows a typical cell.
3. (Continued)

a) **Copy and complete this sentence:**
   The type of cell shown is ______________ cell. (1)

b) Name the parts labelled A, B and E on the diagram. (2)

4.) **State the difference between the cell wall of a plant and a bacterial cell** (1)

5.) **Copy and complete the table below by matching the parts of the cell from the list with their correct function.**

<table>
<thead>
<tr>
<th>List: nucleus; cytoplasm; cell membrane; chloroplast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part of Cell</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

(2)

6.) **When making a slide of onion cells iodine solution is added. Explain why.** (1)
1. Use the diagram below to complete the table which follows. (8)

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>stores genetic information / controls cell activities</td>
</tr>
<tr>
<td>Cytoplasm</td>
<td>2</td>
</tr>
<tr>
<td>Cell membrane</td>
<td>3</td>
</tr>
<tr>
<td>Cell wall</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>site of photosynthesis</td>
</tr>
<tr>
<td>6</td>
<td>stores water and minerals help support the cell, and when full it pushes</td>
</tr>
<tr>
<td></td>
<td>outwards against the wall to help provide support</td>
</tr>
<tr>
<td>Mitochondrion</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>site of protein synthesis</td>
</tr>
</tbody>
</table>
1. The diagrams show the production of insulin by genetic engineering. They are not in the correct order.

(a) Use letters to put the diagrams in the correct sequence.

The first and last have been done for you.

B   E

(1)

(b) Explain why there is an ever-increasing need for insulin produced by genetic engineering.

_________________________________________________________

_________________________________________________________ (1)
1. (Continued)

(c) Before biotechnology was used to produce insulin, it was obtained from the pancreas of animals such as pigs. 

Give one advantage of producing insulin by genetic engineering.

__________________________________________________________
__________________________________________________________

(1)

2. Read the following passage and answer the questions based on it.

Adapted from *GM Organisms* by John Pickrell, [www.newscientist.com](http://www.newscientist.com)

Genetic modification (GM) of crops began with the discovery that the soil bacterium *Agrobacterium* could be used to transfer useful genes from unrelated species into plants. The Bt gene is one of the most commonly inserted. It produces a pesticide toxin that is harmless to humans but is capable of killing insect pests. Many new crop types have been produced. Most of these are modified to be pest, disease or weedkiller resistant, and include wheat, maize, oilseed rape, potatoes, peanuts, tomatoes, peas, sweet peppers, lettuce and onions.

Supporters argue that drought resistant or salt resistant varieties can flourish in poor conditions. Insect-repelling crops protect the environment by minimising pesticide use. Golden rice with extra vitamin A or protein-enhanced potatoes can improve nutrition.

Critics fear that GM foods could have unforeseen effects. Toxic proteins might be produced or antibiotic-resistance genes may be transferred to human gut bacteria. Modified crops could also accidentally breed with wild plants or other crops. This could be serious if, for example, the crops which had been modified to produce medicines bred with food crops.

Investigations have shown that accidental gene transfer does occur. One study showed that modified pollen from GM plants was carried by the wind for tens of kilometres. Another study proved that genes have spread from the USA to Mexico.
2. (Continued)

(a) What role does the bacterium *Agrobacterium* play in the genetic modification of crops?

______________________________________________________________
______________________________________________________________
______________________________________________________________ (1)

(b) Crops can be genetically modified to make them resistant to pests, diseases and weedkillers. Give another example of genetic modification that has been applied to potatoes.

______________________________________________________________ (1)

3. The diagram below summarises a form of genetic engineering.

Identify cell type A and name a product of genetic engineering.

Describe the advantages and disadvantages of this process. (5)

______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
Cell Biology – Unit 2

Transport across the membrane – Homework 4

1. The diagram below shows a single-celled organism called an amoeba. The arrows indicate the diffusion of substances in and out of the cell.

![Amoeba Diagram](image)

a) Name the substances represented by the letters A, B and C. (2)
b) Which part of the cell controls movement in and out of the cell? (1)
c) Name the process by which materials enter or leave the cell. (1)

2. Three cylinders of potato were carefully dried on blotting paper and weighed. Each piece weighed 3g.

One piece was then placed in each tube as shown below and the tubes were left for 24hrs and then reweighed.

![Potato Cylinders](image)

a) Which potato cylinders would be the heaviest and the lightest? (2)
b) The movement of which substance was mainly responsible for the weight changes in the potato cylinders? (1)
c) Name the process which was responsible for this movement in the potato cylinders. (1)
d) Why were the surfaces of the discs dried before they were reweighed? (1)
3. The apparatus shown in the diagram was set up by groups of students.

![Diagram of apparatus](image)

The cotton wool was soaked with ammonia solution before being placed against the wire gauze and then the tube was corked at both ends.

Ammonia gas causes universal indicator paper to change colour from yellow to blue. The time taken for this to happen was recorded.

The investigation was repeated with three different ammonia solutions.

The results are given in the table below.

<table>
<thead>
<tr>
<th>Concentration of ammonia solution</th>
<th>Pieces of universal indicator paper</th>
<th>Time taken for colour change to occur (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Molar (dilute)</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>4 Molar</td>
<td>11 51 128 211 441 752</td>
<td></td>
</tr>
<tr>
<td>9 Molar (concentrated)</td>
<td>8 36 72 163 305 511</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 12 33 64 146 263</td>
<td></td>
</tr>
</tbody>
</table>

a) The pieces of indicator paper change colour in order. What process is taking place which makes this happen and explain why it happens. (1)

b) Look at the results for the fifth piece of indicator paper in each of the investigations. Suggest a reason for the different times taken for the indicator paper to change colour in each investigation. (1)

c) The indicator paper was moistened with distilled water to make it stick to the inside of the tube. Why was distilled water used and not tap water? (1)
3. (continued)

(d) Suggest two reasons why the tubes were corked  (1)

(e) The tubes must be kept horizontal and not stood on end for these investigations. Explain why?  (1)

(f) State two factors which must be kept constant for each investigation.  (1)
1. The diagrams below show three similar plant cells from strips of onion epidermis. One cell had been placed in water and the other two in sugar solutions of different concentrations.

(a) Copy and complete the table below to show which cell was bathed in each fluid.

<table>
<thead>
<tr>
<th>Bathing Fluid</th>
<th>Letter of Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% sugar solution</td>
<td></td>
</tr>
<tr>
<td>5% sugar solution</td>
<td></td>
</tr>
<tr>
<td>Distilled water</td>
<td></td>
</tr>
</tbody>
</table>

(b) What term could be used to describe the appearance of cells A and C? (2)

(c) Explain the changes that take place in the bathing fluids to cell A and cell C. (2)

2. The diagrams below show the changes which take place in red blood cells when placed in different solutions.

Explain the changes that have taken place in cells A and B? (2)
3. The discs of fresh potato were cut and separated into batches of ten. Each batch was weighed and placed into one of six different concentrations of salt solution.

Fifteen minutes later the discs were removed, any surface liquid wiped off and then the discs were reweighed.

The results are shown in the table and graph.

<table>
<thead>
<tr>
<th>Batch of discs</th>
<th>Concentration of solution (M)</th>
<th>Original mass (g)</th>
<th>Final Mass (g)</th>
<th>Change in mass (g)</th>
<th>% change in mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.1</td>
<td>8.93</td>
<td>9.25</td>
<td>+0.35</td>
<td>+3.6</td>
</tr>
<tr>
<td>B</td>
<td>0.2</td>
<td>9.37</td>
<td>9.61</td>
<td>+0.24</td>
<td>+2.4</td>
</tr>
<tr>
<td>C</td>
<td>0.3</td>
<td>8.74</td>
<td>8.77</td>
<td>+0.04</td>
<td>+0.4</td>
</tr>
<tr>
<td>D</td>
<td>0.4</td>
<td>8.56</td>
<td>8.49</td>
<td>-0.07</td>
<td>-0.8</td>
</tr>
<tr>
<td>E</td>
<td>0.5</td>
<td>9.29</td>
<td>9.10</td>
<td>-0.19</td>
<td>-2.0</td>
</tr>
<tr>
<td>F</td>
<td>0.6</td>
<td>9.63</td>
<td>9.26</td>
<td>-0.37</td>
<td>-3.8</td>
</tr>
</tbody>
</table>
3. (continued)

a) Why were the discs dried before being reweighed? (1)

b) Why were batches of ten discs used rather than single discs? (1)

c) Why does the graph record the percentage change in mass and not the actual change in mass? (1)

d) What has happened to the mass of discs in regions X and Y on the graph? (1)

e) Explain why these changes to the discs have taken place. (1)

f) Which concentration of salt solution would cause no change in the mass of the discs? (1)

g) Explain why the discs in this solution would not change in mass. (1)

4. Name the mechanisms A and B shown below which are used by cells to take in materials.

![Diagram showing mechanisms A and B with descriptions of concentration changes outside and inside cells.]

A: Low concentration outside the cell → High concentration inside the cell

B: High concentration outside the cell → Low concentration inside the cell

(2)
5. Cells were placed in a solution containing potassium ions at a concentration of 10mM. The concentration of potassium ions inside the cells was measured over a period of time.

The experiment was repeated in the presence of a respiratory inhibitor which reduces respiration in cells.

The results are shown in the graph.

Give two pieces of evidence from the data to indicate that uptake of potassium ions involves active transport. (2)
Cell Biology - Unit 2
Transport across the membrane - Homework 6

1. Copy and complete the following sentence:

When a substance diffuses, its particles move from a region where its concentration is _______________ to a region where its concentration is _______________. Osmosis is the name given to the diffusion of ___________ molecules from an area of ___________ water concentration to an area of ___________ water concentration through a _______/_________ membrane.  

2. The diagram opposite shows a plant cell which had been placed in a liquid.

a) Was the liquid distilled water or concentrated sugar solution? (1)

b) State the condition this cell is said to be in. (1)

3. Five cylinders of fresh potato were blotted dry and their mass was recorded. Each one weighed 5g.

One cylinder was placed in each of five test tubes as shown below.

After 24 hours they were again weighed. The cylinder in tube A now weighed 4g and that in tube E weighed 4.5g.
3. (continued)

(a) What process caused the change in mass in tube E? (1)

(b) Which of the five cylinders is likely to be heaviest after 24hrs? Explain your answer. (1)

(c) What is the percentage decrease in mass of the cylinder in A? (1)

4. Plasma and tissue fluid contain about 1% of dissolved salts.

State what would happen if some human liver cells were placed in a 10% salt solution. (1)

5. A piece of potato was cut into six equal sized strips.

The lengths were measured and the strips placed into sugar solutions of different concentrations.

After 2 hours, the lengths were re-measured. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Initial Length (mm)</th>
<th>Final Length (mm)</th>
<th>Change in length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50</td>
<td>42</td>
<td>-8</td>
</tr>
<tr>
<td>B</td>
<td>50</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>50</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>50</td>
<td>51</td>
<td>+1</td>
</tr>
<tr>
<td>E</td>
<td>50</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>50</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

(a) Copy and complete the table to show the changes in length for each strip. (1)

(b) Use the results for change in length of the potato strips to construct a bar chart using the grid below. (1)

(b) Which solution has a water concentration closest to that of the potato cells? (1)
6. Pieces of potato were weighed, placed in sugar (sucrose) solutions of different concentrations for 30 minutes, and then reweighed.

The graph below shows the resulting gain or loss in mass, expressed as a percentage of the original mass, at each sugar concentration.

![Graph showing gain or loss in mass as a percentage of original mass at different sugar concentrations.]

a) Which two terms are used to describe the condition of the potato cells at points A and B on the graph? (2)

b) Give the concentration of the sugar solution which is equal to the concentration of the cell sap in the potato cells. Explain your answer. (2)