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
An athlete decides to try a new type of protein drink after he exercises.

(a) The athlete tests the protein drink to check it contains protein.

Which solution is used to test for protein in the drink?

Tick one box.

- Benedict's
- Biuret
- Iodine
- Universal indicator

(1)

(b) What colour will the solution turn to if there is protein in the drink?

Tick one box.

- Blue-black
- Purple
- Red
- Yellow

(1)
Figure 1 shows the proportion of different nutrients in the protein drink.

(c) What is the ratio of sugar to protein in the protein drink?

1:1 [ ] 1:0:6 [ ] 1:2 [ ] 1:1:6 [ ]

(d) Why is a high protein diet useful to an athlete?

Tick one box.

- Provides amino acids to make new muscle.
- Provides fatty acids to produce urea.
- Provides glucose for energy.
- Provides lactic acid for anaerobic respiration.
When the athlete drinks the protein drink the substances are digested.
The products of digestion are absorbed into the bloodstream.
Absorption happens in the small intestine.

**Figure 2** shows a section of the small intestine.

![Figure 2](image)

(e) How is the small intestine in **Figure 2** adapted to absorb the products of digestion quickly?

Tick two boxes.

- It has a large surface area.
- It has a long diffusion pathway.
- It has a thin surface.
- The concentration inside the small intestine is low.
- It has a poor blood supply.

(2)
Figure 3 shows the proportion of different nutrients in four protein drinks.

Which protein drink should an athlete with diabetes use?

Give a reason for your answer.

Drink ____________________

Reason ____________________________________________________________
___________________________________________________________________

(Total 8 marks)
Figure 1 shows a diagram of the human heart.

(a) Name parts A and B.

A _____________________________

B _____________________________

(b) What is the function of blood vessel C?

Tick one box.

To take blood from the heart around the body

To take blood from the body to the heart

To take blood from the heart to the lungs

To take blood from the lungs to the heart
Coronary heart disease (CHD) develops when layers of fatty material build up in the coronary artery.

One treatment for CHD is to insert a stent into the coronary artery.

**Figure 2** shows a stent in a coronary artery.

Explain why the stent helps to prevent a heart attack.

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(4)
(d) Look at the table below.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of deaths from CHD per 100 000 population per year</th>
<th>Amount of fruit and vegetables eaten in kg per person per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>285</td>
<td>180</td>
</tr>
<tr>
<td>B</td>
<td>250</td>
<td>320</td>
</tr>
<tr>
<td>C</td>
<td>198</td>
<td>250</td>
</tr>
<tr>
<td>D</td>
<td>151</td>
<td>220</td>
</tr>
<tr>
<td>E</td>
<td>125</td>
<td>244</td>
</tr>
</tbody>
</table>

Plot the missing bars for countries D and E on Figure 3.

Use data from the table above.

**Figure 3**

![Figure 3](image-url)
(e) People in country B are more likely to die from CHD than people in country E.

How many more times as likely are people to die from CHD in country B than in country E?

___________________________________________________________________

(1)

(f) A student concluded:

‘The factor that causes CHD is not eating enough fruit and vegetables.’

Evaluate the student’s conclusion.

Use data from Figure 3, and your own knowledge, in your answer.

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(6)

(Total 16 marks)
The digestive system breaks down food into small molecules.
The small molecules can be absorbed into the blood.
The diagram below shows the human digestive system.

(a) (i) Which letter, A, B, C, D, E or F, shows each of the following organs?

Write one letter in each box.

large intestine

small intestine

stomach

(3)
(ii) Different organs in the digestive system have different functions.

Draw one line from each function to the organ with that function.

<table>
<thead>
<tr>
<th>Function</th>
<th>Organ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestion of fat</td>
<td>Large intestine</td>
</tr>
<tr>
<td>Absorption of water into the blood</td>
<td>Liver</td>
</tr>
<tr>
<td>Production of hydrochloric acid</td>
<td>Small intestine</td>
</tr>
<tr>
<td></td>
<td>Stomach</td>
</tr>
</tbody>
</table>

(b) Glucose is absorbed into the blood in the small intestine.

Most of the glucose is absorbed by diffusion.

How does the glucose concentration in the blood compare to the glucose concentration in the small intestine?

Tick (√) one box.

- The concentration in the blood is higher.
- The concentration in the blood is lower.
- The concentration in the blood is the same.

(Total 7 marks)
Exercise can improve health.

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

**Figure 1** shows her results.

![Figure 1](image)

(a) Compare the breathing rates when doing the **three** different activities.

Use values from **Figure 1** in your answer.

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___________________________________________________________________
___________________________________________________________________
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(3)
(b) Explain why the breathing rate changes when doing different activities.

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Figure 2 shows the heart in the circulatory system.

![Figure 2](image)

(c) The heart is a double pump.

Describe what this means.

Use Figure 2 to help you.

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(2)
(d) The wall of the left ventricle is much thicker than the wall of the right ventricle.

Suggest one reason for this.

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___________________________________________________________________
___________________________________________________________________

(1)

(e) People are encouraged to exercise after recovering from a heart attack.

Suggest one reason why.

___________________________________________________________________
___________________________________________________________________

(1)

(Total 10 marks)

The diagram below shows the human digestive system.

(a) (i) What is Organ A?

Draw a ring around the correct answer.

- gall bladder
- liver
- stomach

(1)
(ii) What is Organ B?

Draw a ring around the correct answer.

large intestine          pancreas          small intestine

(1)

(b) Digestive enzymes are made by different organs in the digestive system.

Complete the table below putting a tick (√) or cross (×) in the boxes.

The first row has been done for you.

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>salivary glands</th>
<th>stomach</th>
<th>pancreas</th>
<th>small intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td>amylase</td>
<td>√</td>
<td>×</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>lipase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>protease</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2)

(c) The stomach also makes hydrochloric acid.

How does the acid help digestion?

___________________________________________________________________
___________________________________________________________________

___________________________________________________________________

(1)
(d) Draw **one** line from each digestive enzyme to the correct breakdown product.

<table>
<thead>
<tr>
<th>Digestive enzyme</th>
<th>Breakdown products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amylase breaks down starch into...</td>
<td>amino acids.</td>
</tr>
<tr>
<td>Lipase breaks down fats into...</td>
<td>bases.</td>
</tr>
<tr>
<td>Protease breaks down proteins into...</td>
<td>fatty acids and glycerol.</td>
</tr>
<tr>
<td></td>
<td>sugars.</td>
</tr>
</tbody>
</table>

3 marks

Coronary heart disease (CHD) is a non-communicable disease.

CHD is caused when fatty material builds up in the coronary arteries.

(a) Explain what a non-communicable disease is.

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___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

(2 marks)

The diagram below shows a coronary artery of someone with CHD.
(b) Explain how CHD can cause a heart attack.

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(c) Explain how lifestyle and medical risk factors increase the chance of developing CHD.

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(6)
(Total 11 marks)
Statins are drugs used to treat coronary heart disease (CHD).

New drugs must be trialled before they can be licensed for use.

Some scientists trialled two different types of statin.

The scientists:

- conducted the trial on 325 patients with a history of CHD in their family
- used a double-blind trial method
- measured the change in blood cholesterol levels over two years
- measured the change in thickness of an artery wall over two years.

(a) During the trials the statins are tested for side effects.

Give two other reasons why the statins are trialled before use.

1. _________________________________________________________________

   _________________________________________________________________

2. _________________________________________________________________

   _________________________________________________________________

   (2)

(b) Describe how the double-blind method is used in this trial.

   _________________________________________________________________

   _________________________________________________________________

   _________________________________________________________________

   _________________________________________________________________

   (2)
The results of drug trials are **peer reviewed** before they are published.

Why are peer reviews important in drug trials?

Tick one box.

To calculate the best dose

To check the drug works

To make sure the scientist gets credit

To prevent false claims
The table below shows the results of the trial.

<table>
<thead>
<tr>
<th></th>
<th>Drug A</th>
<th>Drug B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients who died during the trial</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Number of patients who reported aching muscles</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Number of patients who reported mild abdominal cramps</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Change in blood cholesterol level in percentage</td>
<td>−50.5</td>
<td>−41.2</td>
</tr>
<tr>
<td>Change in thickness of artery wall in mm</td>
<td>−0.0033</td>
<td>+0.032</td>
</tr>
</tbody>
</table>

Drug A is more effective than Drug B.

Give two reasons that support this conclusion.

Use information from the table above.

1. _________________________________________________________________
   ___________________________________________________________________

2. _________________________________________________________________
   ___________________________________________________________________

(e) A scientist concludes that Drug A is a safer drug than Drug B.

Give two reasons why this is not a valid conclusion.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)
The figure below shows a cross-section through a plant root.

(a) What is tissue A?

___________________________________________________________________

(1)
(b) A student is given samples of two fluids.

One fluid is from the phloem of a plant and one from the xylem of a plant.

The student is asked to work out which fluid is from the phloem and which is from the xylem.

She measures the pH and the concentrations of sugar, nitrate ions and potassium ions of each fluid.

The table below shows the student’s results.

<table>
<thead>
<tr>
<th></th>
<th>Fluid A</th>
<th>Fluid B</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.3</td>
<td>5.6</td>
</tr>
<tr>
<td>Sugar in mg / cm³</td>
<td>118</td>
<td>1.18</td>
</tr>
<tr>
<td>Nitrate ions in mg / cm³</td>
<td>10</td>
<td>600</td>
</tr>
<tr>
<td>Potassium ions in μg / cm³</td>
<td>1.18</td>
<td>2500</td>
</tr>
</tbody>
</table>

Which fluid is from the phloem, and which is from the xylem?

Explain your answer.

Use the information from the table above.

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___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

(c) In fluid A, how many times greater is the concentration of sugar than the concentration of potassium ions?

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___________________________________________________________________

(2)
(d) The concentration of potassium ions in the soil is 3.9 μg/cm³

The concentration of potassium ions in the root tissue is 2500 μg/cm³

Explain why the concentration is so much higher in the roots than in the soil.
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___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

(3)
(Total 10 marks)

(a) Blood is made up of four main components.

Red blood cells and white blood cells are two of these components.

Describe the functions of the two other components of blood.
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(2)

(b) The heart is often described as a double pump.

Describe why.
___________________________________________________________________
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(1)
In coronary heart disease (CHD) layers of fatty material build up inside the coronary arteries. This can cause a heart attack.

Statins and stents can be used to reduce the risk of a heart attack in people with CHD.

Evaluate the use of statins and stents in people with CHD.

Remember to include a justified conclusion.

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(6)
(Total 9 marks)
Coronary heart disease (CHD) can be caused by many factors.

The table below shows data related to CHD for five countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of deaths from CHD per 100 000 population per year</th>
<th>Percentage of the population who smoke tobacco</th>
<th>Percentage of the population who drink alcohol heavily</th>
<th>Amount of fruit and vegetables eaten in kg per person per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>285</td>
<td>36</td>
<td>19</td>
<td>180</td>
</tr>
<tr>
<td>B</td>
<td>251</td>
<td>63</td>
<td>34</td>
<td>404</td>
</tr>
<tr>
<td>C</td>
<td>186</td>
<td>47</td>
<td>36</td>
<td>251</td>
</tr>
<tr>
<td>D</td>
<td>149</td>
<td>23</td>
<td>34</td>
<td>218</td>
</tr>
<tr>
<td>E</td>
<td>128</td>
<td>27</td>
<td>12</td>
<td>222</td>
</tr>
</tbody>
</table>

(a) Name one risk factor for CHD that is not shown in the table above.

___________________________________________________________________

(b) A student concludes that the main cause of CHD is not eating enough fruit and vegetables.

Give three reasons why the student’s conclusion is not correct.

Use information from the table above.

___________________________________________________________________
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___________________________________________________________________

(3)
(c) Explain how the build-up of fatty material can damage the heart.

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(4)

(d) Describe how statins can help to reduce deaths from CHD.

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(2)
(Total 10 marks)