**Answer ALL questions.**

1. There are many different substances in the human body and they have different features.

   Draw lines to join each feature to any substances it applies to.

   Each feature may apply to one or more substances.

   **(7)**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>produced during respiration</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>excreted by the lungs</td>
<td>faeces</td>
</tr>
<tr>
<td>formed in the large intestine</td>
<td>glucose</td>
</tr>
<tr>
<td>gives a positive Benedict's test</td>
<td>urea</td>
</tr>
<tr>
<td>found in the nucleus and forms genes</td>
<td>urine</td>
</tr>
<tr>
<td>formed by processes of ultrafiltration and reabsorption</td>
<td>DNA</td>
</tr>
<tr>
<td>nitrogen containing compound excreted by the kidneys</td>
<td></td>
</tr>
</tbody>
</table>

   **(Total for Question 1 = 7 marks)**
A student carries out an investigation to compare the carbon dioxide content of inhaled and exhaled air.

The diagram shows the apparatus used. Bicarbonate indicator is used to show the presence of carbon dioxide. The gas changes the colour of the bicarbonate indicator from red to yellow.

The following two experiments are carried out.

1) The student breathes out into tube A until the bicarbonate indicator turns yellow.

2) The bicarbonate indicator is replaced and the student breathes in through tube B until the indicator turns yellow.

The time taken for the bicarbonate indicator to change from red to yellow is shown in the diagrams.

(a) (i) What is the time taken for the bicarbonate indicator to change from red to yellow in each experiment?

<table>
<thead>
<tr>
<th>Experiment 1</th>
<th>Experiment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>time taken in experiment 1 = ................................. s</td>
<td>time taken in experiment 2 = ........................................ s</td>
</tr>
</tbody>
</table>
(ii) How much longer does it take for the bicarbonate indicator to change colour in experiment 2, compared with experiment 1?

\[
\text{difference in time} = ................................................................. \text{ s}
\]

(iii) Explain why there is a difference between the two times.

(iv) Suggest a safety precaution that the student should observe during the experiments.

(v) Explain why it is better to use bicarbonate indicator in these experiments rather than limewater.
(b) The student exercises for five minutes and then repeats the investigation.

(i) Complete the table by placing a tick (✓) in the correct box for each experiment to show how the times after exercise compare with the times before exercise.

<table>
<thead>
<tr>
<th></th>
<th>Longer time</th>
<th>Shorter time</th>
<th>Same time</th>
</tr>
</thead>
<tbody>
<tr>
<td>experiment 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>experiment 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Explain why you think that the student will obtain these results.

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(Total for Question 2 = 13 marks)
3  Describe the life cycle of Schistosoma.

(Total for Question 3 = 8 marks)
4 (a) The words in the box name some of the parts of the male and female reproductive systems.

<table>
<thead>
<tr>
<th>epididymis</th>
<th>seminal vesicle</th>
<th>testis</th>
<th>uterus</th>
</tr>
</thead>
<tbody>
<tr>
<td>ureter</td>
<td>vagina</td>
<td>vulva</td>
<td>urethra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ovary</td>
</tr>
</tbody>
</table>

Complete the table using the word or words that match the description in the first column.

<table>
<thead>
<tr>
<th>Description</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>duct that carries both urine and sperm</td>
<td>epididymis</td>
</tr>
<tr>
<td>produces sperm</td>
<td>testis</td>
</tr>
<tr>
<td>where the fertilised ovum implants</td>
<td>vaginal</td>
</tr>
<tr>
<td>produces part of the seminal fluid</td>
<td>seminal vesicle</td>
</tr>
<tr>
<td>where sperm is deposited during intercourse</td>
<td>urethra</td>
</tr>
</tbody>
</table>
(b) Describe the functions of the following female hormones.

(i) Follicle-stimulating hormone (FSH)

(ii) Oestrogen

(iii) Oxytocin

(Total for Question 4 = 11 marks)
5 The diagram shows part of the human digestive system.

(a) (i) Name structures A and C.

A ..........................................................  
C ..........................................................

(ii) Name the solution that passes down duct B.

..........................................................  ..........................................................
(b) Duct B sometimes becomes blocked.

Suggest what effects this might have on the process of digestion. (4)
(c) The diagram shows a villus that is present in structure C of the digestive system.

The size of the villi is reduced in people with coeliac disease.

Suggest how someone with coeliac disease is likely to be affected.

(Total for Question 5 = 10 marks)
6 The diagram shows a simplified kidney dialysis machine.

(a) Using arrows on the diagram, show the direction of blood flow in the artery and vein.  

(b) Tube Y is made of a material that only allows small molecules to leave the blood. 
Tube Y is performing the same function as part of the real kidney tubule. 

(i) Name this part of the kidney tubule. 

(ii) Explain why tube Y would need to be several metres long in the kidney machine.
(c) Liquid X changes in composition as it flows through the machine.

Give two changes in composition. 

1 ..................................................................................................................................

2 ..................................................................................................................................

(d) Glucose is added to liquid X before it flows into the machine.

Explain why glucose is added. 

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(e) (i) State exactly where haemoglobin is found in the body. 

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(ii) Suggest why there is a haemoglobin detector found at the point where liquid X flows out of the machine. 

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(Total for Question 6 = 11 marks)