**Form 4 Biology**

**Time: 1h 30min**

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Global Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Mark</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>15</td>
<td>15</td>
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<td>15</td>
<td>15</td>
<td>100</td>
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<td>Mark</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

**Instructions:**

- Answer all questions in Section A in the space provided.
- Answer Question 1 and any other 2 questions in Section B on the foolscap provided.
- Calculators are allowed during the exam.
Section A

Answer ALL questions in this section, in the space provided. This section carries 55 marks.

1. a) Write the biological term that describes the processes below:
   
i) The removal of undigested matter: _______________________
   
   ii) Rhythmic squeezing movements in the oesophagus wall: _______________________
   
   iii) Releasing energy from food: _______________________
   
   iv) Breathing air containing other people’s smoke: _______________________
   
   v) The breakdown of excess proteins in the liver: _______________________

   b) Name the substance necessary for each of the following:
   
i) Activation of pepsin: _______________________
   
   ii) Trapping dust particles in the trachea: _______________________

   c) Name the structure which:
   
i) prevents swallowed food entering the trachea: _______________________
   
   ii) allows nutrient-rich blood to reach the liver: _______________________
   
   iii) prevents the trachea from bending or twisting: _______________________  

(Total: 10 marks)
2. A student investigated the effect of temperature on a biological washing powder shown in the picture below.

![Biological Washing Powder Box]

a) What is the optimum temperature for enzymes in this biological washing powder to act on the stain?

___________________________________________________________(1 mark)

b) Why does the manufacturer add ‘avoid using boiling water’ on the label.

___________________________________________________________(1 mark)

c) Give TWO reasons why biological washing powders are more effective than ordinary washing powders.

___________________________________________________________

___________________________________________________________(1,1 mark)

d) The diagram shows how the enzyme lipase in the biological washing powder breaks down the fat stain.

![Diagram of Enzyme Lipase]

i) Name the part of the enzyme labeled D.

___________________________________________________________(1 mark)
ii) Name the structure represented by letters:

A: ___________________________

B: ___________________________

C: ___________________________ (3 marks)

e) Only a small amount of enzyme is present in the biological washing powder.

Explain why this is still efficient.

________________________________________________________________________
________________________________________________________________________ (2 marks)

(Total: 10 marks)

3. The table shows some of the enzymes involved in the digestion of starch, proteins and fats, in different parts of the digestive system.

<table>
<thead>
<tr>
<th>Part of the digestive system</th>
<th>Substance digested</th>
<th>Enzyme</th>
<th>Product of digestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth</td>
<td>starch</td>
<td>salivary amylase</td>
<td>Maltose</td>
</tr>
<tr>
<td>Stomach</td>
<td>proteins</td>
<td>pepsin</td>
<td>Molecule W</td>
</tr>
<tr>
<td>Small intestine</td>
<td>proteins</td>
<td>A</td>
<td>Dipeptides and amino acids</td>
</tr>
<tr>
<td></td>
<td>fats</td>
<td>B</td>
<td>Molecules X and fatty acids</td>
</tr>
</tbody>
</table>

a) Name the enzymes

A: ___________________________

B: ___________________________ (1,1 mark)

b) Name the organ that produces enzyme A.

________________________________________________________________________ (1 mark)

c) Name the molecules

W: ___________________________

X: ___________________________ (2 marks)
d) Maltose is a disaccharide. Name the final product of digestion of maltose.

_________________________________________________________(1 mark)

e) Plants store food as starch. Starch is a polysaccharide.

i) Define the term ‘polysaccharide’.

_________________________________________________________(2 marks)

ii) Why is starch a suitable chemical for storage?

_________________________________________________________(1 mark)

iii) List the elements making up starch.

_________________________________________________________(1 mark)

(Total: 10 marks)

4. Food tests were carried out on three different food samples labeled 1, 2 and 3. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Food sample</th>
<th>Results when foods were tested with different chemicals.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Iodine solution</td>
</tr>
<tr>
<td>1</td>
<td>Blue black</td>
</tr>
<tr>
<td>2</td>
<td>Brown</td>
</tr>
<tr>
<td>3</td>
<td>Brown</td>
</tr>
</tbody>
</table>

a) What does each of the chemicals below test for?

i) Iodine solution: __________________________________________

ii) Benedict’s solution: ______________________________________ (1,1 mark)

b) Name the TWO chemicals that are used in the Biuret test.

_________________________________________________________(2 marks)
c) Which of the food tests in the table requires heating?

______________________________________________________________(1 mark)

d) Which food sample is:

i) Bread: __________________

ii) Meat: __________________ (1,1 mark)  

(Total: 7 marks)

5. A student set up the apparatus shown below. Air from the surrounding is passed through liquid X in flask A before it flows into the lime water in flask B. Air then flows into Flask C which has 2 snails, and finally in Flask D, containing lime water.

![Diagram of apparatus]

a) Describe the aim of this experiment.

______________________________________________________________(2 marks)

b) Name liquid X.

______________________________________________________________(1 mark)

c) Explain why air is passed from the surrounding air into liquid X in Flask A.

______________________________________________________________(1 mark)

d) Explain the role of lime water in this experiment.

______________________________________________________________(1 mark)
e) What happens to the lime water in Flask D after some time? Give ONE reason for your answer.

__________________________________________________________________
______________________________________________

(1,1 mark)

f) Name one suitable control that can be used during this experiment.

__________________________________________________________________

(1 mark)

(Total: 8 marks)

6. The graph below shows the breathing rate of a runner before and after a race. The height of each curve shows the volume of air breathed in (amount of air), in one breath.

![Graph of breathing rate](image)

a) Compare the number of breaths of the runner before and after the race.

__________________________________________________________________

(1 mark)

b) What evidence from the graph proves your answer in (a)

__________________________________________________________________

(1 mark)

c) After the race, the volume of air breathed in and out increased.

i) Calculate the amount of air that goes in and out of the runner’s lungs in the 20 seconds after running the race. (show your working)

__________________________________________________________________

(3 marks)
ii) Explain why more air was breathed in after the race.

_________________________________________________________________________
_________________________________________________________________________

(2 marks)

d) Name the gas exchange surface in

i) Insects: __________________________

ii) Fish: __________________________

iii) Earthworm: __________________________

(3 marks)

(Total: 10 marks)

Section B

Answer question 1 and any TWO others. Answer the questions of Section B on the foolscaps provided. This section carries 45 marks.

1. A student carried out an experiment to investigate the effect of temperature on the breakdown of starch by the enzyme amylase. Samples of the mixture were kept in water baths at different temperatures for 30 minutes. At the end of this time, the samples were analysed to find out how much glucose had been produced in each. The following table shows the results obtained.

<table>
<thead>
<tr>
<th>Temperature/°C</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units of sugar</td>
<td>5</td>
<td>23</td>
<td>50</td>
<td>82</td>
<td>93</td>
<td>70</td>
<td>15</td>
<td>4</td>
</tr>
</tbody>
</table>

a) On the graph paper provided, draw a graph to show how the production of sugar varied with temperature. (6 marks)

b) List TWO conclusions that can be drawn from this graph. (2 marks)

c) Name TWO glands that produce amylase in the body. (2 marks)

d) Give ONE reason why amylase does not act on starch in the stomach. (2 marks)

e) Bile is involved in the digestion of fats.

i) Name the organ that produces bile and the organ that stores bile before it is released in the duodenum. (2 marks)

ii) State the function of bile in the digestion of fats. (1 mark)

(Total: 15 marks)
2. During a science fieldwork, students found 2 different skulls which are shown below.

![Skull 1 and Skull 2](image)

a) Students concluded that skull 2 belongs to a carnivore. Name TWO features, visible in the diagram which indicate that the students are correct. (2 marks)

b) Name the parts labelled A and C. (2 marks)

c) Name and state the function of the part labelled B (1 mark)

d) Compare the jaw movement of a herbivore and a carnivore. (2 marks)

e) Rabbits have bacteria present in part of their intestine which is enlarged to form a fermentation chamber.

i) Name this part of the intestine.

ii) Explain the role of bacteria within the rabbit’s intestines. (1 mark)

f) The human’s ileum is adapted for the efficient absorption of nutrients through the presence of numerous villi. Draw a large well labeled diagram of a villus. (5 marks)

(Total: 15 marks)
3. Doctors recommend a balanced diet as part of a healthy lifestyle. A recent study showed that Malta has a high incidence of obesity and a relatively low incidence of rickets.

a) Define ‘balanced diet’. (2 marks)

b) For each of the substances below, state ONE reason why they are needed in a balanced diet and name ONE food item rich in each substance.

   i) Proteins

   ii) Fibre (2,2 marks)

   c) Rickets is a deficiency disease. Name ONE symptom of this disease. (1 mark)

   d) Give ONE reason for the low incidence of rickets in Malta. (1 mark)

   e) Biology students argued that obesity is also a deficiency disease. Explain why they are incorrect. (2 marks)

   f) Vitamin D is sometimes called the ‘sunshine vitamin’. Explain. (2 marks)

   g) Emphysema is a disease related to the breathing system. Explain why people suffering from emphysema are often out of breath. (3 marks)

(Total: 15 marks)
4. Lungs are specialised gas exchange surfaces in the human body.
   a) Draw a large well labeled diagram to show how gas exchange takes place in the alveolus of a human. (5 marks)
   b) State TWO characteristics that make alveoli an efficient gas exchange surface. (2 marks)
   c) Explain how the breathing system is adapted to provide the lungs with clean air. (2 marks)
   d) Describe the mechanisms involved during exhalation (breathing out). (4 marks)
   e) Young people who start smoking, usually find it difficult to quit the habit. Give a biological explanation for this. (2 marks)
   (Total: 15 marks)

5. Wine is produced when during anaerobic respiration, yeast acts on sugar and converts it into alcohol.
   a) Name the process by which yeast produces wine from grapes and write the word or chemical equation to summarise this process. (2, 2 marks)
   b) Yeast is economically important in the production of bread. Explain what happens to each of the products produced during this process. (2 marks)
   c) Anaerobic respiration can take place in human muscle cells after heavy exercise, causing the formation of lactic acid. Explain:
      i) the effect of lactic acid in muscles. (1 mark)
      ii) the mechanisms the body adopts to break it down. (2 marks)
      iii) the products of lactic acid breakdown. (2 marks)
   d) List TWO differences between aerobic and anaerobic respiration. (2 marks)
   e) The use of anaerobic bacteria in the breakdown of carbohydrates in plant material and manure is industrially important for the production of biogas. List TWO reasons why the production of biogas is an environmentally friendly process. (2 marks)
   (Total: 15 marks)