Centre Number						Candidate Number				
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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
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TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2015

Biology BIOL1

Unit 1 Biology and disease

Thursday 21 May 2015 1.30 pm to 2.45 pm

For this paper you must have:
- a ruler with millimetre measurements
- a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- You may ask for extra paper. Extra paper must be secured to this booklet.
- Do all rough work in this book. Cross through any work you do not want to be marked.

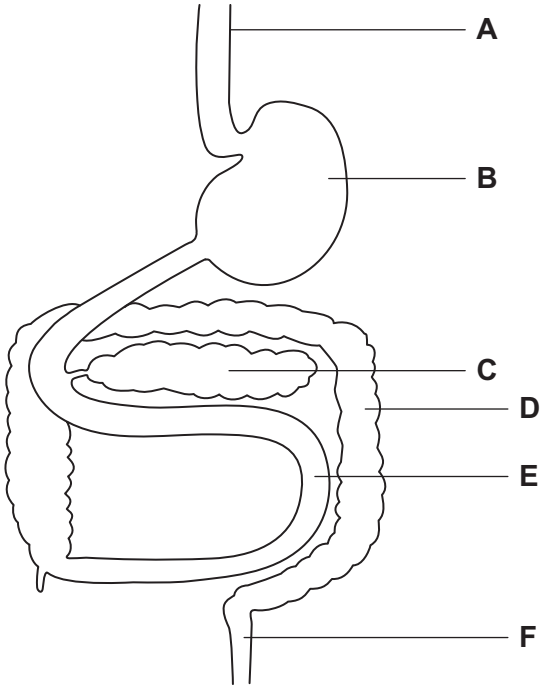
Information
- The maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- You are expected to use a calculator, where appropriate.
- Quality of Written Communication will be assessed in all answers.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific vocabulary accurately.

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Answer **all** questions in the spaces provided.

1 **Figure 1** represents part of the human digestive system. The organs are labelled **A**–**F**.

Figure 1



1 (a) Give the letter of the organ that produces amylase.

[1 mark]

1 (b) Give the letter of the organ that produces maltase.

[1 mark]

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1 (c) Maltose is hydrolysed by the enzyme maltase.

Explain why maltase catalyses only this reaction.

[3 marks]

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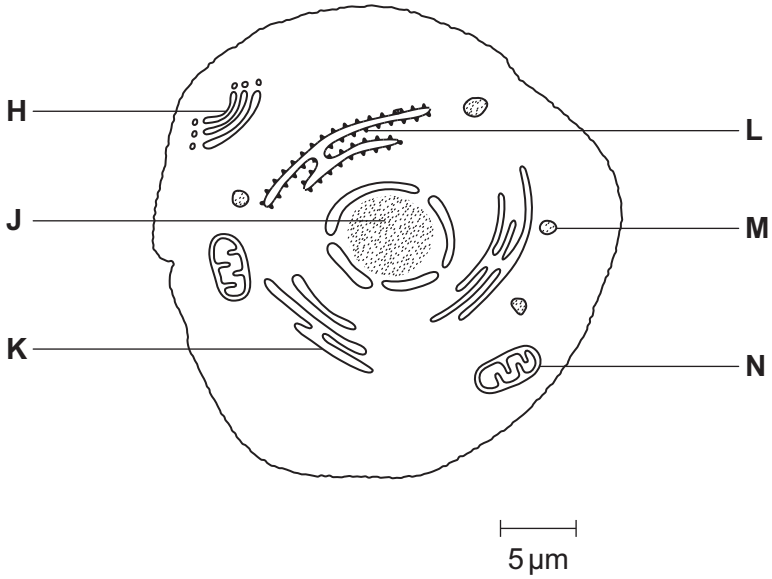
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2 **Figure 2** shows a eukaryotic cell.

Figure 2



2 (a) Complete **Table 1** by giving the letter labelling the organelle that matches the function.

[3 marks]

Table 1

Function of organelle	Letter
Protein synthesis	
Modifies protein (for example, adds carbohydrate to protein)	
Aerobic respiration	

2 (b) Use the scale bar in **Figure 2** to calculate the magnification of the drawing.
Show your working.

[2 marks]

Answer = ...

5

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3 (a) Give **two** ways in which pathogens can cause disease.

[2 marks]

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3 (b) Putting bee honey on a cut kills bacteria. Honey contains a high concentration of sugar.

Use your knowledge of water potential to suggest how putting honey on a cut kills bacteria.

[3 marks]

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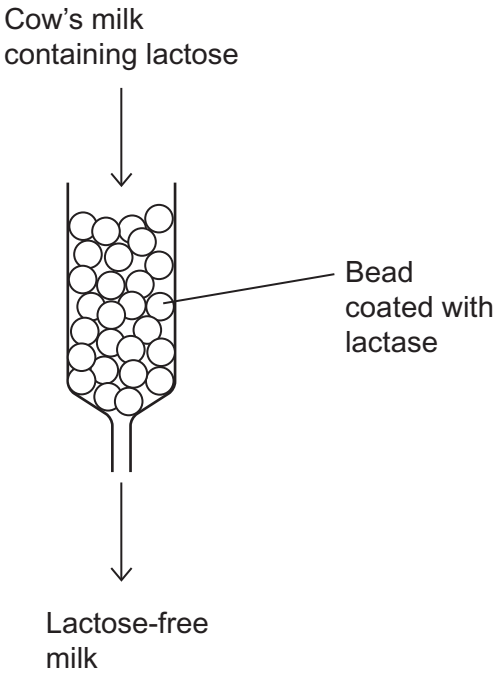
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4 Cow's milk contains the sugar lactose. Many cats are unable to digest cow's milk because they are lactose intolerant.

Cow's milk can be made suitable for these cats by treating it with the enzyme lactase to hydrolyse lactose. This makes the cow's milk lactose-free. Beads are coated with lactase and placed in a tube, as shown in **Figure 3**. Cow's milk flows over the beads and the lactose is hydrolysed.

Figure 3



4 (a) Attaching lactase to the beads is a more efficient use of lactase than adding the lactase directly to cow's milk.

Suggest **three** reasons why it is more efficient to attach lactase to the beads.

[3 marks]

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4 (b) Monosaccharides and disaccharides taste sweet.
The lactose-free milk made after hydrolysis with lactase tastes sweeter than the cow's milk containing lactose.
Suggest why.

[2 marks]

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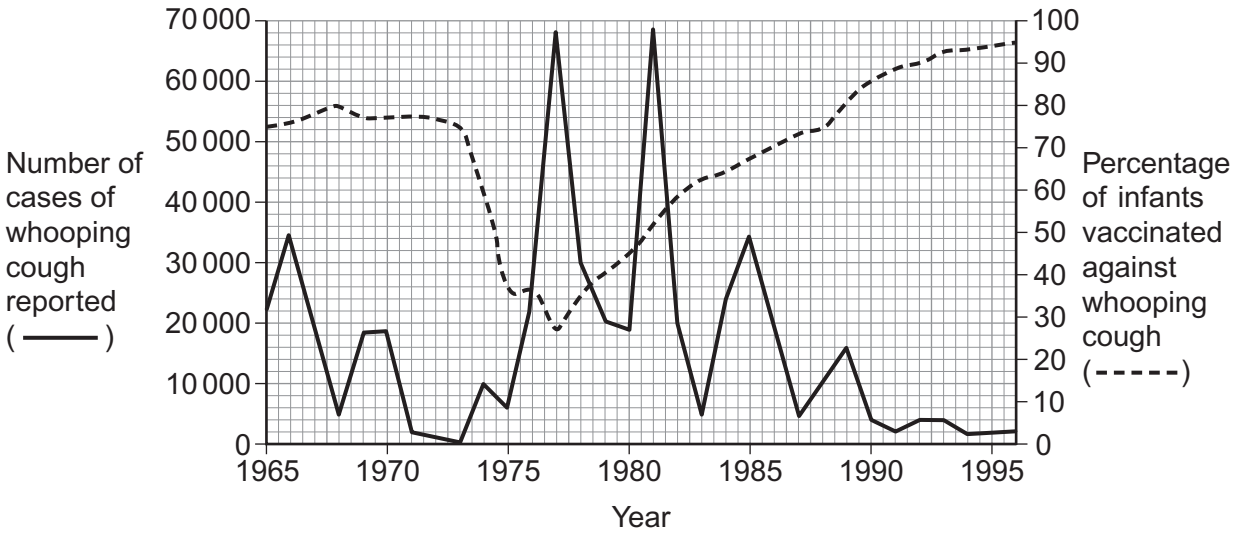
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5 Whooping cough is a disease that affects some infants. Doctors collected data relating to whooping cough between 1965 and 1996.

They collected data for:
- the number of cases of whooping cough reported
- the percentage of infants vaccinated against whooping cough.

Figure 4 shows the data collected by the doctors.

Figure 4



5 (a) Suggest **two** reasons why the percentage of infants vaccinated decreased between 1973 and 1975.

[2 marks]

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5 (b) Between 1980 and 1990, there were three peaks in the number of reported cases of whooping cough. After 1981, the number of cases of whooping cough in each peak decreased.

Use the information from **Figure 4** to suggest why.

[2 marks]

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5 (c) The percentage of the population vaccinated does **not** need to be 100% to be effective in preventing the spread of whooping cough.

Suggest why.

[2 marks]

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6 (a) When a person has an asthma attack, the airways in the lungs become narrower.
Give **one** reason why the airways become narrower.

[1 mark]

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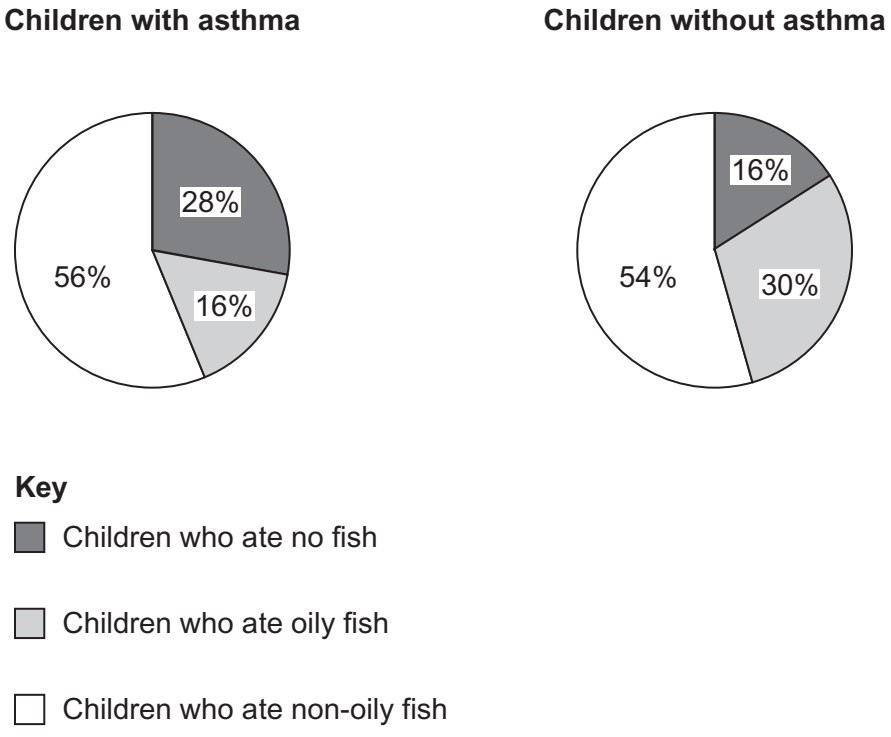
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Nutritionists investigated the relationship between eating oily and non-oily fish and the incidence of asthma. They analysed the diets of children with asthma and the diets of children without asthma.

Figure 5 shows their results.

Figure 5



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6 (b) What conclusions can you make from the data in **Figure 5**?

[3 marks]

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6 (c) Describe how you could use the emulsion test to show the presence of oil in a sample of fish.

[3 marks]

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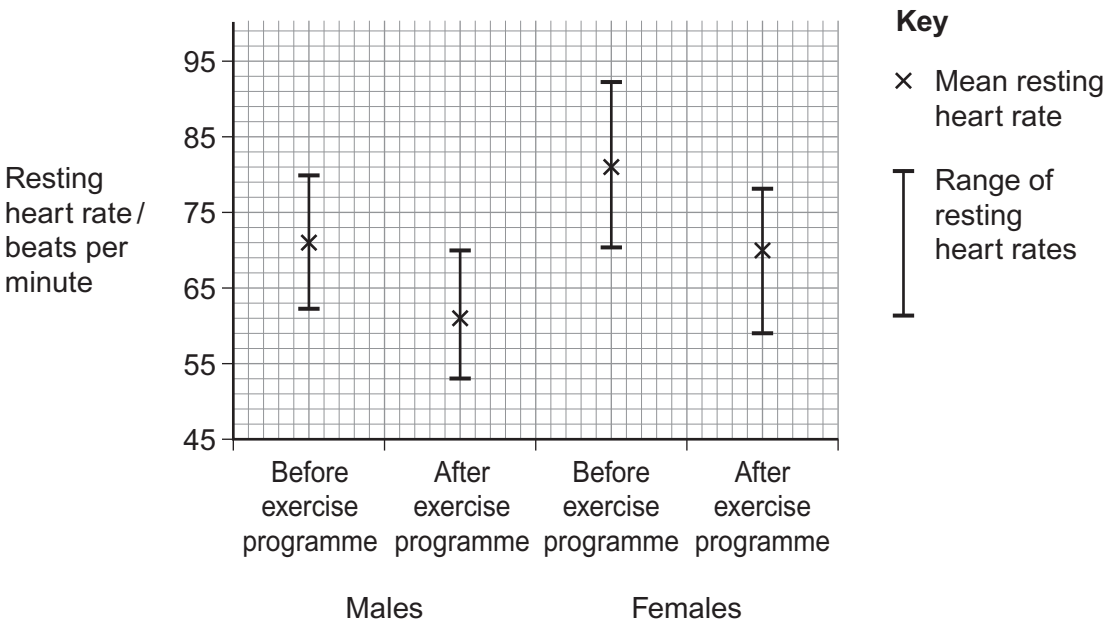
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7 Scientists investigated the effect of a 6-week exercise programme on the resting heart rate of males and females.

The scientists recruited a large group of male volunteers and a large group of female volunteers. They measured the resting heart rate of each volunteer before the exercise programme. Both groups took part in the same exercise programme. The scientists measured the resting heart rate of each volunteer after the exercise programme.

The scientists determined the mean resting heart rate and the range of resting heart rates for each group before and after the exercise programme. **Figure 6** shows their results.

Figure 6



7 (a) What was the range of the resting heart rates in males after the exercise programme?

[1 mark]

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7 (b) Calculate the percentage decrease in the mean resting heart rate of females after the exercise programme. Show your working.

[2 marks]

Answer = ... %

7 (c) The scientists used the percentage change in the mean resting heart rate after the exercise programme to compare the results for males and females.

Explain why they used percentage change in the resting heart rate.

[2 marks]

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7 (d) The scientists calculated the cardiac output of the volunteers before and after the exercise programme. In some volunteers, their cardiac output stayed the same, even though their resting heart rate decreased.

Explain how their cardiac output could stay the same even when their resting heart rate had decreased.

[2 marks]

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8 Read the following passage.

Low-density lipoprotein (LDL) is a substance found in blood. A high concentration of LDL in a person's blood can increase the risk of atheroma formation. Liver cells have a receptor on their cell-surface membranes that LDL binds to. This leads to LDL entering the cell. A regulator protein, also found in blood, can bind to the same receptor as LDL. This prevents LDL entering the liver cell. People who have a high concentration of this regulator protein in their blood will have a high concentration of LDL in their blood. Scientists have made a monoclonal antibody that prevents this regulator protein working. They have suggested that these antibodies could be used to reduce the risk of coronary heart disease.

A trial was carried out on a small number of healthy volunteers, divided into two groups. The scientists injected one group with the monoclonal antibody in salt solution. The other group was a control group. They measured the concentration of LDL in the blood of each volunteer at the start and after 3 months. They found that the mean LDL concentration in the volunteers injected with the antibody was 64% lower than in the control group.

Use the information in the passage and your own knowledge to answer the following questions.

8 (a) The scientists gave an injection to a mouse to make it produce the monoclonal antibody used in this investigation (line 7).

What should this injection have contained?

[1 mark]

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8 (b) LDL enters the liver cells (lines 3–4).

Using your knowledge of the structure of the cell-surface membrane, suggest how LDL enters the cell.

[2 marks]

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8 (c) Explain how the monoclonal antibody would prevent the regulator protein from working (lines 7–8).

[2 marks]

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8 (d) Explain how this treatment could reduce the risk of coronary heart disease (lines 8–9).

[3 marks]

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8 (e) Describe how the control group should have been treated.

[2 marks]

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9 (a) Describe and explain how cell fractionation and ultracentrifugation can be used to isolate mitochondria from a suspension of animal cells.

[5 marks]

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9 (b) Describe the principles and the limitations of using a transmission electron microscope to investigate cell structure.

[5 marks]

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END OF QUESTIONS

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