



**Answer Questions 1 and 2 in the spaces provided.**

1. An experiment was carried out to investigate the control of blood glucose concentration in a group of healthy volunteers. At the start of this experiment, 34 volunteers each drank a syrup containing 50 g of glucose. The concentration of glucose and insulin in blood samples were determined at the start of the experiment, and at half hourly intervals for a period of two hours.

The results are shown in the table below.

Time / minutes	Mean blood glucose concentration / $\text{mmol dm}^{-3}$	Mean blood insulin concentration / $\mu\text{mol dm}^{-3}$
0 (start of experiment)	5.0	20.0
30	7.2	85.0
60	5.5	74.0
90	4.4	35.0
120	4.2	20.0

- (a) Describe and explain the change in blood glucose concentration from the start of the experiment to 30 minutes.

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- (b) Compare the changes in blood glucose concentrations with the changes in blood insulin concentrations as shown by these results.

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- (c) One of the effects of insulin is to activate glycogen synthase, an enzyme in liver cells, which promotes the synthesis of glycogen from glucose. Glucose enters liver cells by facilitated diffusion.

Suggest why the uptake of glucose by liver cells is increased if insulin is present.

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- (d) Name **one** hormone, other than insulin, which is involved with the regulation of blood glucose and describe its effect on blood glucose concentration.

Hormone .....

Effect on blood glucose concentration .....

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(Total 11 marks)

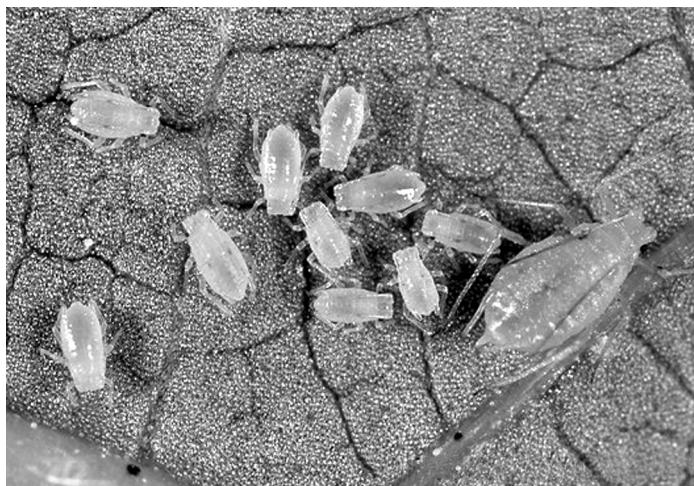
Q1

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2. Aphids are insect pests of many different crop plants, including sugar beet. Aphids have piercing mouthparts and suck plant sap; they also transmit plant diseases, such as virus yellows.

**Aphids**



Jack K. Clark, Agstock, Science Photo Library

In a field trial, the effect of an insecticide was tested on a crop of sugar beet. One plot was left untreated; the other was sprayed with insecticide X. The results are summarised in the table below.

Treatment of plot	Mean number of aphids per plant	Percentage of plants infected with virus yellows (%)	Yield of sugar / tonnes ha <sup>-1</sup>
Untreated	16.7	26.2	9.3
Sprayed with insecticide X	0.8	9.4	11.0

- (a) Describe the effect of spraying with insecticide on the mean numbers of aphids and the percentage of plants infected with virus yellows.

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- (b) Calculate the percentage increase in the yield of sugar produced by the insecticide-treated crop. Show your working.

Answer .....%  
**(2)**

- (c) Most of the sugar produced by sugar beet is stored in the form of sucrose. Describe the structure of sucrose.

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- (d) Insecticide X prevents acetylcholine from binding to receptors on the postsynaptic membrane of neurones. Suggest what effects this will have on the transmission of nerve impulses in the nervous system of an insect.

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(e) Describe the possible **disadvantages** of the control of insect pests using chemical insecticides.

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Q2

(Total 12 marks)

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**Write an essay on ONE of the following topics.**

**For Biology you should choose EITHER Question 3 OR Question 4B.**

**3.** Genetic variation and natural selection.

**(15 marks)**

**4B.** Pollination and the control of growth in flowering plants.

**(15 marks)**

**For Biology (Human) you should choose EITHER Question 3 OR Question 5H.**

**3.** Genetic variation and natural selection.

**(15 marks)**

**5H.** Meiosis and chromosome mutations.

**(15 marks)**

Marks will be awarded for scientific content, coverage of the topic, and the quality of written communication. You should include in your answer any relevant information from the whole of your course. You may include diagrams if you wish, but make sure that they are relevant to your essay and add extra information to it.





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Indicate which question you have chosen by marking the box (ⓧ). If you change your mind, put a line through the box (ⓧ) and then indicate your new question with a cross (ⓧ).

Chosen question number: **Question 3**

**Question 4B**

**Question 5H**

**Write your answer, including any plan, here.**

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