

- (d) Studies have shown that it is possible to determine the rate of formation of glomerular filtrate. This can be determined by dividing the concentration of inulin in the urine by the concentration of inulin in the plasma, and multiplying this by the rate of formation of urine.

This is shown by the formula below.

$$\text{Rate of formation of glomerular filtrate} = \frac{U}{P} \times V$$

Where U = concentration of inulin in the urine

P = concentration of inulin in the plasma

V = rate of formation of urine.

In an investigation, U, V and P were measured. The values are shown in the table below.

U	125.0 mg cm ⁻³
P	2.0 mg cm ⁻³
V	2.0 cm ³ min ⁻¹

Use the formula above to calculate the rate of formation of glomerular filtrate. Show your working.

Answer

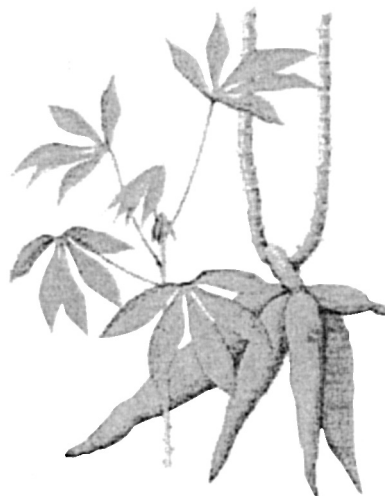
(2)

Q1

(Total 8 marks)



2. Cassava (*Manihot esculenta*) is an important crop plant, which is grown in many tropical and subtropical areas of the world.



Cassava

The roots of cassava provide an important source of starch and starch-based products. The leaves may also be eaten as they provide protein and vitamins A and B.

- (a) Cassava is usually propagated using stem cuttings, rather than seeds. This is a form of cloning.

Suggest advantages of propagating cassava by stem cuttings rather than by seeds.

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(2)



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(b) One of the major pests of cassava is the green mite. Various other species of mites are predatory and are being evaluated as biological control agents of the cassava green mite. Mites are small invertebrates related to spiders.

(i) Suggest why green mites are considered to be pests of cassava.

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(ii) Suggest advantages of the use of biological, rather than chemical methods, to control green mites.

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(c) An investigation was carried out to evaluate different species of predatory mites as biological control agents of green mites. Two different species of predatory mites *T. aripo* and *G. annectens* were used. Each species of predatory mite was placed in a dish containing a cassava leaf disc on which there were a known number of green mite eggs. The dishes were kept under carefully controlled conditions. After 24 hours, the numbers of eggs eaten by each predatory mite were counted and the means calculated.

The results of this investigation are shown in the table below.

Number of green mite eggs	Mean number of eggs eaten by predatory mites	
	<i>T. aripo</i>	<i>G. annectens</i>
1	0.93	1.00
3	2.90	2.53
7	6.83	6.20
15	14.94	11.31
30	28.60	15.53
105	81.30	18.10
200	101.31	11.50

(i) Suggest why the dishes were kept at a constant temperature during this investigation.

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(ii) Describe the relationship between the number of green mite eggs and the number of eggs eaten by *T. aripo*.

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(iii) From the results of this investigation, which species of predatory mite seems to be the more effective as a biological control agent? Give an explanation for your answer.

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(3)

(Total 15 marks)

Q2

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Write an essay on ONE of the following topics.

Put a cross in the box below indicating the question you have chosen (☒). If you change your mind, put a line through the box (☒) and then put a cross in the other box (☒).

Chosen question number: **Question 3** ☒

Question 4B ☒

Question 5H ☒

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

3. The structure and functions of liver cells. **(15 marks)**

4B. Pigments and their roles in flowering plants. **(15 marks)**

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

3. The structure and functions of liver cells. **(15 marks)**

5H. Meiosis, genetic variation 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.

Write your answer, including any plan, here.

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