

231/2

— **BIOLOGY** —  
(THEORY)

Paper 2



Name ..... Index Number .....

Candidate's Signature ..... Date .....

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections; **A** and **B**.
- (d) Answer **all** the questions in section **A** in the spaces provided.
- (e) In section **B** answer question **6** (**compulsory**) and either question **7** or **8** in the spaces provided after question **8**.
- (f) This paper consists of **12** printed pages.
- (g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (h) Candidates should answer all the questions in English.

**For Examiner's Use Only**

Section	Question	Maximum Score	Candidate's Score
<b>A</b>	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
<b>B</b>	6	20	
		20	
<b>Total Score</b>		<b>80</b>	



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## SECTION A (40 marks)

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

1. In an experiment to investigate the effect of sodium chloride on the growth rate in a spinach seedling, seeds were treated with different concentrations of sodium chloride. The results are as recorded in the table below.

Concentration of sodium chloride (mol/l)	Percentage of spinach seeds which started to grow roots	Mean root length (mm)
0.00	99.98	17.70
0.06	98.20	15.60
0.12	92.0	10.20
0.18	54.0	7.60

- (a) From the results in the table above, explain the effect of increasing the concentration of sodium chloride. (3 marks)

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- (b) Apart from a ruler, state **two** other equipment one would need to determine the rate of growth in the roots. (2 marks)

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- (c) With a reason, state **one** other part of the seedling the students would focus on to determine the effect of sodium chloride on growth. (2 marks)

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- (d) State the likely effect on the seedling of increasing the concentration of sodium chloride to 2.20 mol/l. (1 mark)

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2. The table below shows results of blood cell counts per mm<sup>3</sup> of blood from a sample of people living at different altitudes.

Red blood cells ( $\times 10^4$ )	4.8	5.3	6.7	7.6	8.47	9.82
White blood cells ( $\times 10^4$ )	0.45	0.45	0.45	0.45	0.45	0.45
Altitude (metres)	750	1,500	2,250	3,000	4,500	4,500

- (a) Explain the relationship between:
  - (i) red blood cells count and the altitude; (3 marks)

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- (ii) white blood cells count and the altitude. (3 marks)

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- (b) Explain why chances of nose-bleeding increase with altitude in humans. (2 marks)

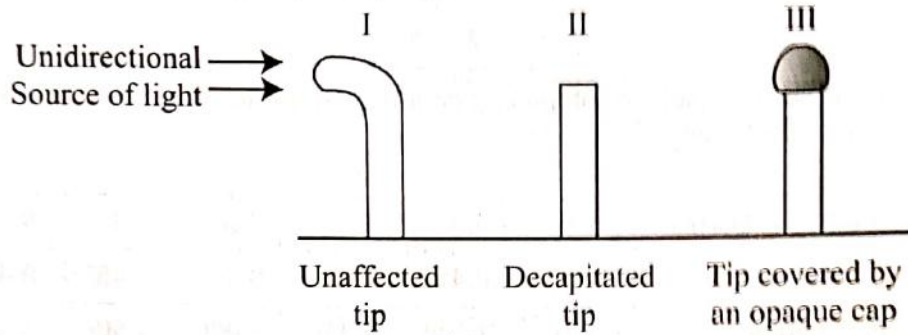
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3. (a) State **one** importance of irritability to living organisms. (1 mark)

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(b) In an experiment, students treated seedlings as illustrated below.



(i) Account for the observations made in seedling I. (3 marks)

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(ii) Explain the similarity in the end results made in seedlings II and III. (2 marks)

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(iii) State the likely treatment that would make seedlings II and III respond like seedling I. (2 marks)

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4. In cats, the gene for fur colour is sex-linked. Letter G represents the gene for ginger fur colour while letter B represents the gene for black fur colour in a given cat species. These genes are codominant. Heterozygous females have ginger and black patches of fur and their phenotype is described as tortoise-shell.

(a) With reference to the information given above, what is meant by the term codominance? (1 mark)

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921 (b) Explain why male cats with a tortoise-shell phenotype do not usually occur. (2 marks)

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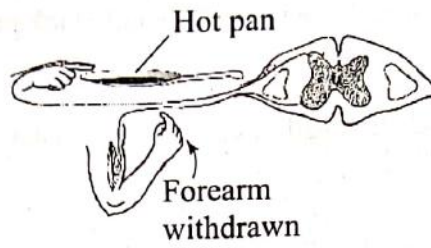
(c) A tortoise-shell female was crossed with a black male. Determine the genotypes and phenotypes of the offspring. (5 marks)

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5. A person accidentally touches a hot pan and responds as illustrated in the diagram below.



(a) Explain how the response illustrated above occurs. (6 marks)

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(b) Explain how auxins are utilised as selective weed killers in agriculture. (2 marks)

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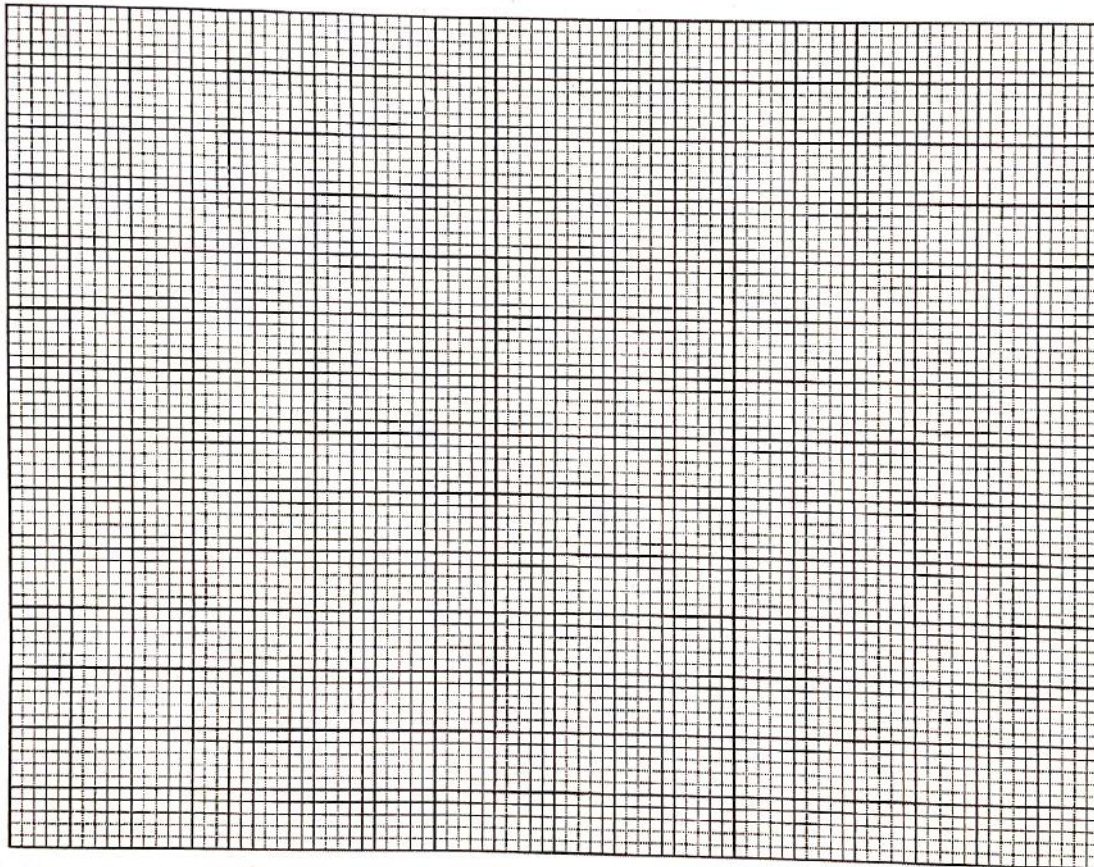
## SECTION B (40 marks)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. The table below shows the rate of product formation for two enzymes, H and J over a range of pH values.

pH	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Rate of product formation for enzyme H (mg/hr)	34.5	40.5	33.5	15.0	–	–	–	–	–	–
Rate of product formation for enzyme J (mg/hr)	–	–	–	15.0	20.0	30.0	40.5	23.5	11.0	6.0

- (a) On the same axis, plot graphs of the rate of product formation against pH. (8 marks)



- (b) Account for the rate of product formation for enzyme H between:

(i) pH 1.0 and 3.0

(3 marks)

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(ii) pH 3.0 and 7.0. (3 marks)

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(c) From the graph, determine:

(i) the pH value at which the rate of product formation of the two enzymes was the same (1 mark)

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(ii) the value of the rate of product formation for enzymes H and J at the pH value stated in (c)(i) above (1 mark)

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(iii) the optimum pH value for enzyme J (1 mark)

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(d) State **one** variable that may lead to the change in the optimum rate of product-formation of the two enzymes. (1 mark)

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(e) Suggest with a reason, the likely part of the human alimentary canal where enzyme H would be found. (2 marks)

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7. Giving examples, describe the following interactions among organisms: (20 marks)

- (a) predator-prey
- (b) symbiosis
- (c) parasitism.

8. Explain the effect of increased physical activity on the following organ systems: (20 marks)

- (a) heart
- (b) lungs
- (c) kidneys
- (d) skin.

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Handwriting practice lines consisting of multiple rows of dotted lines on a white background.

A series of horizontal dotted lines for writing, spanning most of the page width.

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Lined writing area with horizontal dotted lines.

**THIS IS THE LAST PRINTED PAGE.**

*Kenya Certificate of Secondary Education, 2019*  
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