4.3.2 Biology Paper 2 (231/2)

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)

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

(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)

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

2. The table below shows results of blood cell counts per mm^3 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:

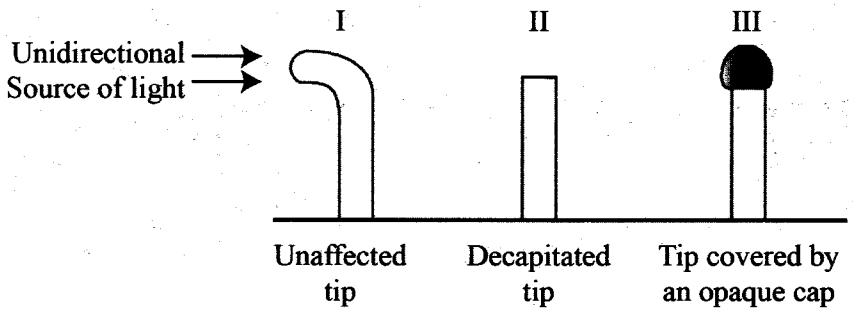
(i) red blood cells count and the altitude; (3 marks)

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

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

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

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



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

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

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

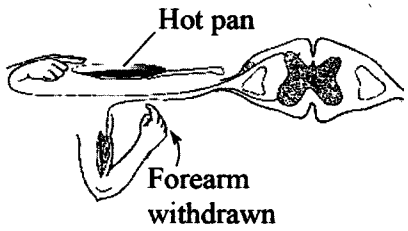
4. In cats, the gene for fur colour is sex-linked. Letter G represents the gene for ginger fur colour while letter B represents the gene for black fur colour in a given cat species. These genes are codominant. Heterozygous females have ginger and black patches of fur and their phenotype is described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

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

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

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

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)

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

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)

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

(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)

(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)

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

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

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

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.