

FORM TP 2016045



TEST CODE 01207020

MAY/JUNE 2016

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®  
EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This paper consists of SIX questions in TWO sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, answers should be illustrated with diagrams.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

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SECTION A

Answer ALL questions in this section.

Write your answers in the spaces provided in this booklet.

1. (a) Students investigate the effect of temperature on the rate of reaction of the enzyme, catalase. They use crushed potato as the source of the enzyme and place 5 mg into each of 7 test tubes. They add 3 cm<sup>3</sup> of 1% hydrogen peroxide to each test tube and place them into water-baths kept at the following temperatures: 0 °C, 10 °C, 20 °C, 30 °C, 40 °C, 50 °C and 60 °C. They count the number of bubbles released per minute from each test tube and record the data in Table 1.

TABLE 1: EFFECT OF TEMPERATURE ON CATALASE ACTIVITY

Test Tube	Temperature (°C)	Number of O <sub>2</sub> Bubbles per Minute
1	0	0
2	10	1
3	20	5
4	30	10
5	40	15
6	50	1
7	60	0

- (i) Plot a graph on the grid provided on page 5 to show the relationship between the number of oxygen bubbles released and temperature. (4 marks)
- (ii) From your graph, determine the optimum temperature for the enzyme.

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(1 mark)

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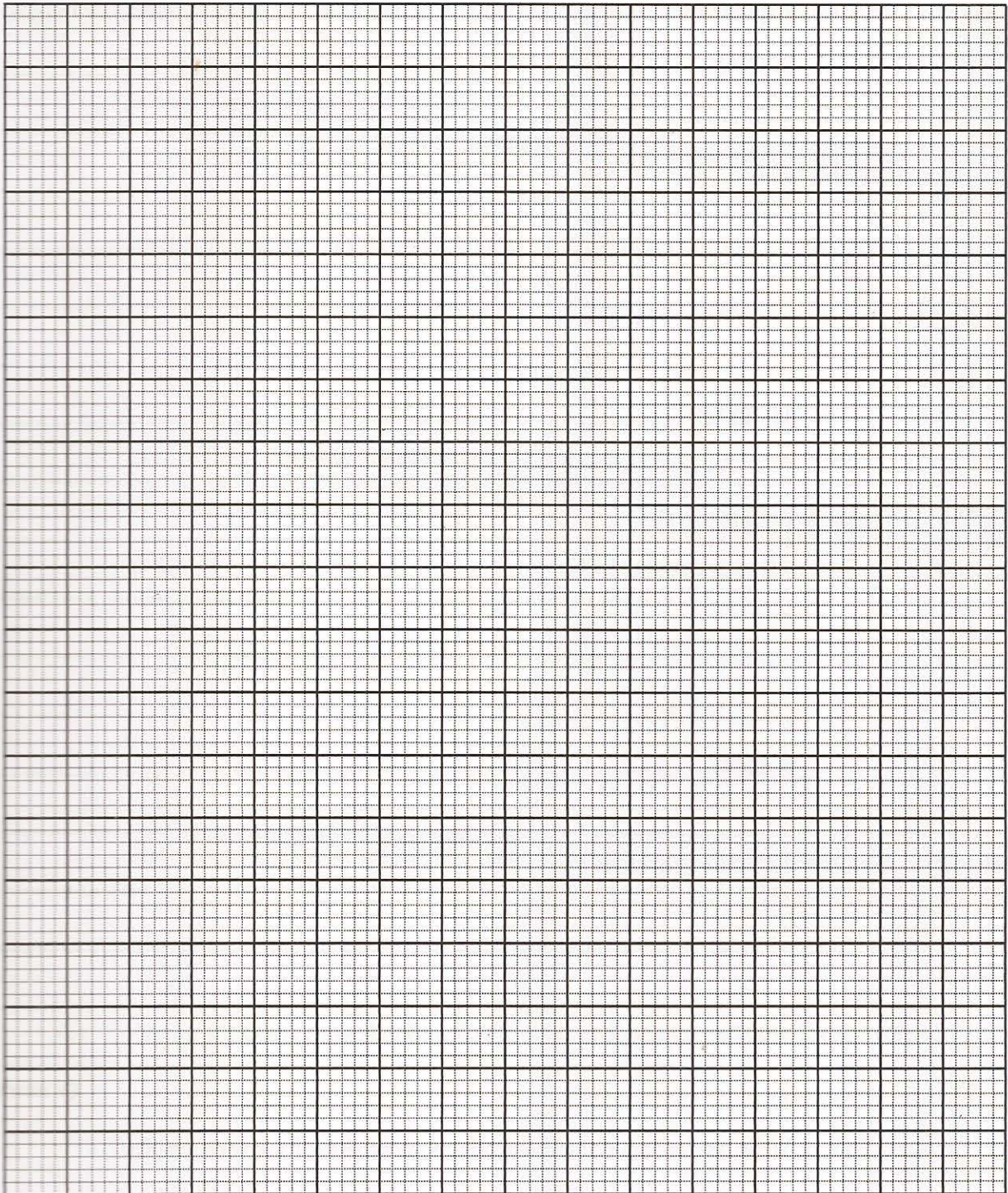
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Graph showing the effect of temperature on the rate of an enzyme-catalyzed reaction

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(iii) Explain the shape of the graph at EACH of the following temperature ranges:

0–10 °C .....

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11–40 °C .....

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> 40 °C .....

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(6 marks)

(iv) Write a conclusion that the students could draw from their results.

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(1 mark)



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(v) Suggest ONE reason why living organisms need to maintain a constant internal temperature.

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**(1 mark)**

(vi) Describe TWO precautions that the students should take when doing this experiment.

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**(2 marks)**

(vii) How could this experiment be modified to investigate the effect of pH on enzyme activity?

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**(2 marks)**

(b) Name TWO enzymes that function in protein digestion and describe the role of EACH.

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**(2 marks)**

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(c) Before food can be chemically digested by enzymes, it must first be mechanically broken down in the alimentary canal.

(i) Name TWO parts of the alimentary canal that are responsible for the mechanical digestion of food.

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**(2 marks)**

(ii) Give TWO reasons why **mechanical** digestion of food is important.

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**(2 marks)**

(iii) Explain the significance of **chemical** digestion of food.

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**(2 marks)**

**Total 25 marks**

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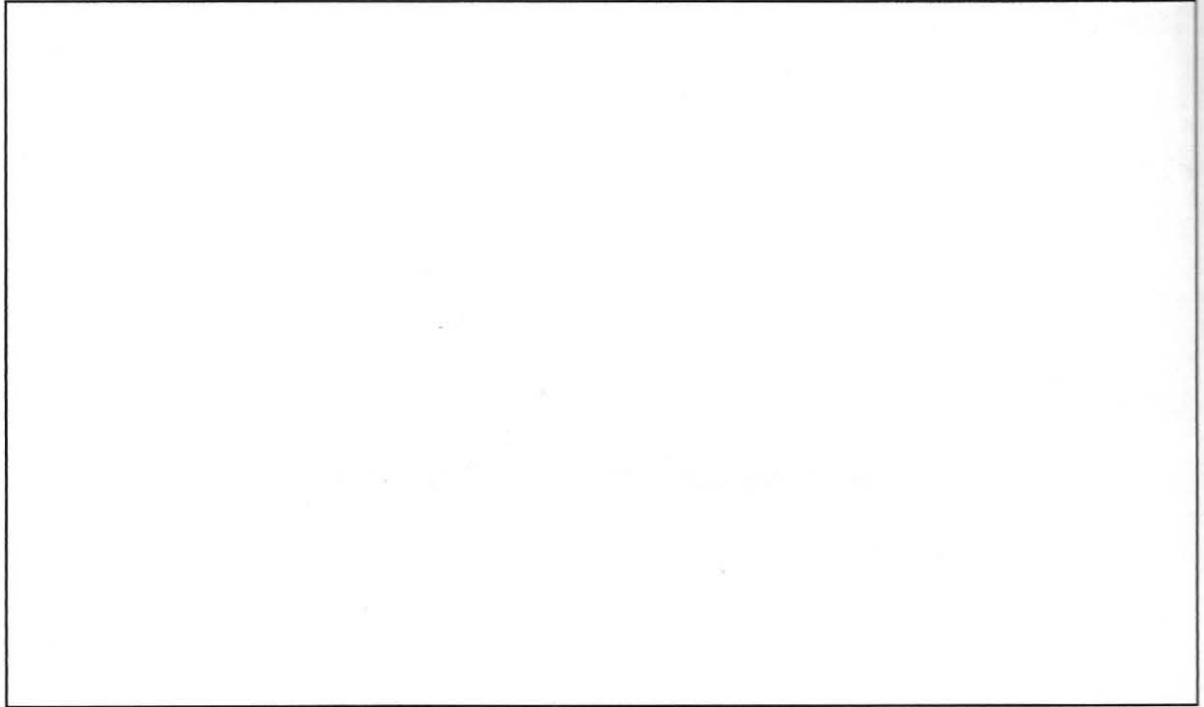


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2. (a) (i) In the box provided below, draw a **food web** consisting of the following organisms:

- Algae
- Small fish
- Tadpole
- Water snake
- Egret
- Eagle



(3 marks)

(ii) What is the role of the organism at the start of the food web?

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(1 mark)

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3. (a) Define EACH of the following terms:

(i) Stimulus .....

(1 mark)

(ii) Receptor .....

(1 mark)

(iii) Effector .....

(1 mark)

(b) Figure 1 is a diagram of a section through the human eye.

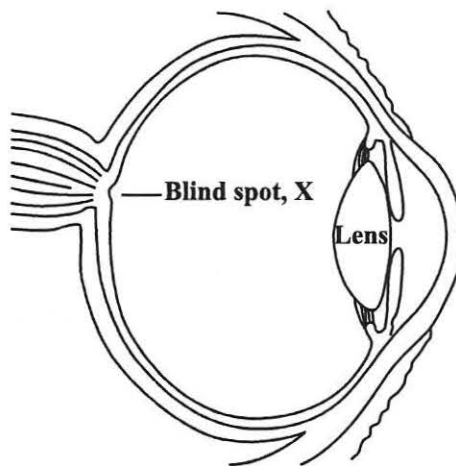


Figure 1. Section through the human eye

(i) Label EACH of the following parts of the eye on Figure 1:

- Pupil
- Ciliary muscles
- Retina
- Optic nerve

(4 marks)

(ii) Why is X called the 'blind spot'?

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(1 mark)

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- (c) A boy looks up from reading his book to see a helicopter flying in the distance. Account for the changes that would occur in the lens of both of his eyes to enable him to see the helicopter.

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(3 marks)

- (d) Figure 2 shows two eyes labelled A and B, under two different light conditions.

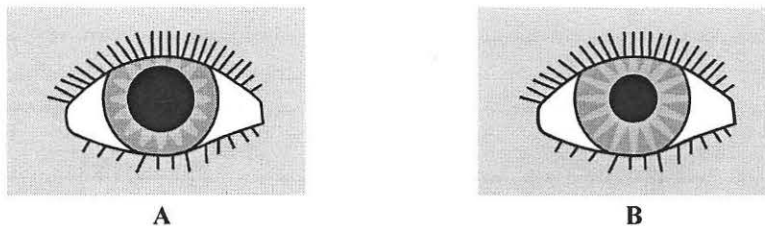


Figure 2. Eyes under different light conditions

Which of the eyes in Figure 2, A or B, shows the appearance of an eye exposed to dim light? Explain your answer.

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(3 marks)

- (e) Why is it important for the eye to respond when exposed to very bright light?

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(1 mark)

Total 15 marks

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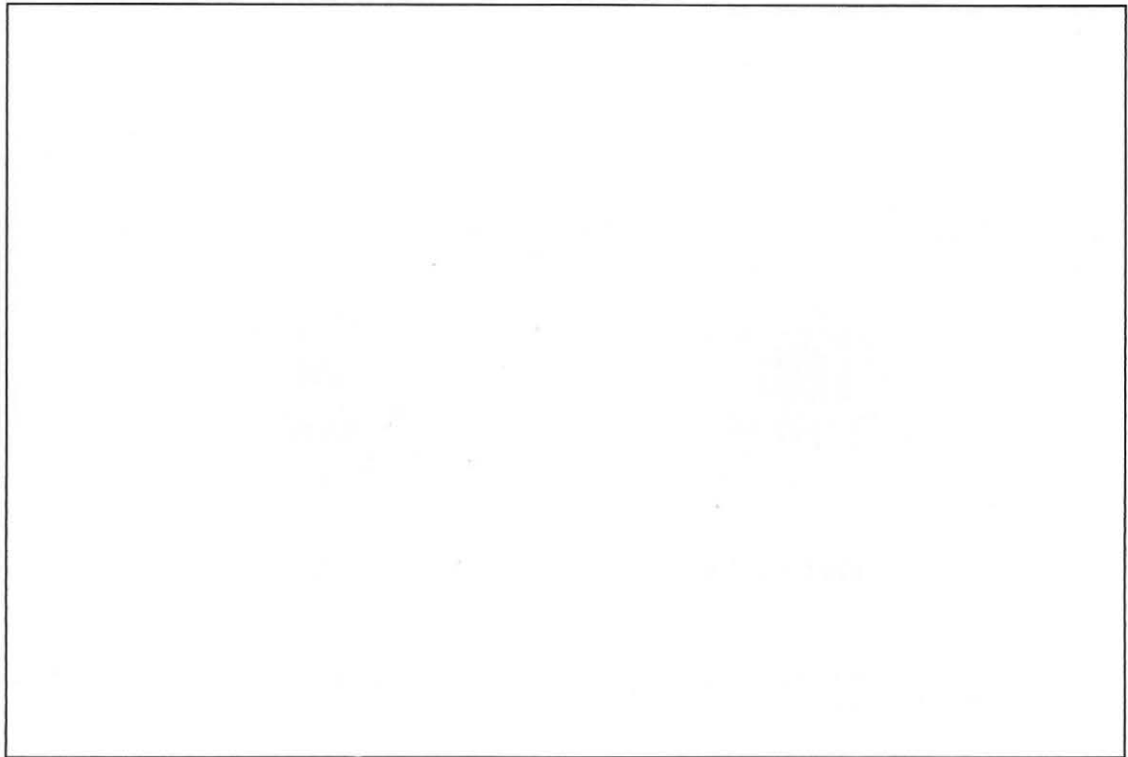
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**SECTION B**

**Answer ALL questions in this section.**

**Write your answers in the spaces provided in this booklet.**

4. (a) In the box below, draw a labelled diagram of the female reproductive system, and using an arrow, trace the path that a spermatozoon would have to take to fertilize an ovum.



**(6 marks)**

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- (b) A young couple wants to choose between two contraceptive methods — barrier or surgical. Discuss why the male may prefer the barrier method rather than the surgical method of contraception. Your answer should include TWO advantages of the barrier method and THREE disadvantages of the surgical method.

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(5 marks)

- (c) A biologist discovers that the flowers of a species of plants have no male reproductive parts. Suggest ONE method by which these plants produce offspring, and THREE advantages of this method.

Method .....

Advantages .....

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(4 marks)

**Total 15 marks**

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5. (a) With the aid of a chemical equation, explain what is meant by the term 'photosynthesis', and discuss how a dicotyledonous leaf is adapted to capture maximum sunlight and carbon dioxide for the process.

Photosynthesis .....

Equation .....

Adaptations .....

(11 marks)

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- (b) Outline how decomposers assist in the cycling of carbon dioxide to make it available to green plants.

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(4 marks)

**Total 15 marks**

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6. (a) State TWO causes of anaemia and describe TWO signs/symptoms of the disease.

Causes .....

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Signs/symptoms .....

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(4 marks)

(b) Sickle-cell anaemia is caused by the presence of a recessive allele. Persons who are heterozygous and carry the sickle-cell allele are more resistant to a type of severe malaria than persons who are homozygous for the normal haemoglobin allele.

(i) State what is meant by EACH of the following terms:

Homozygous .....

.....

Heterozygous .....

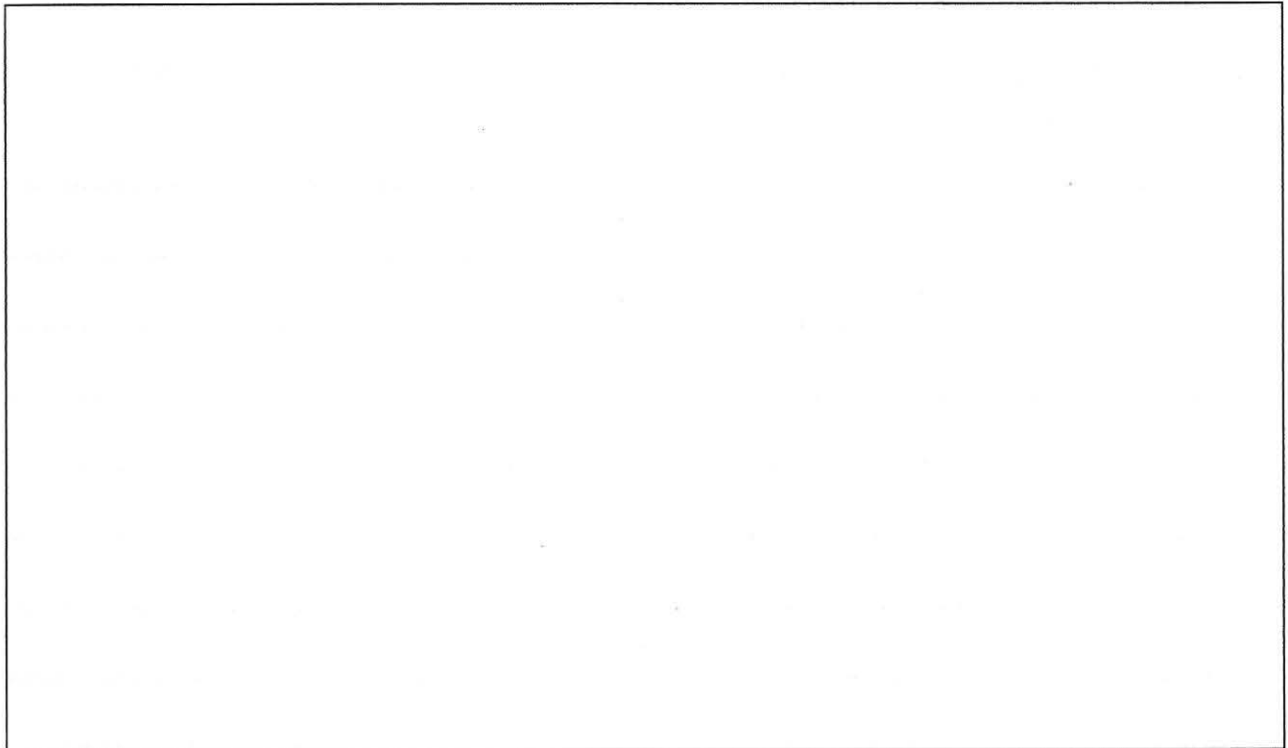
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(2 marks)





- (ii) With the aid of a genetic diagram, show how a man and a woman who do NOT have sickle-cell anaemia can have a child who has the disease.



(6 marks)

- (iii) Explain why the sickle-cell allele is more common in the population, in countries where the severe form of malaria is present.

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(3 marks)

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

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