

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

Candidate Number

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Monday 22 October 2018

Morning (Time: 1 hour 30 minutes)

Paper Reference **WBI04/01**

Biology

Advanced

Unit 4: The Natural Environment and Species Survival

You must have:

Calculator, HB pencil, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*
- Candidates may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Pearson

Answer ALL questions.

Some questions must be answered with a cross . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

- 1** Spoilage of food results from decomposition of the organic matter by microorganisms.

Food can be preserved in a number of different ways to prevent spoilage.

- (a) (i) Put a cross in the box next to the organic molecules that can make up organic matter.

(1)

- A** carbohydrate and water
- B** lipid and protein
- C** lipid and water
- D** protein and water

- (ii) Put a cross in the box next to the microorganisms responsible for decomposition.

(1)

- A** bacteria and fungi
- B** bacteria and viruses
- C** fungi and maggots
- D** fungi and viruses

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(b) Below is a list of some methods used to preserve food:

- pasteurising (heating to high temperatures)
- vacuum packing (removing air)
- pickling in vinegar (vinegar has a pH of 2.5)
- adding salt.

Explain how each of these methods preserves food.

(i) Pasteurising

(2)

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(ii) Vacuum packing

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(iii) Pickling in vinegar

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(iv) Adding salt

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(Total for Question 1 = 10 marks)

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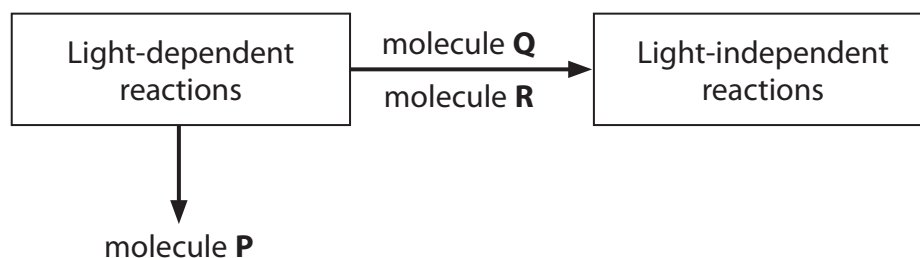
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2 Photosynthesis involves the light-dependent and light-independent reactions.

(a) The diagram below shows part of photosynthesis.



(i) Put a cross in the box next to the name of molecule **P**.

(1)

- A** GALP
- B** hydrogen
- C** oxygen
- D** water

(ii) Put a cross in the box next to the row in the table that correctly identifies molecule **Q** and molecule **R**.

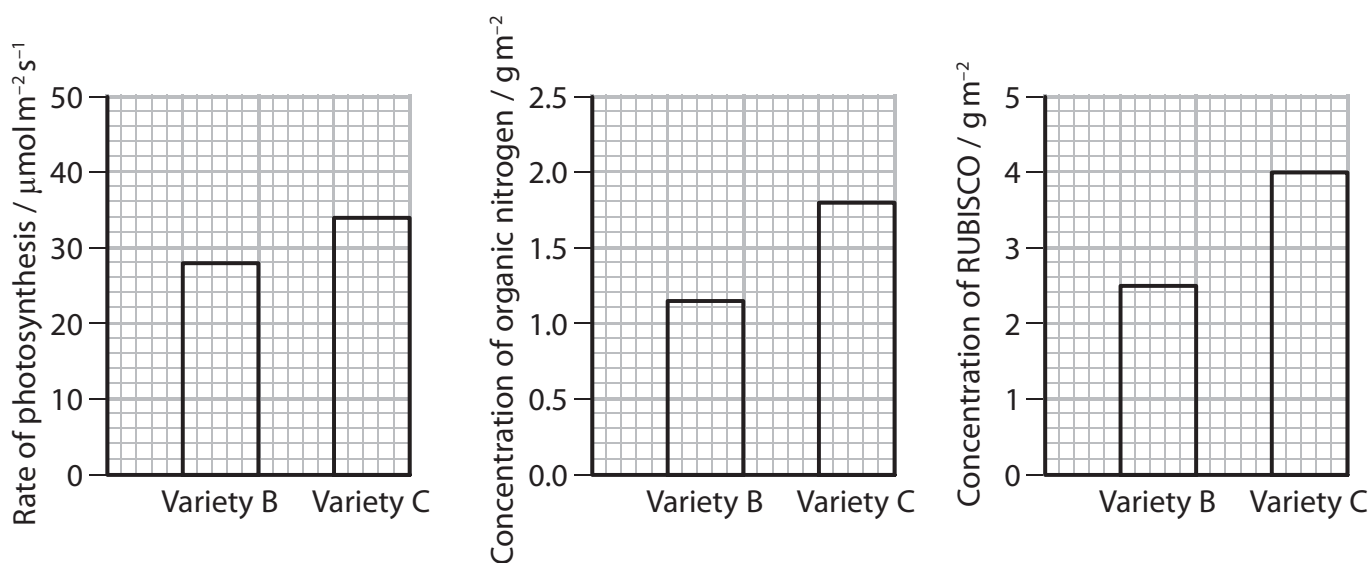
(1)

	Molecule Q	Molecule R
<input type="checkbox"/> A	ATP	carbon dioxide
<input type="checkbox"/> B	ATP	oxidised NADP
<input type="checkbox"/> C	carbon dioxide	reduced NADP
<input type="checkbox"/> D	reduced NADP	ATP



- (b) A study compared the rate of photosynthesis in two varieties of rice plant, B and C. The study also compared the concentration of organic nitrogen and RUBISCO in the leaves of these plants.

The graphs below show the results of this study.



- (i) The rate of photosynthesis was measured in $\mu\text{mol m}^{-2} \text{s}^{-1}$.

Suggest what was measured to obtain these units for the rate of photosynthesis.

(3)

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(ii) Explain how the leaves obtain nitrogen.

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(iii) Explain why the concentration of organic nitrogen has an effect on the content of RUBISCO and on the rate of photosynthesis.

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(Total for Question 2 = 10 marks)

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- 3 Scientists have found antibiotic-resistant bacteria in a number of species of shark in the Atlantic coastal waters around the USA.

Some of these sharks are eaten by people.

The table below shows three species of shark and some of the antibiotics to which bacteria in these sharks are resistant.

Species of shark	Antibiotic
Bull shark 	chloramphenicol gentamicin penicillin sulfamethoxazole
Nurse shark 	amikacin chloramphenicol penicillin sulfamethoxazole
Spinner shark 	cefotaxime chloramphenicol penicillin sulfamethoxazole

- (a) (i) Suggest how the sharks became contaminated with antibiotic-resistant bacteria.

(1)

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(ii) Explain why the presence of antibiotic-resistant bacteria in these sharks is causing concern for human health.

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(b) Sulfamethoxazole is a bacteriostatic antibiotic and gentamicin is a bactericidal antibiotic.

Distinguish between the effects of sulfamethoxazole and gentamicin on bacteria.

(1)

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(c) Amikacin and chloramphenicol affect the activity of ribosomes.

(i) Amikacin prevents the codons on mRNA from being read properly.

Explain how amikacin could affect protein synthesis.

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(ii) Chloramphenicol inhibits an enzyme involved in translation.

Put a cross ☒ in the box next to the bond that will **not** be formed in the presence of chloramphenicol.

(1)

- A ester
- B glycosidic
- C peptide
- D phosphodiester

(iii) Explain why amikacin and chloramphenicol do **not** affect human cells.

(2)

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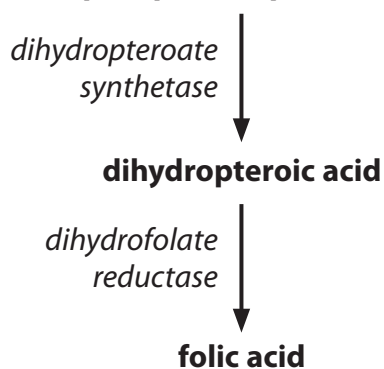
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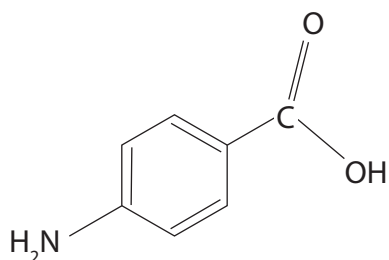
(d) Sulfamethoxazole inhibits the synthesis of folic acid.

The flow chart below shows some of the steps that occur in the synthesis of folic acid.

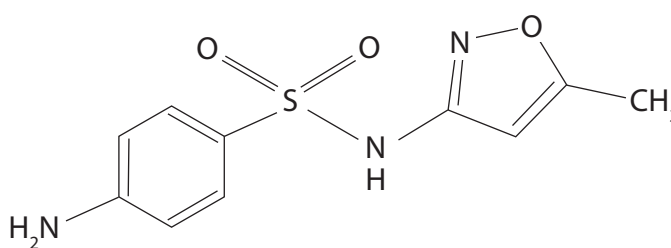
dihydropteroate diphosphate + p-aminobenzoic acid (PABA)



The diagrams below show the structure of PABA and sulfamethoxazole.



PABA



sulfamethoxazole

Explain how sulfamethoxazole inhibits the synthesis of folic acid.

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(e) Cefotaxime and penicillin affect the synthesis of cell walls in bacteria.

Put a cross in the box next to the molecule that is present in the cell walls of bacteria.

(1)

- A amylopectin
- B cellulose
- C glycogen
- D peptidoglycan

(Total for Question 3 = 13 marks)

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- 4 There are two species of squirrel living in the UK, the red squirrel and the grey squirrel.

The photograph below shows a red squirrel.



Magnification $\times 0.2$

Grey squirrels were introduced into the UK in 1876. Since then, the number of red squirrels has decreased.

- (a) There are currently 2.5 million grey squirrels and 140 000 red squirrels.

Calculate the percentage of red squirrels in the total squirrel population.

Show your working.

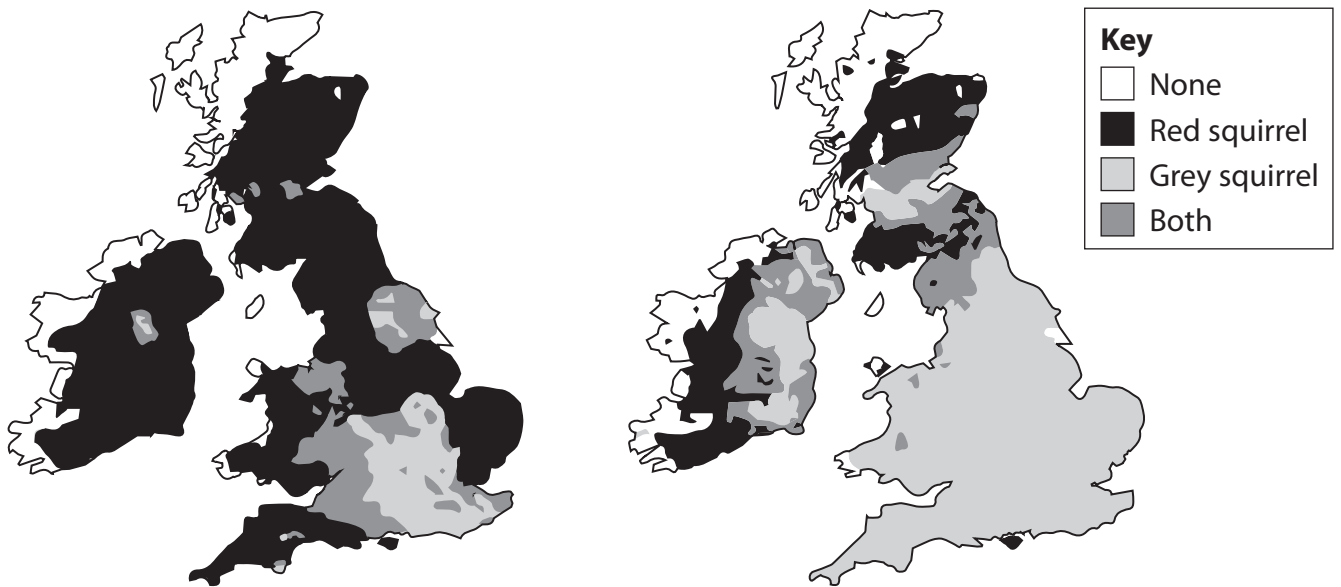
(2)

.....%



(b) Scientists think that the grey squirrels are responsible for the decrease in the number of red squirrels.

The maps below show the distribution of squirrels in the UK in 1945 and in 2010.



Distribution of squirrels in the UK in 1945

Distribution of squirrels in the UK in 2010

Using the information shown in the maps, describe the evidence that the grey squirrels are responsible for the decrease in the number of red squirrels.

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(c) Grey squirrels carry the squirrelpox virus and transmit this to red squirrels.

- (i) Suggest **two** reasons, other than disease, why the grey squirrels could be responsible for the decrease in the number of red squirrels.

(2)

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- (ii) Scientists have found that antibodies against the squirrelpox virus are present in grey squirrels. These antibodies are absent in red squirrels.

Explain why the squirrelpox virus does not cause disease in grey squirrels but kills red squirrels.

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(Total for Question 4 = 11 marks)



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5 Animals are sometimes killed illegally.

Police can use a number of methods to identify the criminal, the specific animal that has been killed and the time of death of the animal.

*(a) In 2000, a tiger was killed in a zoological park for its claws.

In 2005, a tiger claw was found.

Samples of DNA were collected from the claw. The DNA was compared and matched to the DNA of the parents of the tiger killed in 2000.

Describe the methods used in this process.

(6)

Area with horizontal dotted lines for writing the answer.



(b) Estimating the time of death of an animal killed illegally can help to catch the criminal.

(i) Explain how measuring the body temperature of the dead animal can be used to estimate the time of death.

(3)

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(ii) Explain how **one** named method, other than measuring body temperature, can be used to estimate the time of death.

(3)

Method

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Explanation

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(Total for Question 5 = 12 marks)

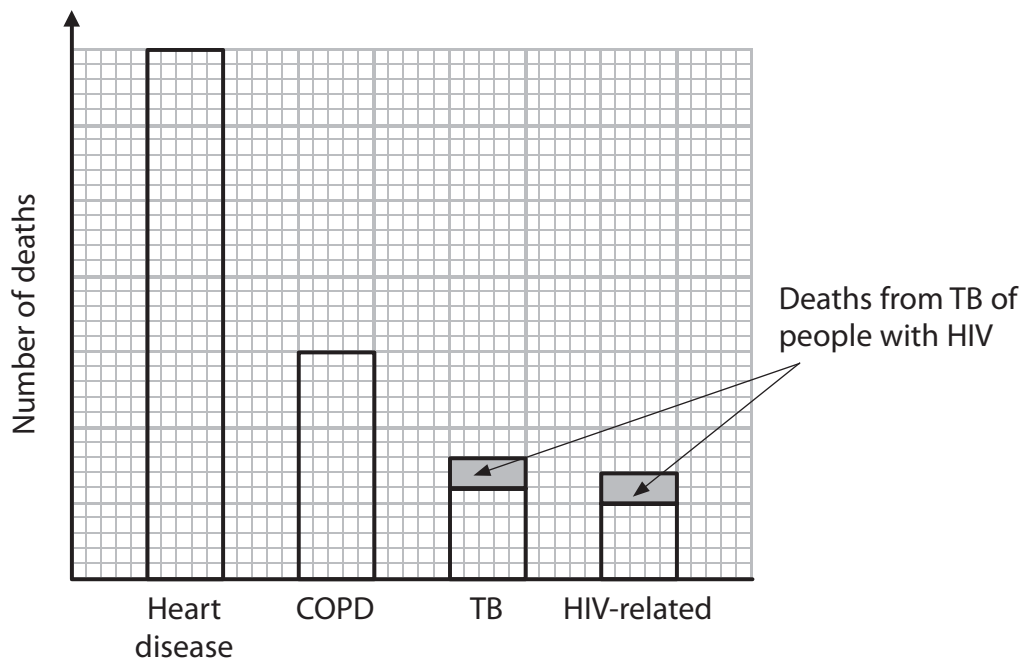


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6 The graph below shows the number of deaths caused by some diseases in 2012.



(a) Heart disease can be caused by atherosclerosis.

Explain how atherosclerosis can result in death from heart disease.

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(b) Chronic obstructive pulmonary disease (COPD) is a group of lung conditions that make it difficult for a person to breathe.

Explain why a difficulty in breathing affects the oxygen concentration in the blood. (2)

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* (c) Explain why death from TB is common in people infected with HIV.

(6)

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(Total for Question 6 = 10 marks)



P 5 5 3 7 8 A 0 1 9 2 8

7 Sri Lanka is an island in the Indian Ocean.

Below are some statements about Sri Lanka.

1. There are large areas of flat land at the coast.
2. There are mountains in the south-central part.
3. The mean temperature ranges from 17 °C to 33 °C.
4. The longest river is the Mahaweli river.
5. There are 3210 species of flowering plants present and 27% of these species are found only in Sri Lanka.

(a) (i) Put a cross in the box next to the number of statements that relate to the topography of this island.

(1)

A 2

B 3

C 4

D 5

(ii) State the term used to describe the 27% of flowering plant species found only in Sri Lanka.

(1)



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(b) Binara are flowering plants found only in Sri Lanka.

The photograph below shows one species of Binara.



Magnification $\times 0.1$

(i) There are five species of Binara.

Calculate the percentage of the flowering plant species found only in Sri Lanka that are Binara species.

Show your working.

(2)

.....%



(ii) The species of Binara shown in the photograph grows to about 1 m in height at altitudes up to 2000 m above sea level.

Describe an investigation that could be carried out to confirm this information.

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(iii) Edaphic factors will also affect where Binara will grow.

Describe how a named edaphic factor could be measured.

(3)

Edaphic factor

Description

(Total for Question 7 = 12 marks)

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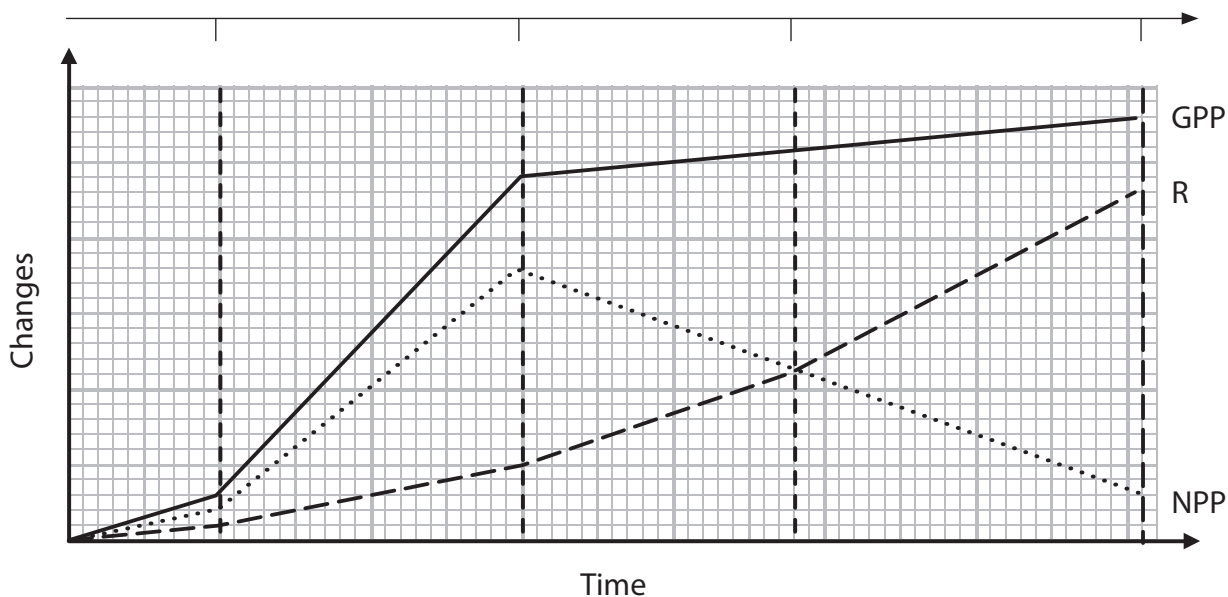


P 5 5 3 7 8 A 0 2 3 2 8

8 As a tree grows, gross primary productivity (GPP), net primary productivity (NPP) and respiration (R) change.

The diagram below shows four stages in the growth of a tree. The diagram shows how the size and shape of the tree change over a period of time.

The graph below shows how the GPP, NPP and R of this tree change over the same period of time.



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(a) Using the information in the graph, describe the changes in GPP, NPP and R over this period of time.

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(b) (i) Using the information in the diagram and the graph, explain the change in R between stage 1 and stage 2.

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P 5 5 3 7 8 A 0 2 5 2 8

(ii) Using the information in the diagram and the graph, explain the change in GPP between stage 1 and stage 2.

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(iii) Using the information in the diagram and the graph, explain the change in NPP between stage 3 and stage 4.

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(Total for Question 8 = 12 marks)

TOTAL FOR PAPER = 90 MARKS



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