

Energy Transfer through ecosystems

Question Paper 4

Level	A Level
Subject	Biology
Exam Board	Edexcel
Topic	Nature of Ecosystems
Sub Topic	Energy transfer through ecosystems
Booklet	Question Paper 4

Time Allowed: 15 minutes

Score: /12

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 It has been estimated that only 5% of the light energy hitting the surface of a leaf reaches the chloroplasts to be used in the synthesis of organic material. The total energy used in this synthesis is known as the gross primary productivity (GPP).

(a) Suggest **two** reasons why 95% of the light hitting the surface of a leaf is not used by the chloroplasts.

(2)

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(b) The mean GPP for plants on Earth is $24.4 \times 10^6 \text{ J m}^{-2} \text{ year}^{-1}$.

The plants use $3.7 \times 10^6 \text{ J m}^{-2} \text{ year}^{-1}$ of this energy in metabolic processes. The energy in the remaining organic material is known as net primary productivity (NPP).

(i) Explain what is meant by the unit **$\text{J m}^{-2} \text{ year}^{-1}$** .

(1)

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(ii) Calculate the percentage of the mean GPP that remains as NPP within plants on Earth.
Show your working.

(2)

Answer..... %

(iii) Place a cross ☒ in the box next to the metabolic process that best describes the process that accounts for most of the difference between GPP and NPP in plants.

(1)

A Chemosynthesis

B Respiration

C Photosynthesis

D Protein synthesis

*(c) With reference to the structures in a chloroplast, explain how the energy from light is made available in ATP molecules for the synthesis of organic materials.

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(Total for Question 1 = 12 marks)