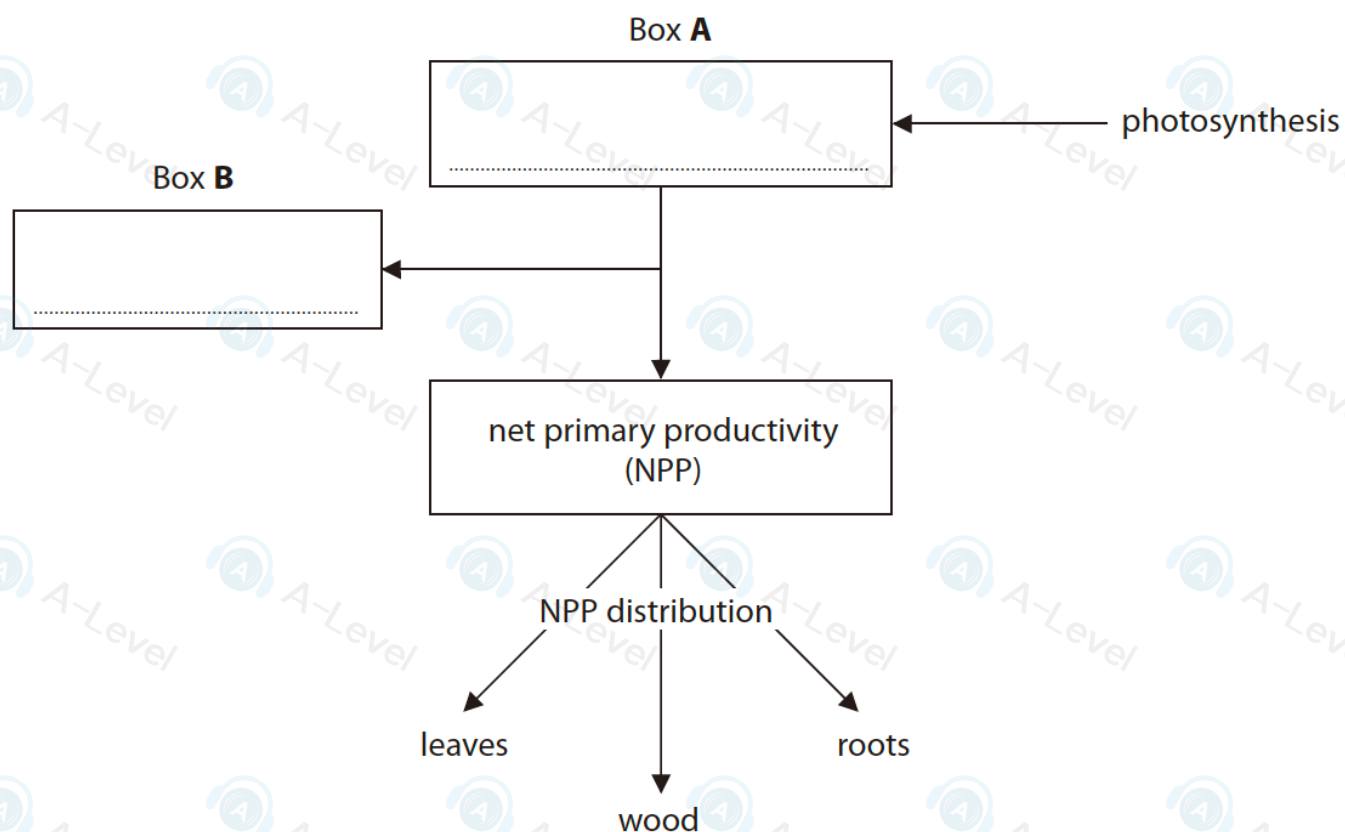


- 1 The diagram shows some processes linking photosynthesis to productivity and the distribution of biomass in the trees in a forest.



- (a) Complete the diagram by writing the appropriate word or words in box **A** and in box **B**.
(1)

(b) In a healthy forest ecosystem, the NPP should be distributed equally to the leaves, wood and roots.

(i) State the meaning of the term **ecosystem**.

(1)

(ii) Which of the following are the units for NPP?

(1)

☐ A $\text{kg m}^{-1} \text{yr}^{-1}$

☐ B $\text{kg m}^{-2} \text{yr}^{-2}$

☐ C $\text{kJ m}^{-1} \text{yr}^{-1}$

☐ D $\text{kJ m}^{-2} \text{yr}^{-1}$

(iii) In this forest, the total NPP was 11 700 units.

The leaves contained 34% of the NPP and the wood contained 39% of the NPP.

Calculate the NPP content in the roots.

(2)

Answer units

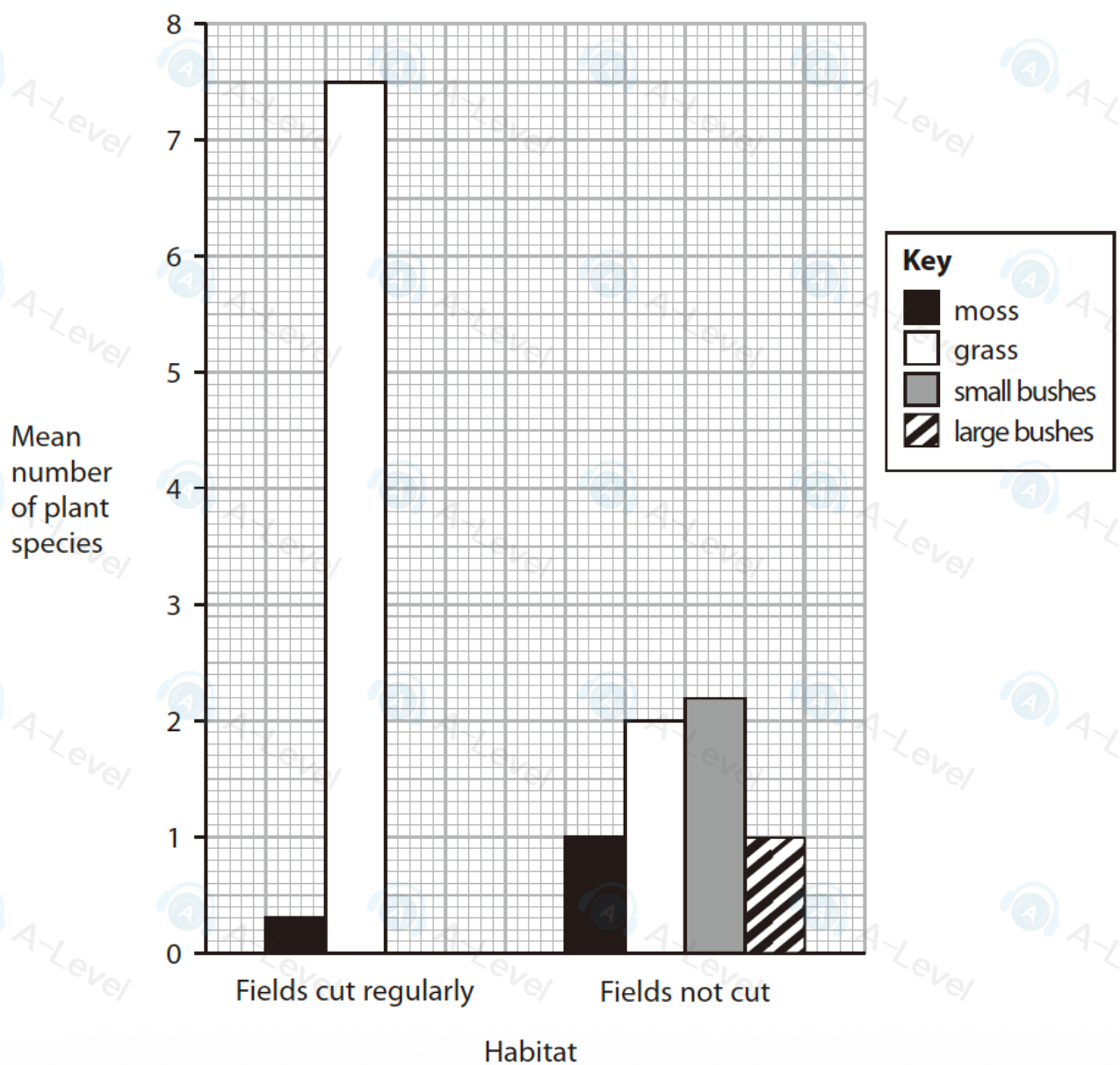
1 Mosses are species of plants that have genomes that enable them to survive in their habitats.

(a) A group of students investigated the mean number of plant species in four habitats.

The habitats that they investigated were:

- fields that were cut regularly
- fields that were not cut
- the middle of woods
- the edge of woods.

The graph shows some of the results from this investigation.



(i) Which row of the table shows the type of factor that affected the plant species in two of these habitats?

(1)

	Cutting the field regularly	Competition with trees for water
☐ A	abiotic factor	abiotic factor
☐ B	abiotic factor	biotic factor
☐ C	biotic factor	abiotic factor
☐ D	biotic factor	biotic factor

(ii) What is the percentage increase in the number of species of moss between the fields cut regularly and the fields not cut?

(1)

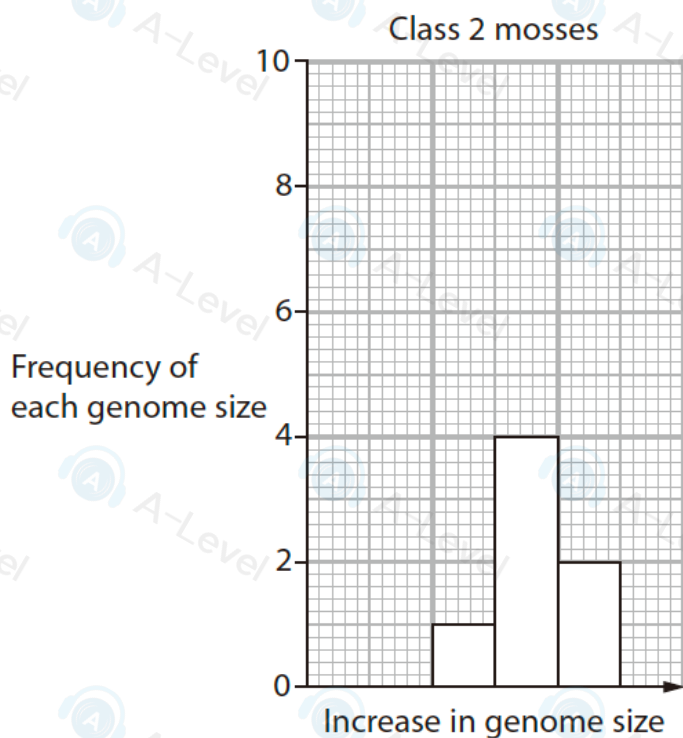
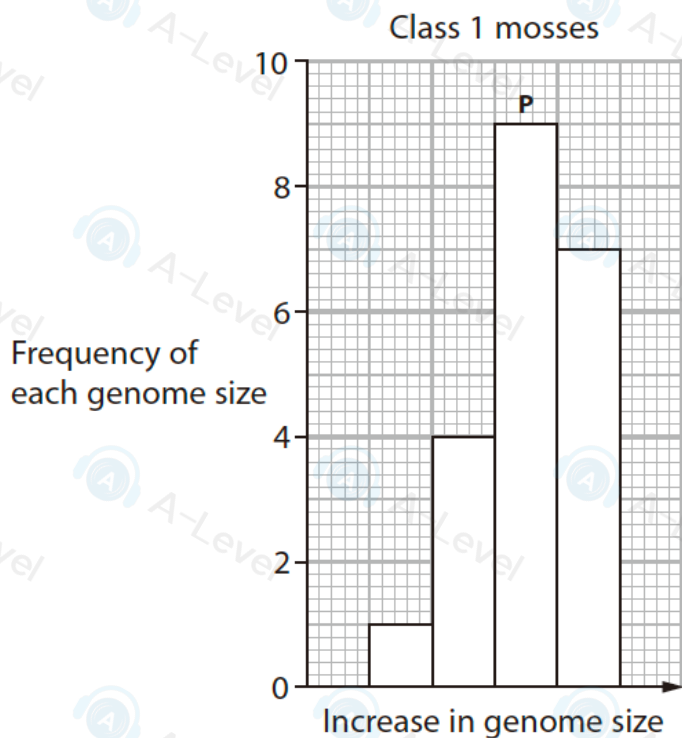
- ☐ **A** 23.3
- ☐ **B** 70.0
- ☐ **C** 233.3
- ☐ **D** 333.3

(iii) Suggest reasons for the differences in the mean number of plant species in fields cut regularly and in fields not cut.

(2)

- (b) In another investigation, the genome size of 30 species of moss was determined. Each species of moss belonged to one of two classes of moss.

The graphs show the frequency of each genome size in the class 1 mosses and some of the class 2 mosses.



- (i) Which does **P** represent?

(1)

- ☐ **A** the maximum genome size on a bar chart
- ☐ **B** the maximum genome size on a histogram
- ☐ **C** mode genome size on a bar chart
- ☐ **D** mode genome size on a histogram

- (ii) One genome size is missing from the graph for class 2 mosses.

Calculate the frequency of this genome size.

(1)

(iii) The mean value for the genome size of class 1 mosses was 0.449 a.u. and the mean value for class 2 mosses was 0.920 a.u.

Calculate the ratio of the genome size of class 1 mosses to the genome size of class 2 mosses.

(1)

Answer.....

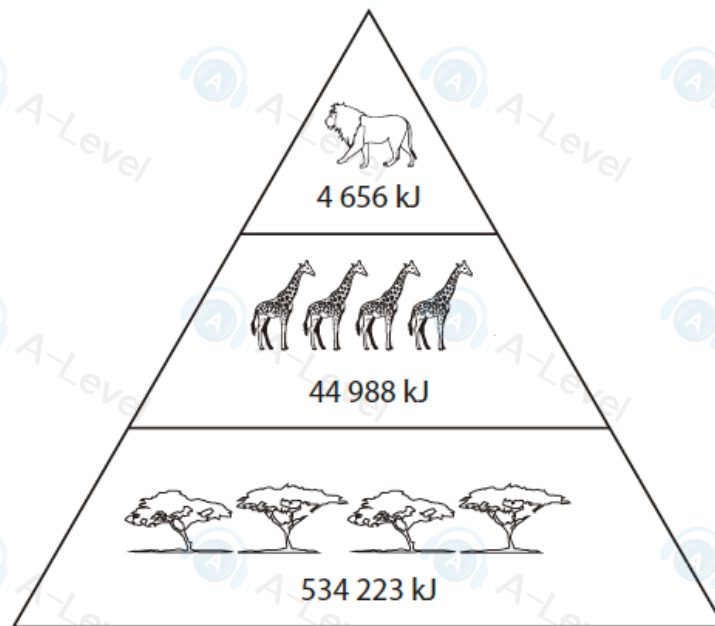
(iv) It was suggested that the chromosomes in class 2 mosses were found in pairs.

Give the evidence that supports this suggestion.

(1)

3 Lions, giraffes and acacia trees are found on the African Plains.

The diagram shows the energy in the trophic levels that these organisms occupy.



(a) Give the meaning of each of the following terms, using the information in the diagram to illustrate your answer.

(i) Habitat

(2)

(ii) Population

(2)

(iii) Community

(2)

(iv) Niche

(2)

(b) Calculate the efficiency of energy transfer between trophic level one and trophic level two.

(1)

Answer.....%

7 The photograph shows a Tasmanian devil.



(Source: © Walter 64 / Alamy Stock Photo)

Tasmanian devils are found in Tasmania.

The population of Tasmanian devils has fallen drastically due to a fatal cancer. This cancer first appeared in the mid-1990s.

There are only a few regions in Tasmania left where healthy Tasmanian devils can still be found.

- (a) The number of Tasmanian devils is estimated to have fallen from 150 000 in the mid-1990s to 25 000 in 2020.

Calculate the percentage decrease in the number of Tasmanian devils from the mid-1990s to 2020.

(1)

Answer%

- (b) Tasmanian devils feed on the dead bodies of animals (carcasses) and scare off other scavengers.

Scientists have studied the scavenging of carcasses in two regions of Tasmania: one region where all Tasmanian devils were healthy and one region where the cancer was common.

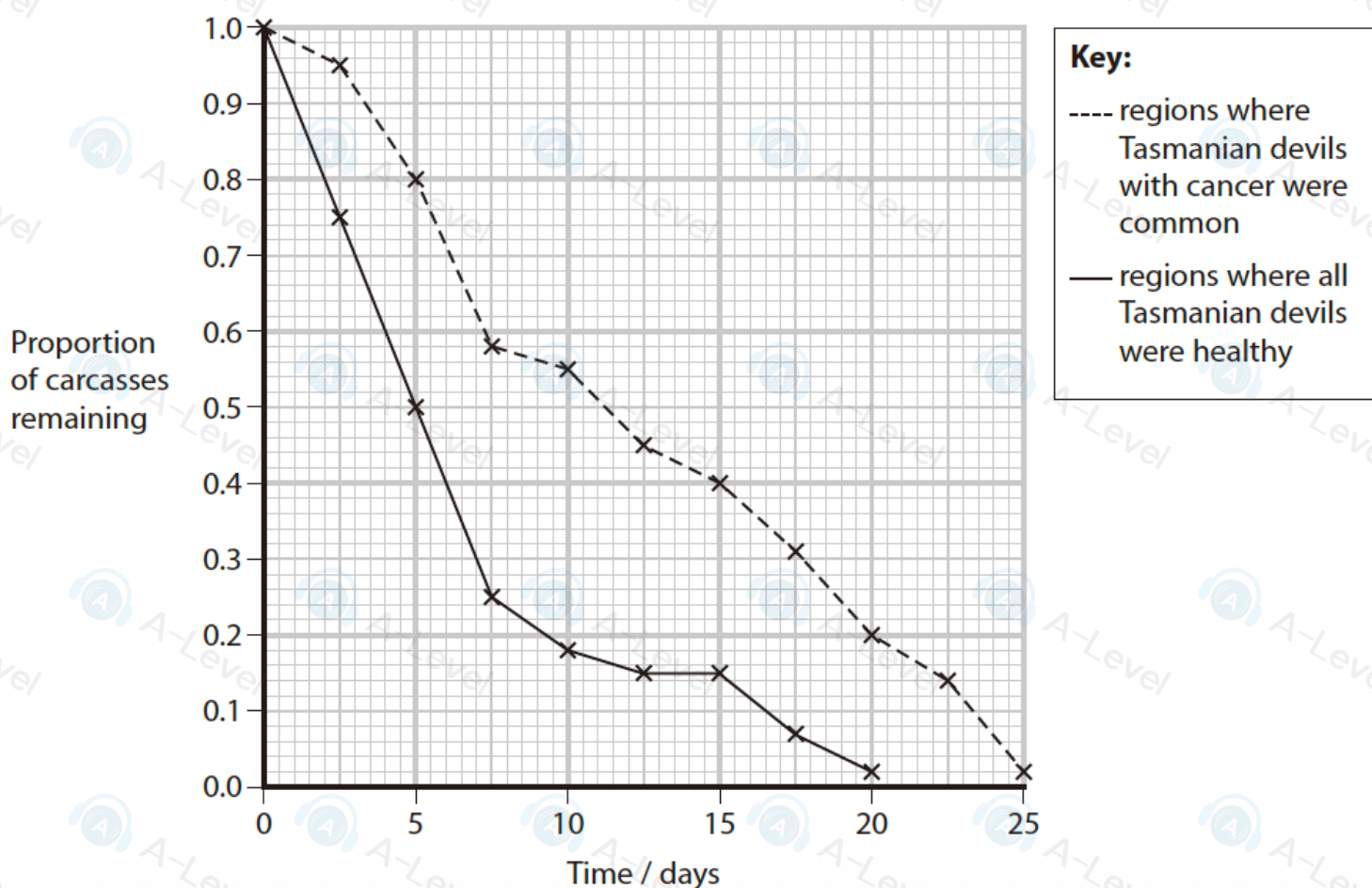
The length of time Tasmanian devils and three other scavenging animals spent feeding on carcasses was investigated.

The results are shown in the table.

Region	Proportion of time the scavengers spent feeding on each carcass			
	Tasmanian devil	Forest raven	Spotted-tailed quoll	Feral cat
Where all Tasmanian devils were healthy	0.76	0.13	0.06	0.05
Where Tasmanian devils with cancer were common	0.26	0.38	0.20	0.16

The length of time it took for the carcasses to be completely eaten was also investigated.

The results are shown in the graph.



* (i) Explain the results of these two studies.

Use the information in the table and the graph to support your answer.

(6)

Handwriting practice lines for the answer.

(ii) Explain what other **biotic** factors could have affected the results from the two different regions of Tasmania, in the second investigation.

(4)

Handwriting practice lines for the answer.