

AS Level Biology A
H020/02 Depth in biology

Question Set 5

1. A study was carried out on butterflies in two different habitats in the north of England. The two habitats were farmland and mixed deciduous woodland.

- Surveys were completed in 1992 and then at four year intervals.
- Data were collected from butterfly transect sites in both habitats. Using this data, the total butterfly population in each habitat was estimated.
- In 2012, the general populations of butterflies in these two habitats reached historical lows as a result of the prolonged cold and wet weather.
- Between 1992 and 2012 the woodland had become overgrown due to lack of active management. In particular the number of open spaces in the woodland had decreased.

(a) The data in Fig. 1 shows the total butterfly populations per square kilometre in both habitats between the years 1992 to 2012.

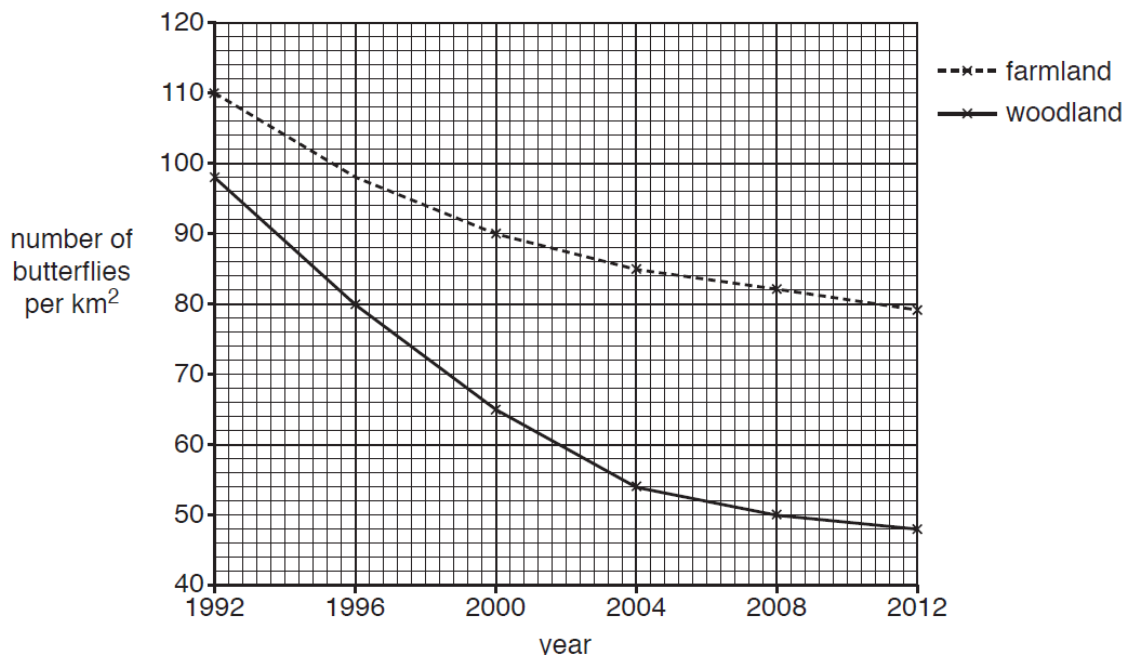


Fig. 1

(i) Calculate the total percentage decrease in the number of butterflies on farmland between 1992 and 2012.

Show your working. Give your answer to the nearest whole number.

$$\frac{110 - 79}{110} \times 100 = 28\%$$

Answer..... **28%**

[2]

(ii) Using the data given in Fig. 1, compare the changes in the number of butterflies on farmland and on woodland between 1992 and 2012.

The number of butterflies per km² decreases more rapidly in the woodland in comparison to the farmland. In the woodland, the number of butterflies decreases by 51% in comparison to a 28% decrease in the farmland. The population of butterflies in the farmland is always greater than in the woodland from 1992 to 2012.

[2]

(iii) Both habitats experienced the same weather conditions.

Suggest a reason for the **difference** in the rates of decline in butterfly numbers in woodland and farmland.

Farmland population may have declined less rapidly due to the conservation of hedgerows which provide a habitat for butterflies.

[1]

(iv) A student made the following statement:

'These data show that the change in butterfly numbers was caused by changes in weather conditions in England.'

[2]

Comment on the validity of this statement.

The statement lacks validity because the cold and wet weather conditions causing the decline in population numbers were only recorded in 2012 and the number of butterflies was decreasing in the years before this. Moreover, correlation does not imply causation. More evidence of the relationship between weather conditions and population numbers is required.

(v) State **one** variable that scientists should control when carrying out surveys such as this. **Sampling carried out at the same time of year.**

[1]

(b) Butterfly species in severe decline on farmland include gatekeeper, large skipper, small copper, wall brown, small tortoiseshell and white-letter hairstreak.

Butterfly species in severe decline in woodland include brown argus, common blue, gatekeeper, holly blue, marbled white, meadow brown, peacock, small copper, small heath, small tortoiseshell and wall brown.

State which habitat you would expect to have greater species richness and give **two** reasons for your answer.

[2]

Expect woodland to have greatest species richness. A greater number of butterfly species are in severe decline in the woodland which may suggest that there is a larger number of species present overall. It is also likely that there is a more diverse range of niches in woodland which can support a greater variety of species.

(c) Female silver-washed fritillary butterflies, *Argynnis paphia*, are usually an orange-brown colour. However, a deep olive-green colour can be seen in some females, largely in the south of England.

(i) What is the term given to this type of biodiversity? **Genetic biodiversity**

[1]

(ii) Give one possible benefit to the species of this type of biodiversity.

[1]

Enables adaptation to a changing environment, increasing the likelihood of species survival.

Total Marks for Question Set 5: 12

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