CHEMISTRY ONLINE
TUITION

Phone: +442081445350

www.chemistryonlinetuition.com

Email:asherrana@chemistryonlinetuition.com

# BIOLOGY

## GENETICS, BIODIVERSITY & CLASSIFICATION

| | |
|---|---|
| Level & Board | AQA (A-LEVEL) |
| TOPIC: | BIODIVERSITY, WITHIN A COMMUNITY |
| PAPER TYPE: | QUESTION PAPER - 1 |
| TOTAL QUESTIONS | 6 |
| TOTAL MARKS | 45 |

# Biodiversity within a community - 1

**1.**

A meadow is a grassland environment that is home to several plant and animal species.

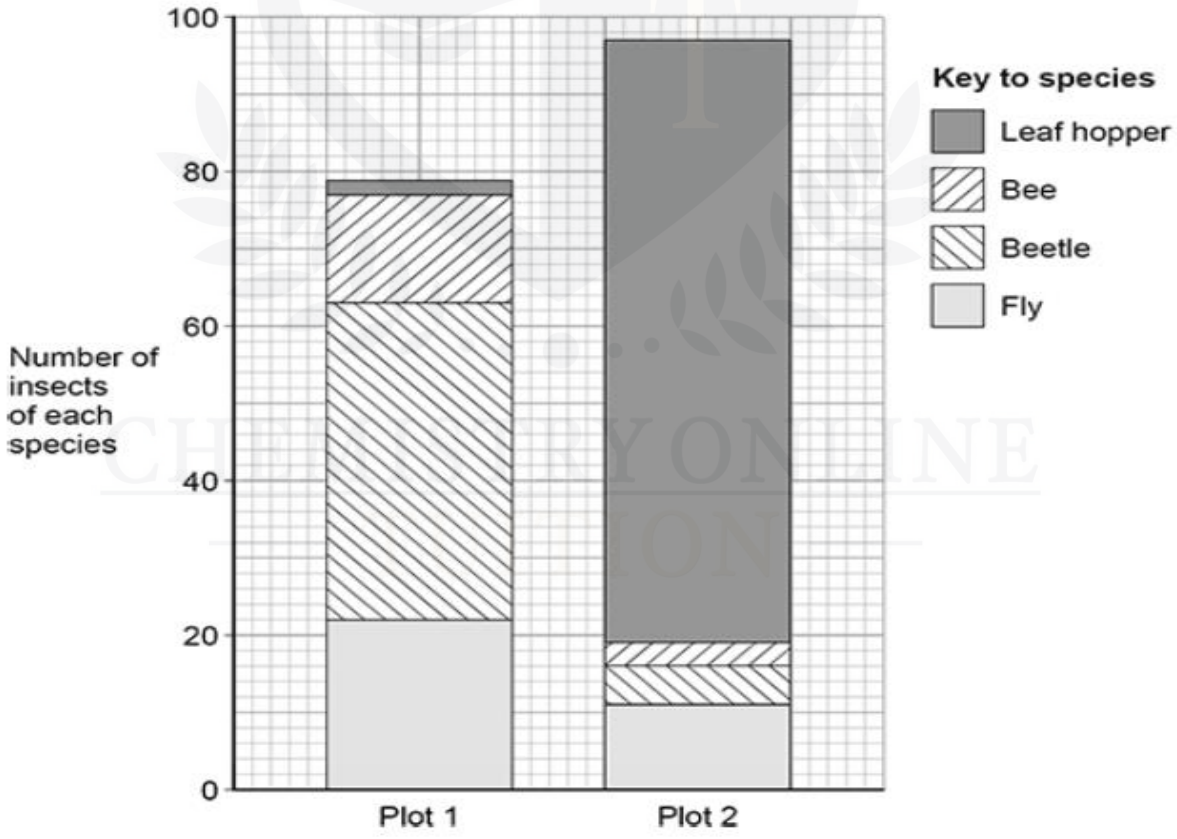
A student looked into whether the biodiversity of insects in a meadow was impacted in any way by chopping off some of the plants.

In the meadow, the student made two sample areas, or plots. Every plot was 10 m by 5 m in size.

The student used a lawnmower once a week to mow the plants in plot 2 and neglected to prune the plants in plot 1.

The student successfully collected every organism from each of the four insect species present in each of these plots after ten weeks.

The student's results are displayed in the figure below.



**(a)** Determine the index of diversity for the insects collected in Plot 1 using the data in the above figure.

The following formula is used to get the diversity index (d):

$$d = \frac{N(N-1)}{\Sigma n(n-1)}$$

where N is the total number of insects of all species and n is the total number of insects of each species.

Give the answer to 2 significant figures and show your working. **(2)**

d = _____

**(b)** The student came to the conclusion that the meadow's insect species richness was enhanced by using a lawnmower to trim down plants.

Provide evidence from the above graphic to demonstrate why the student's conclusion is false**. (1)**



**(c)** The student intended to calculate the overall number of beetle species in the meadow using the data from plot 1.

Provide advice on how the learner should calculate the overall number of beetle species in the meadow using the data from plot 1 and additional information**. (4)**



**2.**

The invertebrate species found in samples collected from two locations in a river were recognized and tallied by a scientist. At every location, the scientist also recorded the water flow rate.

His findings are displayed in Tables 1 and 2.

**Table 1**

| Invertebrate species | Site 1 | Site 2 |
|---|---|---|
| Anglers' Curse mayfly | 17 | 5 |
| Flat-headed mayfly | 6 | 8 |
| Slate Drake mayfly | 0 | 6 |
| Water beetle | 12 | 13 |
| Midge fly | 13 | 13 |
| Total number caught | 48 | 45 |

**Table 2**

| | Site 1 | Site 2 |
|---|---|---|
| Index of diversity | | 4.7 |
| Rate of water flow / cm $s^{-1}$ | 1-14 | 30-60 |

**(a)** Completing Table 2 at Site 1 requires figuring out the diversity index (d).

**(1)**

$$d = \frac{N(N-1)}{\sum n(n-1)}$$

Index of diversity (d) = _____

**(b)** Justify the greater utility of computing an index of diversity as opposed to keeping track of species richness. **(2)**



**(c)** Explain the method used by the scientist to gauge the river's water flow rate. **(1)**

**(d)** Make a hypothesis and provide an explanation for the variation in the abundance of Slate Drake mayflies at various locations along this river using the data in Tables 1 and 2. **(2)**



**(e)** Standardizing the sampling process was crucial while gathering Slate Drake mayflies from the two locations.

Provide one method for standardizing the sampling process. **(1)**

**3.**

**(a)** Students looked into the biodiversity of various farming areas.

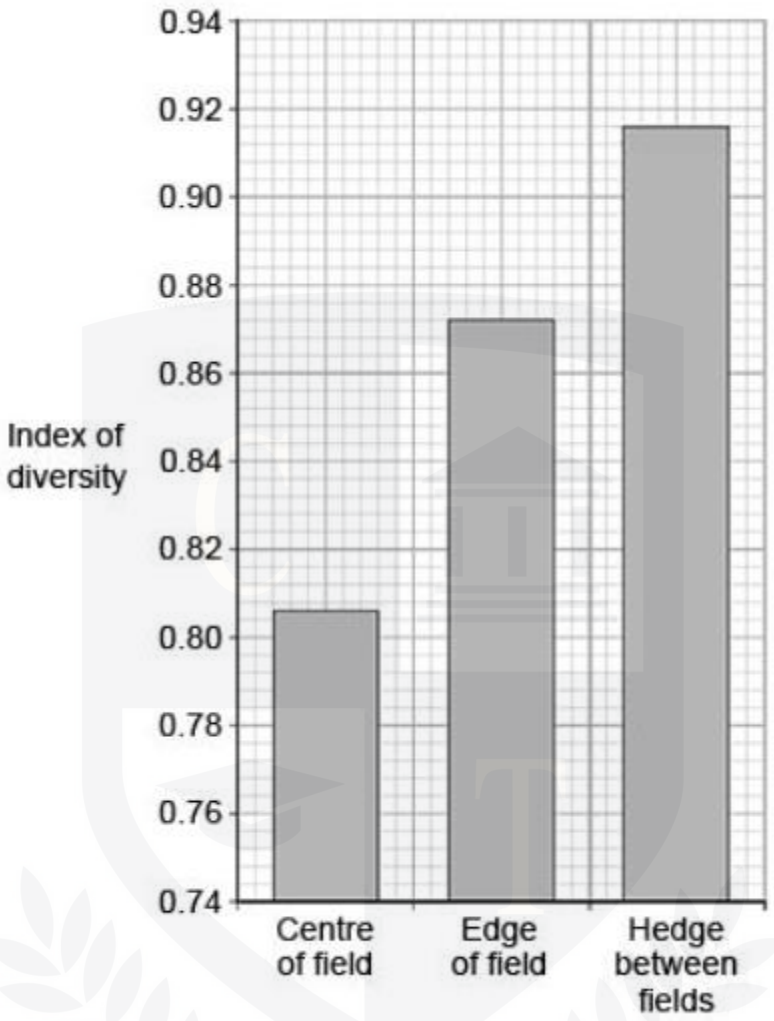
In every one of these environments

- the middle of a field
- the field's edge, and the hedge between fields
- they gathered data.

The graph displays their findings.






**(a)** What information would be required of the students in order to determine each habitat index of diversity?

The equipment used to sample species should not be mentioned in your response. **(1)**



**(b)** Describe the two methods the students made sure each habitat was represented in their diversity index. **(2)**

**(c)** Larger fields and the removal of fences between fields are results of modern farming techniques.

Explain why farmers use of wider fields results in a decline in biodiversity using the above graph. **(1)**



**(d)** Replanting hedges on farms is currently being encouraged.

Provide a farmer with a suggestion and an explanation of the benefits and drawbacks of replanting hedges on her land. **(2)**



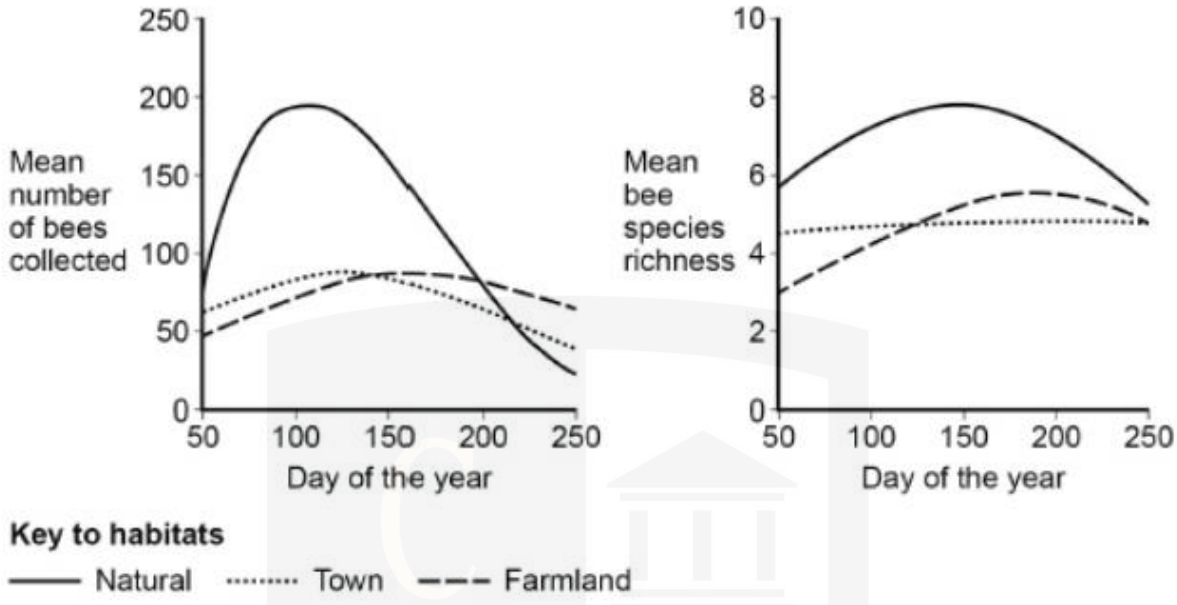
**4.**

Flying creatures called bees consume the nectar produced by flowers. Bees come in a wide variety of species.

Researchers looked into how bee biodiversity changed over the course of a year in three distinct settings. For three years, they collected bees from eight locations in each habitat four times a year.

The graphs below display the scientists findings as they were presented.




**(a)** What does the term "species richness" mean? **(1)**

**(b)** A student came to the following conclusions based on the information in the graphs.

- The ideal environment for bees is their native habitat.
- The town offers the least benefits to bees.

Do these findings hold up to the data in the graphs? Give an explanation for your response. **(4)**

I am Sorry !!!!!

**(c)** Using an ethical way of collecting bees, the scientists were able to precisely identify the species to which each bee belonged.

Provide one factor the scientists had taken into account in each case to ensure that their technique **(2)**

1. was ethical.



2. allowed them to identify accurately the species to which each belonged.

**(d)** Provide two suggestions on how the scientists could have improved the procedure they used to gather the data for this study. **(2)**



**(e)** Three types of bees were gathered from the farmland areas: Andrena piperi, Andrena chlorogaster, and Peponapis prunosa.

What do these names imply about these bee species evolutionary relationships? Give an explanation for your response. **(2)**

**5.**

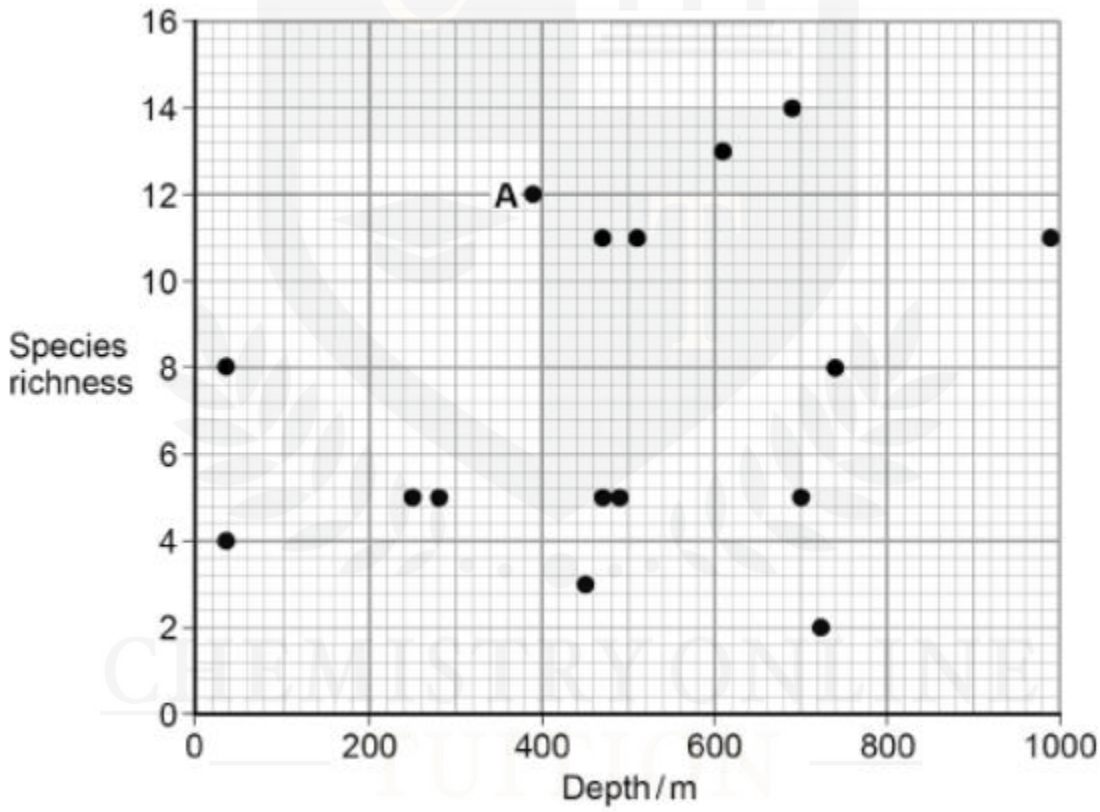
**(a)** Define Specie and species richness. **(2)**



**(b)** Researchers looked into the species richness of fish that were taken in the Pacific Ocean near Chile's western coast at different depths.

The scientist's findings are displayed on the graph. Sample A produced 68% of the fish that were caught during this experiment.




**(b)** What is the species richness modal value? **(1)**



**(c)** Sample A produced 68% of the fish that were caught during this experiment.

According to a student, this demonstrated that sample A had the highest variety index of all the samples.

This conclusion cannot be made with the available data. Explain your reasoning. **(3)**



**6.**

Between 1975 and 2010, ecologists examined alterations in grassland communities situated on sizable islands off the coast of Scotland. They employed information from several sites on each island to ascertain changes in the average species richness and average diversity index.

**(a)** The plant species found at one location on one island in 1975 are listed in Table 1.

**Table 1**

| Species | Number of individuals |
|---|---|
| *Hydrocotyle vulgaris* | 3 |
| *Plantago maritima* | 19 |
| *Ranunculus acris* | 3 |
| *Hieracium pilosella* | 3 |
| *Calliergon cuspidatum* | 10 |
| *Prunella vulgaris* | 16 |
| *Pseudoscleropodium purum* | 6 |

Utilizing the following formula, determine this site diversity index: **(2)**

$$d = \frac{N(N-1)}{\Sigma n(n-1)}$$



I am Sorry !!!!!

**(b)** Describe a technique the ecologists could have employed to ascertain the species richness of plants in a particular location**. (3)**

**(c)** A portion of the ecologists findings are displayed in Table 2. To see whether there were any noteworthy differences between the means from 1975 and 2010, they used a statistical test. Table 2 also displays the P values that they determined.



**Table 2**

| Island | Change in mean species richness between 1975 and 2010 | Value of P | Change in mean index of diversity between 1975 and 2010 | Value of P |
|---|---|---|---|---|
| **Islay** | +8.89 | ≤0.001 | +0.22 | >0.05 |
| **Colonsay** | +14.70 | ≤0.001 | +2.68 | ≤0.01 |
| **Harris** | −5.13 | ≤0.001 | −2.44 | ≤0.01 |

Do these statistics indicate that the grassland communities on these islands have undergone any notable changes? Provide justification for your response. **(3)**



# DR. ASHAR RANA

## M.B.B.S / MS. CHEMISTRY

CHEMISTRY ONLINE TUITION

Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, Math's and Biology Tutor

---

CONTACT INFORMATION FOR
**CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com

Address: 210-Old Brompton Road, London SW5 OBS, UK