Oxford Cambridge and RSA

AS Level Biology A

H020/02 Depth in biology

Question Set 12

1. (a) A group of students were studying a local field, Upper End Meadow. The students sampled plants from this field.

The students' results are given in Table 1.

Species	*n*	$\frac{n}{N}$	$\left(\frac{n}{N}\right)^2$
Meadow buttercup	6	0·250	0·063
Common daisy	7	0·292	0·085
Red clover	3	0·125	0·016
Ribwort plantain	8	0·333	0·111
			∑0·275

Table 1

(i) Calculate the Simpson's Index of Diversity for Upper End Meadow.

Use the information in Table 1 and the formula:

$$D = 1 - \left(\sum\left(\frac{n}{N}\right)^2\right)$$

n = number of organisms of this species
N = total number of organisms

Show your working. Give your answer to **two significant figures**.

N = 24
1 − 0·275 = 0·725

Answer 0·73

[3]

(ii) Name a piece of equipment that you could use for the random sampling of the plants shown in Table 1. Quadrat **[1]**

(b) The group of students attempted to extract and purify DNA from a plant in Upper End Meadow.

The students used the following steps:

1. Mix the plant sample with detergent.
2. Add salt.
3. Add protease enzyme.
4. Spool the DNA precipitate onto a glass rod.

Suggest whether this method would successfully extract and purify DNA. Justify your conclusion.

[3]

Addition of the detergent would help to disrupt the cell and nuclear membranes, releasing the contents of the cell and nucleus. However, this would likely be unsuccessful as the cell walls of the plant sample had not been broken down by grinding prior to detergent addition. Moreover ethanol was not added to precipitate out the DNA.

(c) The students found 50 animals in a soil sample collected from Upper End Meadow and identified them as follows:

- 2 click beetles
- 24 leatherjackets
- 23 meadow ants
- 1 wireworm

What can you conclude about the species evenness shown in the soil sample? Justify your answer.

Conclusion ..Species evenness is low.....

Justification Large number of leatherjackets and meadow ants present but few click beetles and only one wireworm.

[1]

Total Marks for Question Set 12: 8

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